

## COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

Sub-Committee of Experts on the  
Transport of Dangerous Goods  
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Corrections to ST/SG/AC.10/C.3/2000/46 and Comments on ST/SG/AC.10/C.3/2000/34

### Extremely Flammable Criteria, Determination of the Ignition Distance of the Spray Jet

Transmitted by the Expert from the United States

#### Introduction

The Expert from the United States would like to note an amendment to ST/SG/AC.10/C.3/2000/46 and to comment on ST/SG/AC.10/C.3/2000/34 by suggesting revisions to the text of Annexes 2 and 3 (Determination of the Ignition Distance of the Spray Jet, and Foam Flammability Test for Aerosols).

#### Amendment to ST/SG/AC.10/C.3/2000/46

1. With respect to extremely flammable criteria for aerosols, the expert from the United States notes the following amendment to ST/SG/AC.10/C.3/2000/46:

On page 3 of ST/SG/AC.10/C.3/2000/46, replace paragraph number (4) with the following revised definition for an extremely flammable aerosol:

4. *The following definition is proposed:*

*"An aerosol, which meets the criteria of flammable, is classified as being extremely flammable:*

*(1) if, when tested by the ignition distance test method at 15 centimetres, a flashback (a flame extending back to the actuator) is obtained at any degree of valve opening and the flash point of the base product is less than -5 °C; or,*

*(2) if the aerosol contains 85% or more of constituents having a flash point of 60 °C or below and a heat of combustion greater than 95% ethanol."*

#### Comments on ST/SG/AC.10/C.3/2000/34

2. With respect to ST/SG/AC.10/C.3/2000/34, in Annex 2, "Procedure for determination of the ignition distance of the spray jet", the following modifications are proposed (see attached amended Annex 2 for detailed proposed revisions):

- It is recommended that more specific criteria be used for the ignition source. Currently the ignition source is defined as “a gas burner with a blue, non-luminous flame 4-5 cm in height”. It is recommended that natural gas (methane) be specified as the fuel type since the heat of combustion varies depending on the type of gas used (methane, ethane or propane). It is also recommended that the height of the inner cone of the flame be specified at 2 cm, and that a 10 mm diameter for the burner tube be specified.
  - It is recommended that the test procedure be revised so that the aerosols are tested in three orientations: upright, horizontal, and inverted. This is to account for the effect of the orientation on the combustion of the spray.
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## **Annex 2 (with proposed amendments)** **Determination of the ignition distance**

### OF THE SPRAY JET

#### **OBJECTIVE**

This Test Standard describes the method to determine the ignition distance of an aerosol spray in order to assess the associated flame risk

#### **PRINCIPLE**

An aerosol is sprayed in the direction of an ignition source at intervals of 15cm to observe if ignition and sustained combustion of the spray takes place.

Ignition and sustained combustion is defined as when a stable flame is maintained for 5 seconds.

~~The ignition source is defined as a gas burner with a blue, non-luminous flame 4-5 cm in height.~~  
**The ignition source is defined as a methane gas burner (i.e. Bunsen or equivalent) with adjustable gas flow and adjustable combustion air emitting a blue, non-luminous flame 4-5 cm in height with a 2 cm bright inner cone. The burner tube diameter shall be approximately 10 mm.**

#### **SCOPE**

This test is applicable to aerosol products with a spray distance of 15 cm or more. Aerosol products with a spray distance of less than 15cm such as: dispensing foams, mousses and gels or fitted with a metering valve are excluded from this test. Aerosol products that dispense foams, mousses or gels are subject to testing under the Aerosol Foam Flammability Test.

#### **GENERAL REQUIREMENTS**

Before testing, each aerosol dispenser should be conditioned and then primed by discharging for approximately 1 second. The purpose of this action is to remove non-homogeneous material from the diptube.

Follow strictly the instructions of use. When shaking is required, shake immediately before testing.

