



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels,
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Proposal for a

COMMISSION DIRECTIVE .../.../EC

of [...]

amending, for the purposes of adapting to technical progress, Council Directive 75/324/EEC on the approximation of the laws of the Member States relating to aerosol dispensers

EN

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(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Directive 75/324/EEC of 20 May 1975 on the approximation of the laws of the Member States relating to aerosol dispensers¹, and in particular Articles 5 and 10(3) thereof,

Whereas:

- (1) Technical progress and innovation have made possible the placing on the market of an increasing number of aerosol dispensers with a complex technical design and characteristics different from the traditional ones. However, the provisions of Directive 75/324/EEC are not sufficient to guarantee a high level of safety for such non-traditional aerosol dispensers. The individual design of non-traditional aerosols may create safety hazards that are not addressed by the safety provisions of the Directive, which are adapted to the known design of traditional aerosols. Therefore, a hazard analysis is necessary to be performed by the manufacturer in order to cover all safety aspects adequately.
- (2) Where appropriate the hazard analysis must address the risk resulting from the inhalation of the spray ejected by the aerosol dispenser under normal or reasonably foreseeable conditions of use, taking into account droplet size and size distribution in conjunction with physical and chemical properties of the contents, as the inhalation of small aerosol droplets may give rise to adverse health effects for the user under such conditions of use, even if the aerosol dispenser is properly classified and labelled according to the provisions of Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations

¹ OJ L 147, 9.6.1975, p. 40. Directive as last amended by Council Regulation (EC) No 807/2003 (OJ L 122, 16.5.2003, p. 36).

and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations².

- (3) The safeguard clause provided for in Article 10 of Directive 75/324/EEC has been applied by one Member State. The safeguard measure adopted is justified in view of the risk of flammability raised, under normal or reasonably foreseeable conditions of use, by the substances contained in the aerosol dispenser.
- (4) The current definition of flammable contents is not sufficient to guarantee a high level of safety in all cases. In particular, although some contents dispersed by aerosol dispensers are not defined as “flammable” according to the criteria listed in Annex VI to Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances³, they may lead to ignition under normal or reasonably foreseeable conditions of use of the aerosol dispenser. Furthermore, the current criteria for flammability only address chemical substances and preparations and do not take properly into account special physical conditions of an aerosol spray or specific conditions of use.
- (5) In order to achieve the optimal level of safety and considering the specificities of aerosol dispensers, the new criteria for the classification of the flammability of aerosol dispensers should also address the hazards relating to the dispersion of the contents of aerosol dispensers and the specific conditions of use of the aerosol dispensers rather than only the physical and chemical properties of the contents themselves.
- (6) The provisions of Directive 75/324/EEC currently in force require that each filled aerosol dispenser be immersed in a bath of hot water in order to assess its leak tightness and burst resistance. However, heat sensitive aerosol dispensers cannot withstand this test. Technological progress has made possible alternative test methods for the final assessment of aerosol dispensers for burst resistance and leak tightness, which guarantee the same level of safety.
- (7) The provisions of Directive 75/324/EEC currently in force provide for the possibility to use a test system enabling a result equivalent to that of the water bath method, subject to the agreement of the Committee referred to in Article 6. However, this procedure appears to be extremely heavy to be implemented in practice, and therefore, it has never been used. Therefore, in order to enable economic operators to benefit from technological progress without compromising the current level of safety by guaranteeing the appropriate technical expertise, it is necessary that the alternative test methods are approved, instead of the Committee referred to in Article 6 of the Directive, by the relevant competent authorities designated by Member States under Council Directive 94/55/EC on the approximation of the laws of the Member States with regard to the transport of dangerous goods by road⁴.

² OJ L 200, 30.7.1999, p.1. Directive as last amended by Commission Directive 2006/8/EC (OJ L 19, 24.1.2006, p.12).

³ OJ L 196, 16.8.1967, p. 1. Directive as last amended by Commission Directive 2004/73/EC (OJ L 152, 30.4.2004, p. 1).

⁴ OJ L 319, 12.12.1994, p. 7. Directive as last amended by Commission Directive 2006/89/EC (OJ L 305, 4.11.2006, p.4).

