TEST FOR DETERMINING THE FLASHBACK AND THE LENGTH OF THE FLAME PROJECTION OF A FLAMMABLE PRODUCT ENCLOSED IN A SPRAY CONTAINER

Application

1. This test is to be used to determine the flashback and the length of the flame projection of a flammable product enclosed in a spray container.

Apparatus

2. The following apparatus is to be used in this test:
   (a) a flammability tester, as illustrated in Figures 1 and 2 to the Schedule, that
   (i) is constructed so that the spray container can be secured in place by means of a holding device, such as a three-pronged clamp affixed to a ring stand, in such a manner that the discharge from the spray container is in the horizontal plane,
   (ii) may include a remote control device by which
      (A) the valve of a pressurized container can be activated, such as a side-pull, caliper-type bicycle hand brake, or
      (B) the trigger or plunger of a pump-spray container can be pneumatically activated, as illustrated in Figures 3 and 4 to the Schedule,
   (iii) has a vertically mounted burner that
      (A) has an inside diameter of 1.2 mm,
      (B) has a Luer-Lock 16-gauge needle affixed to a metal tube or another suitable device, and
      (C) is placed at a distance of 15 cm from the discharge orifice of the spray container, which distance is to be measured horizontally between the vertical planes of the discharge orifice and the burner orifice, and
   (iv) has two support frameworks, placed on the opposite side of the burner from the spray container, one at a distance of 15 cm from the burner and the other at a distance of 100 cm from the burner, each of which
      (A) has an internal open space for testing a pressurized container of 35 cm wide by 100 cm high or, for testing a pump-spray container, of 35 cm wide by 60 cm high,
      (B) is constructed from metal or other non-flammable material,
CCCRR, 2001 Schedule 1 - TEST FOR DETERMINING THE FLASHBACK AND THE LENGTH OF THE FLAME PROJECTION OF A FLAMMABLE PRODUCT ENCLOSED IN A SPRAY CONTAINER

(C) is mounted in a vertical plane perpendicular to the direction of discharge from the spray container, and
(D) is adjustable in the vertical plane;
(b) a cylinder of chemically pure (C.P.) grade propane fitted with a regulator capable of delivering pressure to the burner appropriate to maintaining a flame height of 5 cm;
and
(c) loosely woven cotton fabric commonly referred to as cheesecloth that has, in the bleached state, a mass per unit area of not less than 35 g/m² and not more than 65 g/m².

Test Specimen

3. (1) When there are instructions by the manufacturer respecting the shaking of the spray container, a test composed of the following number of discharges from each of three spray containers of the same product and of the same size must be conducted:
   (a) in the case of a pressurized container, three discharges; and
   (b) in the case of a pump-spray container, 10 discharges.

(2) When there are no instructions by the manufacturer respecting the shaking of the spray container, a test, using each of three spray containers of the same product and of the same size, must be conducted as follows:
   (a) in the case of a pressurized container, without shaking the container, discharge it three times and then, after shaking it in the manner set out in paragraph 4(9)(a), discharge it a further three times; or
   (b) in the case of a pump-spray container, without shaking the container, discharge it 10 times and then, after shaking it in the manner set out in paragraph 4(9)(a), discharge it a further 10 times.

Procedure

4. (1) A test
   (a) must be conducted at a room temperature of 22 ± 2°C in the absence of air currents, with an allowance made for a clearance of 50 cm beyond the support framework that is set at a distance of 100 cm from the burner; and
   (b) may be conducted in a fume hood with the exhaust fan turned off and the protecting door lowered.
(2) Any fume must be removed from the test area and any residue cleaned up after each discharge.

(3) Before testing, each spray container must be
(a) maintained at a temperature of 22 ± 2°C for at least four hours; and
(b) primed by
   (i) in the case of a pressurized container, discharging the container for five seconds, and
   (ii) in the case of a pump-spray container, activating the trigger or pump using each of 18 N, 36 N and 54 N of pressure for each possible nozzle position until
      (A) in the case of the "stream" position, a continuous stream is produced, and
      (B) in the case of the "spray" position, a mist is produced.

(4) Install the first spray container in the holding device and ensure that the burner orifice is 15 cm from the discharge orifice of the spray container in the horizontal plane and 5 cm below it in the vertical plane and that the discharge orifice points in the direction of the burner.

(5) Adjust the burner to give a flame height of 5 cm and release the following trial discharges from the spray container:
   (a) in the case of a pressurized container, a single discharge; and
   (b) in the case of a pump-spray container, three discharges.