The tests should be carried out in a draught-free environment capable of ventilation, with the temperature controlled at 20°C ± 5°C and relative humidity in the range 30 - 80%.

#### **EQUIPMENT AND APPARATUS**

- Water bath maintained at 20°C accurate to " 1°C.
- Calibrated laboratory scales (balance) accurate to " 0.1g
- Chronometer (stopwatch) accurate to " 0.2s
- Graduated scale, support and clamp graduations in cm
- Gas burner with support and clamp.
- Thermometer accurate to " 1°C
- Hygrometer accurate to " 5%
- Pressure gauge accurate to " 0.1 Bar

## TESTING

Each aerosol dispenser is to be tested:

- when full according to the complete procedure, with the gas burner in the range of 15 – 90 cm distance from the actuator of the aerosol can
- when 10 -12% full nominal (% by weight) only one test, either at 15 cm distance from the actuator when the spray from a full can did not ignite at all, or at the Flame Ignition Distance of the spray of a full can plus 15 cm

Can position during the test to be as per label instructions **with subsequent tests in the horizontal and inverted positions**. The ignition source will be positioned accordingly.

The following procedure requires testing the spray at intervals of 15 cm between the burner flame and the aerosol actuator, in the range of 15 – 90 cm. It is efficient to start at 60 cm distance between burner flame and aerosol actuator. The distance between burner flame and aerosol actuator should be increased by 15 cm in the case of an ignition of the spray at 60 cm distance. The distance should be decreased by 15 cm in the case of no ignition at 60 cm distance between burner flame and aerosol actuator. The aim of the procedure is to determine the maximum distance between aerosol actuator and burner flame that leads to sustained combustion of the spray or to determine that ignition could not be obtained at 15 cm distance between the burner flame and the aerosol's actuator.

## TEST PROCEDURE

1. A minimum of ~~39~~ full aerosol dispensers per product shall be conditioned to 20°C " 1°C with at least 95% of the dispenser immersed in the water for at least 30 minutes before each test (If the aerosol is fully immersed, 30 mins conditioning is sufficient).
2. Comply with General Requirements. Record the temperature and relative humidity of the environment.
3. Weigh an aerosol dispenser and note its weight.
4. Determine the internal pressure and initial discharge rate at 20°C " 1°C (to eliminate faulty or partly filled aerosol dispensers).
5. Support the gas burner on a flat horizontal surface or fix the burner to a support by means of a clamp.
- ~~6. Ignite the gas burner; the flame shall be non-luminous and approximately 4-5 cm high.~~  
**6. Ignite the gas burner; the flame shall be non-luminous and approximately 4-5 cm high with a 2 cm bright inner cone.**
7. Place the actuator's exit orifice at the required distance from the flame, **with the can in an upright position according to normal use instructions.**
8. Level the actuator's orifice and burner flame, ensuring that the orifice is properly directed towards and aligned with the flame (see Figure 1). The spray shall be expelled through the top half of the flame.
9. Comply with the general requirements regarding shaking of the dispenser.