- (8) Safety concerns have been raised following the burst and leak of metal aerosol dispensers heated to high temperatures, as is the case in cars exposed to solar radiation. It is therefore necessary to limit the maximum filling level to the same value for all types of aerosol dispensers.
- (9) Most environmentally friendly and non-flammable propellants are compressed gases. However, the loss of pressure of aerosol dispensers using compressed gas propellants at the end of their life-time typically leads to a less efficient yield of contents. Consequently, the use of compressed gases as propellants should be encouraged by increasing the maximum internal pressure of aerosol dispensers, to the extent that it is safe for the consumer.
- (10) Directive 75/324/EEC should therefore be amended accordingly.
- (11) The measures provided for in this Directive are in accordance with the opinion of the Committee on the adaptation to Technical Progress of the Directive on aerosol dispensers,

HAS ADOPTED THIS DIRECTIVE:

Article 1

Directive 75/324/EEC is amended as set out in the Annex to this Directive.

Article 2

1. Member States shall adopt and publish by...{18 months from the entry into force} the laws, regulations and administrative provisions necessary to comply with this Directive. They shall forthwith communicate to the Commission the text of those provisions and a correlation table between those provisions and this Directive.

Member States shall apply those provisions as from {6 months from the deadline for transposition}.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such a reference is to be made.

2. Member States shall communicate to the Commission the texts of the main provisions of national law which they adopt in the field covered by this Directive.

Article 3

This Directive shall enter into force on the twentieth day following the date of its publication in the *Official Journal of the European Union*.

Article 4

This Directive is addressed to the Member States.

Done at Brussels, [...]

For the Commission

[...]

Member of the Commission

ANNEX

Directive 75/324/EEC is hereby amended as follows:

- (1) In Article 8 the following paragraph 1a is added:

“1a. Where an aerosol dispenser contains flammable components as defined in point 1.8 of the Annex but the aerosol dispenser is not considered as “flammable” or “extremely flammable” according to the criteria set out in point 1.9 of the Annex, the quantity of flammable material contained in the aerosol dispenser must be stated clearly on the label, in the form of the following legible and indelible wording: “X% by mass of the contents are flammable”.

- (2) Article 9a is repealed.

- (3) The Annex is amended as follows:

- (a) Point 1.8. is replaced by the following:

“1.8. Flammable contents

Contents of aerosols shall be considered as flammable if they contain any component which is classified as flammable:

- (a) *flammable liquid means a liquid having a flash point of not more than 93°C.*
- (b) *flammable solid means a solid substance or mixture which is readily combustible, or may cause or contribute to fire as a result of friction. Readily combustible solids are powdered, granular, or pasty substances or mixtures which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.*
- (c) *flammable gas means a gas or gas mixture having a flammable range with air at 20°C and a standard pressure of 1,013 bar.*

This definition does not cover pyrophoric, self-heating or water-reactive substances and mixtures, which shall never be components of aerosol contents.”

- (b) The following point 1.9. is inserted:

“1.9. Flammable aerosols

For the purpose of this Directive, an aerosol is considered as ‘non-flammable’, ‘flammable’ or ‘extremely flammable’ according to its chemical heat of combustion and mass content of flammable components, as follows:

- (a) *The aerosol is classified as ‘extremely flammable’ if it contains 85% or more flammable components and the chemical heat of combustion exceeds or is equal to 30 kJ/g;*

- (b) *The aerosol is classified as ‘non-flammable’ if it contains 1% or less flammable components and the chemical heat of combustion is less than 20 kJ/g.*
- (c) *All other aerosols will be submitted to the following flammability classification procedures or shall be classified as ‘extremely flammable’. The ignition distance test, the enclosed space test and the foam flammability test shall comply with point 6.3.*

1.9.1. Flammable spray aerosols

In the case of spray aerosols the classification shall be made taking into account the chemical heat of combustion and on the basis of the results of the ignition distance test, as follows:

- (a) *If the chemical heat of combustion is less than 20 kJ/g:*
 - (i) *The aerosol is classified as ‘flammable’ if ignition occurs at a distance equal or greater than 15 cm but less than 75 cm;*
 - (ii) *The aerosol is classified as ‘extremely flammable’ if ignition occurs at a distance of 75 cm or more;*
 - (iii) *If no ignition occurs in the ignition distance test, the enclosed space test shall be performed and in this case, the aerosol is classified as ‘flammable’ if the time equivalent is less than or equal to 300 s/m³ or the deflagration density is less than or equal to 300 g/m³; otherwise the aerosol is classified as ‘non-flammable’;*
- (b) *If the chemical heat of combustion is equal to or more than 20 kJ/g, the aerosol is classified as ‘extremely flammable’ if ignition occurs at a distance of 75 cm or more; otherwise the aerosol is classified as ‘flammable’.*

1.9.2. Flammable foam aerosols

In the case of foam aerosols, the classification shall be made on the basis of the results of the foam flammability test.