(6) If the operation set out in subsection (5) does not produce a flame projection, lower the burner orifice by 5 cm and adjust the burner to give a flame height of 12 cm.

(7) Attach the cheesecloth to the flammability tester with bulldog clips or in any other manner so as to cover the entire internal space of the support framework set at a distance of 15 cm from the burner and verify that the cheesecloth is at a proper horizontal distance from the vertical plane of the burner orifice on the opposite side of the burner from the spray container.

(8) Adjust the height of the support framework so that the cheesecloth will intercept the line of flame projection.

(9) Prepare the spray container in accordance with the manufacturer's instructions and
(a) if shaking is applicable,
   (i) shake vigorously for five seconds, or for the period specified in the manufacturer's instructions,
   (ii) install the spray container in the holding device,
(iii) 15 seconds after the cessation of shaking, release the first discharge in accordance with subsection (10), and
(iv) allow the spray container to stand for at least 60 seconds between discharges; or
(b) if shaking is not applicable, install the spray container in the holding device and release the discharge in accordance with subsection (10), allowing the spray container to stand for at least 60 seconds between discharges.

(10) Discharge the spray container
(a) in the case of a pressurized container, for five seconds or until the cheesecloth ignites; or
(b) in the case of a pump-spray container, for 10 sprays or until the cheesecloth ignites.

(11) In the case of a pump-spray container, repeat the procedure set out in paragraph (10)(b) for each nozzle position and each of 18 N, 36 N and 54 N of pressure.

(12) If the cheesecloth attached to the support framework that is set at a distance of 15 cm from the burner ignites, the remaining discharges referred to in section 3 must be carried out in accordance with subsections (1) to (11) using a new piece of cheesecloth attached to the support framework that is set at a distance of 100 cm from the burner.

Determination and Reporting of Flame Projection and Flashback

5. (1) If at any time during the test the cheesecloth that is mounted at a distance of 100 cm from the burner is ignited, the length of the flame projection is 100 cm or more.

(2) If at any time during the test the cheesecloth that is mounted at a distance of 15 cm from the burner is ignited and, at all times during the test, the cheesecloth that is mounted at a distance of 100 cm from the burner remains unignited, the length of the flame projection is 15 cm or more but less than 100 cm.

(3) If at any time during the test the cheesecloth mounted at a distance of 15 cm from the burner is not ignited but there is a flame projection, the length of the flame projection is less than 15 cm.

6. The following test results must be recorded:
(a) the length of the flame projection
   (i) in the case of a pressurized container, for each discharge, and
   (ii) in the case of a pump-spray container, for each discharge at each nozzle position and each pressure applied;
CCC, 2001 Schedule 1 - TEST FOR DETERMINING THE FLASHBACK AND THE LENGTH OF THE FLAME PROJECTION OF A FLAMMABLE PRODUCT ENCLOSED IN A SPRAY CONTAINER

(b) a lack of flame projection resulting from any of the test discharges; and
(c) any flashback.
CCCRR, 2001 Schedule 1 - TEST FOR DETERMINING THE FLASHBACK AND THE LENGTH OF THE FLAME PROJECTION OF A FLAMMABLE PRODUCT ENCLOSED IN A SPRAY CONTAINER

FIGURE 1

FLAMMABILITY TESTER - PRESSURIZED CONTAINER
CCCRR, 2001 Schedule 1 -  TEST FOR DETERMINING THE FLASHBACK AND THE LENGTH OF THE FLAME PROJECTION OF A FLAMMABLE PRODUCT ENCLOSED IN A SPRAY CONTAINER
CCCRR, 2001 Schedule 1 - TEST FOR DETERMINING THE FLASHBACK AND THE LENGTH OF THE FLAME PROJECTION OF A FLAMMABLE PRODUCT ENCLOSED IN A SPRAY CONTAINER

FIGURE 3
HOLDING APPARATUS FOR A TRIGGER-TYPE CONTAINER - ISOMETRIC VIEW

FIGURE 4
HOLDING APPARATUS FOR A PLUNGER TYPE OR PRESSURIZED CONTAINER ISOMETRIC VIEW
SCHEDULE 2
(Subsection 1(1) and section 21)

HAZARD SYMBOLS

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SCHEDULE 3
(Section 7)

TEST METHOD FOR DETERMINING WHETHER A CONTAINER LEAKS

**Interpretation**

1. The definitions in this section apply in this Schedule.

**Definitions**

“seal” « sceau d'étanchéité »

“seal”, in respect of a container, means any device or membrane under the closure that covers the opening of the container, including any membrane that is part of the container, such as a heat induction seal or a sonic seal. It does not include a liner or a mechanism that is an integral part of the closure.

