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**COMMITTEE OF EXPERTS ON THE TRANSPORT  
OF DANGEROUS GOODS**

**Sub-Committee of Experts on the  
Transport of Dangerous Goods**  
(Eighteenth session, 3-14 July 2000,  
agenda item 6 (c))

**GLOBAL HARMONIZATION OF SYSTEMS OF CLASSIFICATION  
AND LABELLING OF CHEMICALS**

**Physical hazards**

**Proposal from the Chemical Specialities Manufacturers Association (CSMA)**

The Chemical Specialities Manufacturers Association (CSMA), representing the United States of America Aerosol Industry, is submitting two options for aerosol flammability classification. Option 1 includes a separate Proposal for Storage and Use (Annex 1), and a separate Proposal for Transport (Annex 2). Option 2 includes a single, combined Proposal for Flammability Classification (Annex 3). Annex 4 is a supporting document on Justification of Chemical Heat of Combustion Method.

*An Analysis of Aerosol Flammability Classification Methods* prepared for Factory Mutual Research Corporation, August 1991 is included in an addendum to this proposal (ST/SG/AC.10/C.3/2000/49/Add.1).

**Annex 1**  
**Proposal**  
**for supply and use**

**AEROSOLS**

Aerosols containing only non-flammable components (flashpoint > 93°C) shall be regarded as being NON-FLAMMABLE.

Aerosols, whose contents are ejected as solid or liquid particles in suspension in a gas, as a powder or in a liquid state or in a gaseous state, and which contain flammable components with a flashpoint of 93 °C or less, shall be tested to determine their flammability and should be classified on the basis of the results obtained with the following test methods. If testing is not conducted, the product shall be regarded as being FLAMMABLE.

- a. All spray aerosol products are tested using the **Ignition Distance Test**.

*If there is no ignition at 30 cm or more in the Ignition Distance Test, the aerosols shall be regarded as being NON-FLAMMABLE under foreseeable conditions of use.*

- b. All spray aerosol products are tested using the **Enclosed Space Ignition Test** or on equivalent validated calculations based on constants.

*If the equivalent time is greater than 100 seconds/m<sup>3</sup> in the Enclosed Space Ignition Test or has met calculations equivalent to that result, the aerosols shall be regarded as being NON-FLAMMABLE under foreseeable conditions of use.*

- c. All aerosol products, which are emitted in the form of a foam, mousse, gel or paste, are tested using the Aerosol Foam Flammability Test under foreseeable conditions of use.

*If the flame height exceeds 4 cm and the burning time exceeds 2 seconds, the aerosols shall be regarded as being FLAMMABLE, otherwise the aerosols shall be regarded as being NON-FLAMMABLE.*

Annex 2

Proposal for transport

**2.2.4 AEROSOLS**

2.2.4.1 Aerosols containing only non-flammable components (flashpoint > 93°C) shall be regarded as being in sub-division 2.2 (NON-FLAMMABLE).

2.2.4.2 Aerosols, whose contents are ejected as solid or liquid particles in suspension in a gas, as a powder or in a liquid state or in a gaseous state, and which contain flammable components with a flashpoint of 93°C or less, shall be tested to determine its flammability and should be classified on the basis of the results obtained with the following test methods. If testing is not conducted, the product shall be regarded as being in sub-division 2.1 (FLAMMABLE).

- a. All spray aerosol products are tested using the **Enclosed Space Ignition Test** or equivalent validated calculations based on constants.

*If the deflagration density is greater than or equal to 100 grams per cubic meter, the aerosols shall be regarded as being in sub-division 2.2 (NON-FLAMMABLE), otherwise the aerosols shall be regarded as being in sub-division 2.1 (FLAMMABLE),*

*OR*

*If the chemical heat of combustion is less than 20kJ/g, as determined by the methods described in NFPA 30B, the aerosols shall be regarded as being in sub-division 2.2 (NON-FLAMMABLE), otherwise the aerosols shall be regarded as being in sub-division 2.1 (FLAMMABLE).*

**Annex 3**

**Proposal for flammability classification**

**AEROSOLS**

Aerosols containing only non-flammable components (flashpoint > 93°C) shall be regarded as being NON-FLAMMABLE.

Aerosols, whose contents are ejected as solid or liquid particles in suspension in a gas, as a powder or in a liquid state or in a gaseous state, and which contain flammable components with a flashpoint of 93 °C or less, shall be tested to determine their flammability and should be classified on the basis of the results obtained with the following test methods. If testing is not conducted, the product shall be regarded as being FLAMMABLE.

- a. All spray aerosol products are tested using the **Ignition Distance Test**.

*If there is no ignition at 30 cm or more in the Ignition Distance Test, the aerosols shall be regarded as being NON-FLAMMABLE under foreseeable conditions of use.*

- b. All spray aerosol products are tested using **the Enclosed Space Ignition Test** or equivalent validated calculations based on constants.

*If the equivalent time is greater than 100 seconds/m<sup>3</sup> or the deflagration density is greater than or equal to 100 grams per cubic meter in the Enclosed Space Ignition Test or has met calculations equivalent to that result, the aerosols shall be regarded as being NON-FLAMMABLE under foreseeable conditions of use.*

- c. All aerosol products, which are emitted in the form of a foam, mousse, gel or paste, are tested using the **Aerosol Foam Flammability Test** under foreseeable conditions of use.

*If the flame height exceeds 4 cm and the burning time exceeds 2 seconds, the aerosols shall be regarded as being FLAMMABLE, otherwise the aerosols shall be regarded as being NON-FLAMMABLE.*

**Annex 4****Justification of Chemical Heat of Combustion Method  
for Aerosol Flammability Classification**

Early aerosol testing in the U.S. used different methods:

- Flame Extension Test
- Drum test
- 12 Pallet Load Test
- Aerosol Flammability Test (AFT) which consists of the Single Can Fireball Test and the Pan Fire Test.
- Classification by base product composition.

Factory Mutual, the experts in fire research conducted an independent analysis of the data from such tests. This analysis concluded that a simple calculation to determine the total “Heat of Combustion” is sufficient to predict the product’s flammability, making no distinction on whether it comes from the base product, propellant, spray rate, pressure or spray pattern. This extensive flammability test program which was started in 1984 has continued over the years and was used by the National Fire Protection Association in the development of NFPA Code 30B, Code for the Manufacture and Storage of Aerosol Products.

Determining the cut-off points for flammability criteria can be determined on calculations and the physical testing criteria based on the calculated cut-off point, which could be mutually agreed to.

This would:

- Provide calculations as an alternative to testing that may present safety concerns.
- Provide physical criteria that would relate to a scientific calculation and scale, which the industry could agree to.
- Harmonize transport, supply, storage, and use by parameters using the same basic calculations, but change the cut-off points for the use.
- Remove physical testing inconsistencies.

A summary of the *Analysis of Aerosol Flammability Classification Methods* is enclosed. A copy of the full report will be mailed to you. The full report is quite lengthy and may be difficult to translate. Therefore, we would suggest that a copy of the summary be provided to all parties.

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