- (a) *The aerosol product shall be classified as ‘extremely flammable’ if:*
 - (i) *the flame height is 20 cm or more and the flame duration is 2 s or more;*

or

 - (ii) *the flame height is 4 cm or more and the flame duration is 7 s or more.*
- (b) *The aerosol product which does not meet the criteria in (a) is classified as ‘flammable’ if the flame height is 4 cm or more and the flame duration is 2 s or more.”*

- (c) The following point 1.10. is inserted:

“1.10. Chemical Heat of Combustion

The chemical heat of combustion DH_c shall be either determined by

- (a) *acknowledged rules of technology, described e.g. in standards such as ASTM D 240, ISO 13943 86.1 to 86.3 and NFPA 30B, or found in the scientifically established literature*

or

- (b) *applying the following calculation method:*

The chemical heat of combustion (DH_c), in kilojoules per gram (kJ/g), can be calculated as the product of the theoretical heat of combustion (DH_{comb}), and a combustion efficiency, usually less than 1.0 (a typical combustion efficiency is 0.95 or 95%).

For a composite aerosol formulation, the chemical heat of combustion is the summation of the weighted heats of combustion for the individual components, as follows:

$$\Delta H_c = \sum_i^n [w_i \% \times \Delta H_{c(i)}]$$

where:

DH_c = *chemical heat of combustion (kJ/g) of the product;*

$w_i\%$ = *mass fraction of component i in the product;*

$DH_{c(i)}$ = *specific heat of combustion (kJ/g) of component i in the product.*

The person responsible for the marketing of the aerosol dispenser has to describe the method used for determining the chemical heat of combustion in a document to be made readily available in an official Community language at the address specified on the label in accordance with point (a) of Article 8(1), if the chemical heat of combustion is used as a parameter for assessing the flammability of aerosols according to the provisions of this Directive.”

- (d) The following provision is inserted after point 2. “General provisions” and before point 2.1.

“Without prejudice to specific provisions of the Annex on requirements related to the flammability and pressure hazard, the person responsible for the marketing of aerosol dispensers is under an obligation to analyse the hazards in order to identify those which apply to his aerosol dispensers. Where appropriate, this analysis shall include a consideration of the risks resulting from the inhalation of the spray ejected by the aerosol dispenser under normal and reasonably foreseeable conditions of use, taking into account droplet size distribution in conjunction with physical and

chemical properties of the contents. He must then design, construct and test it and, if applicable, draft special statements concerning its use, taking account of his analysis.”

(e) Point 2.2(b) is replaced by the following:

“(b) Where the aerosol is classified as ‘flammable’ or ‘extremely flammable’ according to the criteria of point 1.9:

- The flame symbol, in accordance with the model in Annex II to Directive 67/548/EEC;*
- The indication ‘flammable’ or ‘extremely flammable’, depending on the classification of the aerosol as ‘flammable’ or ‘extremely flammable’.”*

(f) Point 2.3(a) and 2.3(b) are replaced by the following:

“(a) Whatever its contents, any additional operating precautions which alert consumers to the specific dangers of the product; if the aerosol dispenser is accompanied by separate instructions for use, the latter must also reflect such operating precautions;

(b) Where the aerosol is classified as ‘flammable’ or ‘extremely flammable’ according to the criteria of point 1.9, the following warnings:

- The safety phrases S2 and S16 laid down in Annex IV to Directive 67/548/EEC;*
- ‘Do not spray on a naked flame or any incandescent material’.”*

(g) The following point 2.4. is inserted:

“2.4. Volume of the liquid phase

The volume of the liquid phase at 50°C must not exceed 90% of the net capacity.”

(h) Point 3.1.2. is replaced by the following:

“3.1.2. Filling

At 50°C, the pressure in the aerosol dispenser must not exceed 12 bar.

However, if the aerosol does not contain a gas or mixture of gases having a flammable range with air at 20°C and a standard pressure of 1,013 bar, the maximum allowable pressure at 50°C is 13,2 bar.”

(i) Points 3.1.3., 4.1.5. and 4.2.4. are deleted.

(j) Point 6.1.4. is replaced by the following:

“6.1.4. Final inspection of filled aerosol dispensers

6.1.4.1. Aerosol dispensers shall be subject to one of the following final test methods.

(a) *Hot water bath test*

Each filled aerosol dispenser shall be immersed in a hot water bath.