“test sample” « échantillon d'essai »

"test sample" means

(a) in the case of a container of a chemical product, the container filled with the product in the manner in which it is sold to the consumer; or

(b) in the case of an empty container that is destined to receive a chemical product, the container filled with the product that it is destined to receive.

**Test Method**

**Preparation of Sample for Testing**

2. Except in the case of a single-use container, (a) open the test sample; (b) remove any seal that is present under the closure in accordance with the manufacturer's instructions or, if no instructions are provided, puncture the seal; and (c) reclose the sample as tightly as possible without stripping the threads of the closure.

Bring to room temperature

3. Place the test sample in a test location that has a constant temperature of 23 ± 2°C for at least four hours to permit the container and its contents to reach the temperature of the test location.
CCCRR, 2001 Schedule 3 - TEST METHOD FOR DETERMINING WHETHER A CONTAINER LEAKS

Testing for Leaks

Position of test sample

4. Position the test sample
   (a) over a clean piece of blotting paper or another paper that stains on contact with a liquid;
   (b) in an inverted position at a 45° angle below the horizontal; and
   (c) with the closure in the lowest possible position and free of any obstruction.

Examine paper

5. After one hour, remove the test sample and examine the paper described in paragraph 4(a) for evidence that any of the contents have leaked from the sample.

PASS OR FAIL

Fail

6. If an examination of the paper described in paragraph 4(a) discloses any trace of the contents of the test sample, the sample has failed the leakage test and a container of the same type as the test sample must not be used for a chemical product.

Pass

7. If no trace of the contents of the test sample is found on the paper described in paragraph 4(a), the sample has passed the leakage test and a container of the same type as the test sample may be used for a chemical product.

DISCUSSION OF CCCR, 2001 SCHEDULE 3

Definitions:

The following terms are defined in section 1 of the CCCR, 2001: chemical product, container, manufacturer, single-use container.

Requirements:

Section 7 requires that a container of a liquid chemical product must pass the leakage test described in this Schedule, or an equivalent test.

Topics

Definitions
Requirements
Test Sample
Removing the Seal
Temperature Conditioning
Testing for Leaks
Non-Mandatory Tests
Field Test
Aging Test
Life Test
Coding System
Test Sample:

The leakage test does not have to be performed on every container in a production lot. The test sample would be a representative sample of that lot. However, every new production lot would require a new test sample.

If a test sample fails, then the whole production lot of containers fails.

Removing the Seal:

Experiments conducted by industry and the Product Safety Laboratory showed that sonic-sealed containers will leak when the seal has been removed or punctured. Similar container-closure systems leaked far less when the container had not previously been sonic-sealed.

The Product Safety Laboratory observed that containers with punctured sonic seals leaked within the same amount of time as those where the sonic seal was completely removed. In addition, the amount of product which leaked from containers with punctured seals was similar to containers with completely removed seals. During the reasonably foreseeable use of liquid chemical products, it is unlikely that a consumer would be meticulous to the point that he or she would take the time to completely remove a seal. Some consumers may simply puncture the seal with a tool or a key, while others may rip the seal or make an opening large enough to allow the liquid to flow out. Hence in the leakage test, the seal should be removed according to instructions, if present, or otherwise punctured.

The exception for opening, breaking the seal and re-closing single-use containers recognizes that these containers are intended to be opened only once and not re-closed. Note that if it is possible to re-close the container, then that container is not considered to be a single-use container, and that product must meet the full requirements of the CCCR, 2001 for recloseable containers.

Temperature Conditioning:

Often, in packaging locations, the plastic containers coming from their moulds are hot, while the products that go into them may be very cold, especially in winter when exterior storage tanks are used. This difference in temperature creates a stress between the closure and the container which could make the package leak. However, once the two temperatures equilibrate and the product is in the hands of consumers, the performance of the package may be different. Thus the leakage test should be carried out with the container and the contents at the same temperature. The temperature of 23 ± 2°C is used because this is the average temperature most likely to be found throughout the lifetime of a container.
**Testing for Leaks:**

Besides blotting paper, examples of other papers that stain on contact include thermal paper and filter paper. These other papers are not specifically referenced in Schedule 3 in order to be consistent with the leak test described in the standard CSA Z76.1-99 (entitled *Recloseable Child-Resistant Packages*).