10. Actuate the valve of the aerosol dispenser, to discharge its contents for 5 seconds, unless ignition occurs. If ignition occurs, continue discharging and time the duration of the flame for 5 seconds, from the start of ignition.
11. Note the ignition results for the distance between the gas burner and the aerosol dispenser in the table provided.
12. Repeat steps 7, 8, 9, 10 and 11 twice more (a total of 3) for the same can at the same distance between the gas burner and the aerosol actuator.
13. Repeat the test procedure for another two aerosol cans of the same product at the same distance between gas burner and aerosol actuator.
14. Repeat steps 7, 8, 9, 10, 11, 12 and 13 of the test procedure at a distance between 15 and 90 cm between the actuator of the aerosol can and the burner flame depending on the outcome of each test (*see also the paragraph on TESTING*).
15. **Repeat steps 7-13 so that 3 cans are tested in each of the following positions: upright, horizontal (i.e. rotated 90° from the upright position), and inverted.**
16. If no ignition occurs at 15 cm, the procedure is finished for initially full cans. The procedure is also finished when ignition and sustained combustion is obtained at a distance of 90 cm. If ignition could not be obtained at 15 cm distance, record that ignition did not occur. The maximum distance between burner flame and the aerosol's actuator for which an ignition and sustained combustion was observed is noted as the Ignition Distance, in all other circumstances.
17. One test should also be conducted on 3 cans of 10 - 12% nominal fill level. These cans should be tested at a distance between the aerosol's actuator and the burner flame of "the Flame Ignition Distance of full cans + 15 cm". **These cans should also be tested in upright, horizontal, and inverted positions.**
18. Discharge an aerosol can to a 10 - 12% nominal fill level (by weight) in bursts of 30 seconds maximum. Observe a 300 seconds minimum time period between bursts. During this interim period dispensers should be placed in the water bath for conditioning.
19. Repeat steps 7 to 13 for 10 - 12% nominal fill aerosol cans, omitting step 12.
20. Record all results in the Table 1 as shown below.

## REMARKS

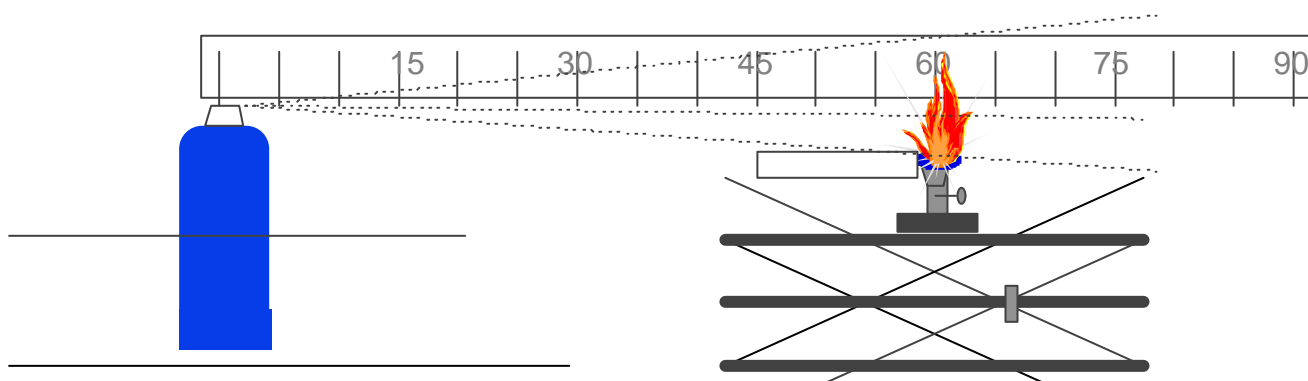
Perform all experiments in a fume hood in a room that may be well-ventilated. Ventilation of the fume hood and room can be applied for at least 3 minutes after each test. Take all necessary safety precautions to prevent the inhalation of combustion products.

The cans with a 10-12% nominal fill level are tested only once. The result tables ~~needs~~ **need** only 1 result per can indicated.

Table 1

Date	Temperature				°C					
	Relative Humidity				%					
Name of Product										
Net Volume	Can 1			Can 2			Can 3			
Initial Level of filling	%			%			%			
Dispenser Distance	Test	1	2	3	1	2	3	1	2	3
15 cm	Ignition?									
	Y or N									
30 cm	Ignition?									
	Y or N									
45 cm	Ignition?									
	Y or N									
60 cm	Ignition?									
	Y or N									
75 cm	Ignition?									
	Y or N									
90 cm	Ignition?									
	Y or N									
Observations										

**Note: This table should be duplicated for each position required by the test (i.e. upright,**



**horizontal, and inverted positions).**

**Figure 1 Note: This figure portrays the aerosol in an upright position, however the aerosol should also be tested in horizontal and inverted positions.**