- (i) *The temperature of the water bath and the duration of the test shall be such that the internal pressure reaches that which would be exerted by its contents at a uniform temperature of 50°C.*
- (ii) *Any aerosol dispenser showing visible permanent distortion or a leak must be rejected.*

(b) *Hot final test methods*

Other methods for heating the contents of aerosol dispensers may be used if they guarantee that the pressure and temperature in each filled aerosol dispenser reach the values required for the hot water bath test and distortions and leaks are detected with same precision as in the case of the hot water bath test.

(c) *Cold final test methods*

An alternative cold final test method may be used if it is in accordance with the provisions of an alternative method to the hot water bath test for aerosol dispensers specified in point 6.2.4.3.2.2 of Annex A to Directive 94/55/EC.

6.1.4.2. *For aerosol dispensers the contents of which undergo a physical or chemical transformation changing their pressure characteristics after filling and before first use, cold final test methods according to point 6.1.4.1(c) should be applied.*

6.1.4.3. *In case of test methods according to points 6.1.4.1 (b) and 6.1.4.1 (c):*

- (a) *The test method must be approved by a competent authority .*
- (b) *The person responsible for the marketing of aerosol dispensers must submit an application for approval to a competent authority. The application must be accompanied by the technical file describing the method.*
- (c) *The person responsible for the marketing of aerosol dispensers must, for surveillance purposes, keep the approval of the competent authority, the technical file describing the method and, if applicable, control reports readily available at the address specified on the label in accordance with point (a) of Article 8(1).*
- (d) *The technical file must be established in an official Community language or a certified copy thereof must be available.*
- (e) *'competent authority' means the authority designated in each Member State under Directive 94/55/EC.*

(k) The following point 6.3. is inserted:

“6.3. Tests on the flammability of aerosols

6.3.1. Ignition distance test for spray aerosols

6.3.1.1. Introduction

6.3.1.1.1. This test standard describes the method to determine the ignition distance of an aerosol spray in order to assess the associated flame risk. The aerosol is sprayed in the direction of an ignition source at intervals of 15 cm 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 at least 5 s. The ignition source is defined as a gas burner with a blue, non-luminous flame 4-5 cm in height.

6.3.1.1.2. 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 15 cm such as dispensing foams, mousses, gels and pastes or fitted with a metering valve, are excluded from this test. Aerosol products that dispense foams, mousses, gels or pastes are subject to testing under the aerosol foam flammability test.

6.3.1.2. Apparatus and material

6.3.1.2.1. The following apparatus is required:

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

6.3.1.3. Procedure

6.3.1.3.1. General requirements

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

6.3.1.3.1.2. The instructions of use shall be strictly followed, including whether the dispenser is intended to be used in the upright or inverted position. When shaking is required, shake immediately before testing.

6.3.1.3.1.3. *The test shall be carried out in a draught-free environment capable of ventilation, with the temperature controlled at $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and relative humidity in the range 30 - 80%.*

6.3.1.3.1.4. *Each aerosol dispenser is to be tested:*

- (a) *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;*
- (b) *when 10 - 12% full nominal (% by mass) 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.*

6.3.1.3.1.5. *During the test, the can shall be positioned as indicated by label instructions. The ignition source shall be positioned accordingly.*

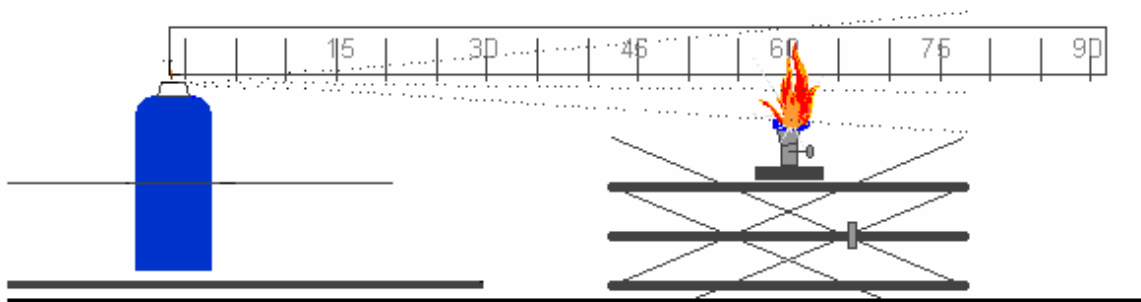
6.3.1.3.1.6. *The following procedure requires testing the spray at intervals of 15 cm between the burner flame and the aerosol actuator, in the range of 15 - 90 cm. It is efficient to start at 60 cm distance between burner flame and aerosol actuator. The distance between burner flame and aerosol actuator shall be increased by 15 cm in the case of an ignition of the spray at 60 cm distance. The distance shall 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.*