Thermal paper imprints a spot on the paper where the liquid has fallen. If the liquid is a volatile clear solvent, an analyst might not notice a spot on blotting paper. But with thermal paper, it is easier to see clear liquids and the stain does not disappear when the liquid dries up. Hence thermal paper may be used to obtain a permanent record of the leak.

An incline of 45 degrees below the horizontal increases the pressure of the contents against the closure compared with having the container on its side. Paragraph 4(c) ensures that the liquid will touch the closure when inclined. For example, a rectangular container with the closure in the centre of the top should be inclined on its widest edge, to put the closure in the lowest possible position.

The amount of liquid must be enough that it falls to the paper that is positioned below the closure during the test. If the liquid collects around the cap but does not drop to the paper, this would not be considered a leak and the container would not fail.

The quantity of product which leaks-out within the test period is not specified for reasons of simplicity and clarity. Since this requirement applies to products which are inherently hazardous, any evidence of leakage is considered a failure. However, corrective or enforcement actions required as a result of a leaking container would be related to the risk posed by the product. That is, the quantity of product delivered and the nature of the hazard posed by the product.

**Non-Mandatory Tests:**

A number of non-mandatory screening tests are recommended, to support the leakage requirement. Numerous standards have been reviewed to find test methods to support the general packaging guidelines, including those of the U.S., U.K., Transport Canada, the CSA and ASTM. Information from these standards was combined with practical experience and by using technical and scientific support provided by Health Canada. The following recommended test procedures were validated by two non-government laboratories:

**Field Test**

The following screening test could be performed in the field to help Product Safety Inspectors determine whether compliance testing would be required:

Take a container, without exerting any torque on the lid, and invert it at an angle of 45 degrees below the horizontal line for a period of five minutes.
Detection of any trace of liquid on a blotter placed beneath the lid may indicate that the container does not meet section 7, and that compliance testing according to Schedule 3 should be carried out.

**Aging Test**

Since a filled container may deteriorate over time, the person responsible may conduct the following ageing tests to insure that the product will comply with the leakage requirement during its feasible shelf-life:

1. Subject the container to the one-hour leakage test after it has been filled for a minimum of six months.

Research has found that the typical shelf-life of a consumer chemical product is six months. This also corresponds with Transport Canada guidelines.

2. Conduct an accelerated aging test after conditioning the container for a shorter period but at an elevated temperature. For example, test the product after it has been left at 50°C for 28 days.

The accelerated test simulates what might occur at ambient temperatures over a six-month period. Tests have shown that most leakages from containers stored at 50°C will occur within seven days of aging. Note that this test may not be appropriate for certain flammable solvents. Also keep in mind that the 50°C test will only examine the effect of the temperature on the containers, and may have little to do with measuring any interactions between the product and the container or aging over time.

**Life Test**

The following test verifies the ruggedness of the closure during its anticipated life expectancy:

Subject the container to the one-hour leakage test after it has been opened and re-closed according to the container manufacturer's instructions, if present, or otherwise a minimum of 50 times to a maximum of 100 times.

The use of 100 openings and reclosings comes from the CSA Z76-1.99 standard (entitled Recloseable Child-Resistant Packages) and is based upon the average life of a 250 mL container. This standard prescribes mechanical “life tests” to assess whether the container is capable of maintaining its security for the number of uses corresponding to the normal depletion of the product. The limitation of this standard is that it is performed on empty container prototypes or with a placebo. This practice may be acceptable for assessing child-resistant containers that are intended to dispense pills, but may not adequately assess the effect of incompatibility of a chemical product with the container. Hence the life test is presented to evaluate a child-resistant container when it is filled with the chemical product.
Furthermore the life test is presented for use on chemical products which do not need child-resistant containers.

**Coding System**

The use of a coding system, which may be lot numbering or some other system, is recommended as a quality control mechanism because it is a simple way of differentiating between lots. If a problem is found with a product, enforcement and corrective actions could be limited to the specific problem lot and not the entire product line. It will also make it easier for Poison Control Centres to know they have up-to-date product ingredient information when there has been a change in formula.

In the absence of a lot number, all units would be considered as coming from a single lot.
## SCHEDULE 4

*(Paragraph 19(1)(b))*

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Key:
C - Consumer Chemicals and Containers Regulations, 2001
H - Hazardous Products Act
Sch - Schedule to the CCCR, 2001

Note: Information may be in the HPA/CCCR, 2001 and/or the "discussion" corresponding to the cited section(s).

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