6.3.1.3.2. *Test procedure*

- (a) *A minimum of 3 full aerosol dispensers per product shall be conditioned to $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ with at least 95% of the dispenser immersed in the water for at least 30 min before each test (if the aerosol is fully immersed, 30 min conditioning is sufficient);*
- (b) *Comply with general requirements. Record the temperature and relative humidity of the environment;*
- (c) *Weigh an aerosol dispenser and note its mass;*
- (d) *Determine the internal pressure and initial discharge rate at $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ (to eliminate faulty or partly filled aerosol dispensers);*
- (e) *Support the gas burner on a flat horizontal surface or fix the burner to a support by means of a clamp;*
- (f) *Ignite the gas burner; the flame shall be non-luminous and approximately 4-5 cm high;*

- (g) Place the actuator's exit orifice at the required distance from the flame. The aerosol shall be tested in the position it is designed to be used, e.g. upright or inverted;
- (h) Level the actuator's orifice and burner flame, ensuring that the orifice is properly directed towards and aligned with the flame (see Figure 6.3.1.1). The spray shall be expelled through the top half of the flame;

Figure 6.3.1.1.



- (i) Comply with the general requirements regarding shaking of the dispenser;
 - (j) Actuate the valve of the aerosol dispenser, to discharge its contents for 5 s, unless ignition occurs. If ignition occurs, continue discharging and time the duration of the flame for 5 s, from the start of ignition;
 - (k) Note the ignition results for the distance between the gas burner and the aerosol dispenser in the table provided;
 - (l) If no ignition occurs during step (j), the aerosol shall be tested in alternative orientations, e.g. inverted for upright use products, to check if ignition is obtained;
 - (m) Repeat steps (g) to (l) twice more (a total of 3) for the same can at the same distance between the gas burner and the aerosol actuator;
 - (n) Repeat the test procedure for another two aerosol cans of the same product at the same distance between gas burner and aerosol actuator;
 - (o) Repeat steps (g) to (n) 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 6.3.1.3.1.4 and 6.3.1.3.1.5);
 - (p) 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;

- (q) *One test shall also be conducted on 3 cans of 10 - 12% nominal fill level. These cans shall be tested at a distance between the aerosol's actuator and the burner flame of "the flame ignition distance of full cans + 15 cm";*
- (r) *Discharge an aerosol can to a 10 - 12% nominal fill level (by mass) in bursts of 30 s maximum. Observe a 300 s minimum time period between bursts. During this interim period dispensers shall be placed in the water bath for conditioning;*
- (s) *Repeat steps (g) to (n) for 10 - 12% nominal fill aerosol cans, omitting steps (l) and (m). This test shall only be performed with the aerosol in one position, e.g. upright or inverted, corresponding with that which produced the ignition (if any) for filled cans;*
- (t) *Record all results in the Table 6.3.1.1 as shown below.*

6.3.1.3.2.1 All experiments shall be performed 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 min after each test. Take all necessary safety precautions to prevent the inhalation of combustion products.

6.3.1.3.2.2. The cans with a 10 - 12% nominal fill level shall be tested only once. The result tables need only one result per can indicated.

6.3.1.3.2.3. When the test in the position in which the dispenser is designed to be used gives a negative result, the test shall be repeated in the position of the dispenser most likely to result in a positive result.

6.3.1.4. Method of assessing results

6.3.1.4.1. All the results shall be recorded. Table 6.3.1.1 below shows the model of "result table" to be used."

Table 6.3.1.1.

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
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 – including can position							

6.3.2. Enclosed space ignition test

6.3.2.1 Introduction

This test standard describes the method to assess the flammability of products emerging from aerosol dispensers due to their propensity to ignite in an enclosed or confined space. The contents of an aerosol dispenser are sprayed into a cylindrical test vessel containing a burning candle. If an observable ignition occurs, the elapsed time and amount discharged is noted.

6.3.2.2. Apparatus and material

6.3.2.2.1. The following apparatus is required:

Chronometer (stopwatch) accurate to ± 0.2 s

Water bath maintained at 20 °C accurate to ± 1 °C

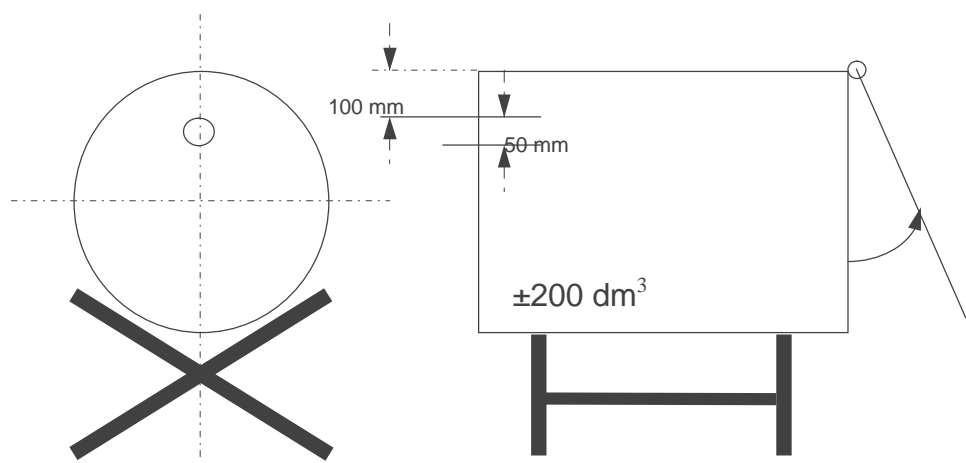
<i>Calibrated laboratory scales (balance)</i>	<i>accurate to ± 0.1 g</i>
<i>Thermometer</i>	<i>accurate to $\pm 1^\circ\text{C}$</i>
<i>Hygrometer</i>	<i>accurate to $\pm 5\%$</i>
<i>Pressure gauge</i>	<i>accurate to ± 0.1 bar</i>
<i>Cylindrical test vessel</i>	<i>as detailed below</i>

6.3.2.2.2. Preparation of test apparatus

6.3.2.2.2.1. A cylindrical vessel approximately 200 dm^3 volume, approximately 600 mm in diameter and approximately 720 mm long and open at one end shall be modified as follows:

- A closure system consisting of a hinged cover shall be matched to the open end of the receptacle; or
- A plastic film 0.01 to 0.02 mm thick may be used as a closure system. If the test is carried out with a plastic film this must be used as described below: Stretch the film over the open end of the drum and hold it in place with an elastic band. The strength of the band shall be such that when placed around the drum resting on its side, it stretches by only 25 mm when a mass of 0.45 kg is attached to its lowest point. Cut a 25 mm slit in the film, starting 50 mm from the edge of the drum. Ensure that the film is taut;
- At the other end of the drum drill a 50 mm diameter hole 100 mm from the edge in such a way that the orifice is uppermost when the receptacle is laid down and ready for the test (Figure 6.3.2.1.)

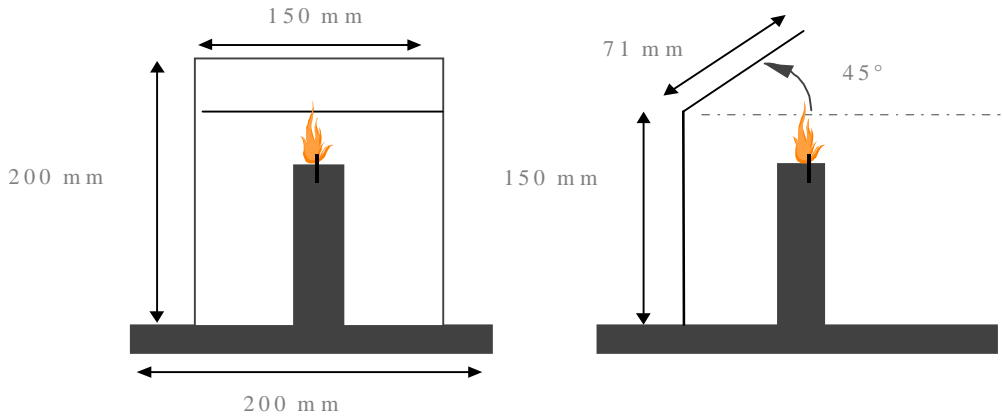
Figure 6.3.2.1.



- On a 200×200 mm metal support place a paraffin wax candle 20 to 40 mm in diameter and 100 mm high. The candle shall be replaced when having a height of less than 80 mm. The candle's flame is protected from the action of the spray

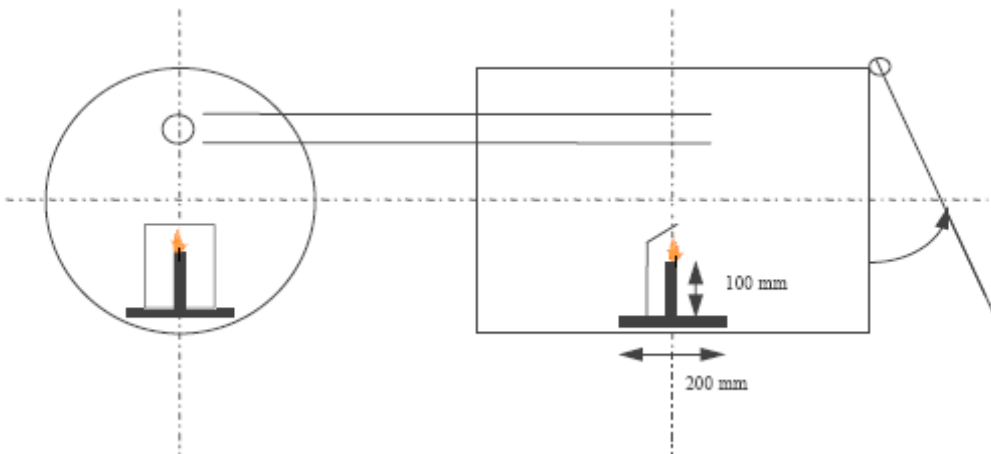
by a 150 mm wide, 200 mm high deflector. This includes the plane inclined at 45° produced 150 mm from the base of the deflector (Figure 6.3.2.2.);

Figure 6.3.2.2.



- (e) The candle placed on the metal support shall be positioned midway between the two ends of the drum (Figure 6.3.2.3.);

Figure 6.3.2.3.



- (f) The drum is laid on the ground or on a support at a spot where the temperature is between 15°C and 25°C. The product to be tested will be sprayed within the drum of roughly 200 dm³ in which there will be a source of ignition.

6.3.2.2.2.2 Usually, the product leaves the aerosol can at an angle of 90° relevant to the vertical axis of the can. The layout and procedure described refers to this kind of aerosol product. In the case of unusually operating aerosols (e.g. vertical-spray aerosol dispensers) it will be necessary to record changes to equipment and procedures in accordance with good

laboratory practice, such as ISO/IEC 17025:1999 General requirements for the competence of testing and calibration laboratories.

6.3.2.3. Procedure

6.3.2.3.1. General requirements

6.3.2.3.1.1. Before testing, each aerosol dispenser shall 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.

6.3.2.3.1.2. The instructions of use shall be strictly followed, including whether the dispenser is intended to be used in the upright or inverted position. When shaking is required, shake immediately before testing.

6.3.2.3.1.3. The tests shall be carried out in a draught-free environment capable of ventilation, with the temperature controlled at $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and relative humidity in the range 30 - 80%.

6.3.2.3.2. Test procedure

- (a) A minimum of 3 full aerosol dispensers per product shall be conditioned to $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ in a water bath with at least 95% of the dispenser immersed in the water for at least 30 min (if the aerosol is fully immersed, 30 min conditioning is sufficient);*
- (b) Measure or calculate the actual volume of the drum in dm^3 ;*
- (c) Comply with general requirements. Record the temperature and relative humidity of the environment;*
- (d) Determine the internal pressure and initial discharge rate at $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ (to eliminate faulty or partly filled aerosol dispensers);*
- (e) Weigh one of the aerosol dispensers and note its mass;*
- (f) Light the candle and apply the closure system (cover or plastic film);*
- (g) Place the aerosol dispenser actuator orifice 35 mm or closer for a wide spray product, from the centre of the entrance hole in the drum. Start the chronometer (stopwatch) and following the instructions for use of the product; direct the spray towards the centre of the opposite extremity (cover or plastic film). The aerosol shall be tested in the position it is designed to be used, e.g. upright or inverted;*
- (h) Spray until ignition occurs. Stop the chronometer and note the time elapsed. Re-weigh the aerosol dispenser and note its mass;*
- (i) Ventilate and clean the drum removing any residue likely to affect subsequent tests. Allow the drum to cool if necessary;*

- (j) Repeat the test procedure steps (d) to (i) for another two aerosol dispensers of the same product (3 in total, note: each dispenser is only tested once);

6.3.2.4. Method of assessing results

6.3.2.4.1. A test report containing the following information shall be drawn up:

- a) The product tested and its references;
- b) The internal pressure and discharge rate of the aerosol dispenser;
- c) The temperature and relative air humidity of the room;
- d) For each test, the discharge time (s) needed to achieve ignition (if the product does not ignite, state this);
- e) The mass of the product sprayed during each test (in g);
- f) The actual volume of the drum (in dm³).

6.3.2.4.2. The time equivalent (t_{eq}) needed to achieve ignition in one cubic metre can be calculated as follows:

$$t_{eq} = \frac{1000 \times \text{discharge time (s)}}{\text{Actual volume of drum (dm}^3\text{)}}$$

6.3.2.4.3. The deflagration density (D_{def}) needed to achieve ignition during the test may also be calculated as follows:

$$D_{def} = \frac{1000 \times \text{Amount of product dispensed (g)}}{\text{Actual volume of drum (dm}^3\text{)}}$$

6.3.3. Aerosol foam flammability test

6.3.3.1. Introduction

6.3.3.1.1. This test standard describes the method to determine the flammability of an aerosol spray emitted in the form of a foam, mousse, gel or paste. An aerosol, which emits a foam, mousse, gel or paste is sprayed (approx. 5 g) on a watchglass and an ignition source (candle, wax taper, match or lighter) is placed at the base of the watchglass to observe if ignition and sustained combustion of the foam, mousse, gel or paste occurs. Ignition is defined as a stable flame maintained for at least 2 s and a minimum 4 cm in height.

6.3.3.2. Apparatus and material

6.3.3.2.1. The following apparatus is required:

Graduated scale, support and clamp gradations in cm

Fire-resistant watchglass roughly 150 mm in diameter

Chronometer (stopwatch) accurate to ± 0.2 s

Candle, wax taper, match or lighter

Calibrated laboratory scales (balance) accurate to ± 0.1 g

Water bath maintained at 20 °C accurate to ± 1 °C

Thermometer accurate to ± 1 °C

Hygrometer accurate to $\pm 5\%$

Pressure gauge accurate to ± 0.1 bar

6.3.3.2.2. *The watchglass is placed on a fire-resistant surface within a draught-free area that may be ventilated after each test. The graduated scale is positioned exactly behind the watchglass and held vertically by means of a support and clamp.*

6.3.3.2.3. *The scale is positioned in such a way that its origin is on a level with the watchglass base in a horizontal plane.*

6.3.3.3. *Procedure*

6.3.3.3.1. *General requirements*

6.3.3.3.1.1. *Before testing, each aerosol dispenser shall 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.*

6.3.3.3.1.2. *The instructions of use shall be strictly followed, including whether the dispenser is intended to be used in the upright or inverted position. When shaking is required, shake immediately before testing.*

6.3.3.3.1.3. *The tests shall be carried out in a draught-free environment capable of ventilation, with the temperature controlled at $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and relative humidity in the range of 30–80%.*

6.3.3.3.2. *Test procedure*

(a) *A minimum of four full aerosol dispensers per product shall be conditioned to $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ with at least 95% of the dispenser immersed in the water for at least 30 min before each test (if the aerosol is fully immersed, 30 min conditioning is sufficient);*

(b) *Comply with general requirements. Record the temperature and relative humidity of the environment;*

(c) *Determine the internal pressure at $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ (to eliminate faulty or partly filled aerosol dispensers);*

- (d) *Measure the discharge or flow rate of the aerosol product to be examined, so that the amount of test product dispensed can be more accurately gauged;*
- (e) *Weigh one of the aerosol dispensers and note its mass;*
- (f) *On the basis of the measured discharge or flow rate and following the manufacturer's instructions, release approximately 5 g of the product onto the centre of the clean watchglass with the aim of producing a mound no higher than 25 mm;*
- (g) *Within 5 s of completion of discharge, apply the source of ignition to the edge of the sample at its base and at the same time start the chronometer (stopwatch). If necessary, the ignition source shall be removed from the edge of the sample after approximately two seconds, in order to clearly observe if ignition has occurred. If no ignition of the sample is apparent, the ignition source shall be reapplied to the edge of the sample;*
- (h) *If ignition occurs note the following points:*
 - (i) *The maximum height of the flame in cm above the base of the watchglass;*
 - (ii) *The flame duration in s;*
 - (iii) *Dry and re-weigh the aerosol dispenser and calculate the mass of the released product;*
- (i) *Ventilate the test area immediately after each test;*
- (j) *If ignition is not obtained and the released product remains in the form of a foam or paste throughout its period of use, steps (e) to (i) shall be repeated. Allow the product to stand for 30 sec, 1 min, 2 min or 4 min before applying the ignition source;*
- (k) *Repeat the test procedure steps (e) to (j) twice more (a total of 3) for the same can;*
- (l) *Repeat the test procedure steps (e) to (k) for another two aerosol cans (3 cans in total) of the same product.*

6.3.3.4. Method of assessing results

6.3.3.4.1. A test report containing the following information shall be drawn up:

- (a) *whether the product ignites;*
- (b) *maximum flame height in cm;*
- (c) *duration of flame in s;*
- (d) *the mass of the product tested.*