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Standard Specification for Determination of Child Resistance of Portable Fuel Containers for Consumer Use¹

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1. Scope

1.1 This specification establishes recognized requirements for determining the child resistance of portable gasoline, kerosene, and diesel containers intended for use by consumers. This specification does not cover single-trip prepackaged containers.

1.2 This specification includes gas/oil mixtures as commonly used for two-cycle engines.

1.3 This specification includes single- and multi-compartment containers.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[F852 Specification for Portable Gasoline Containers for Consumer Use](#)

[F976 Specification for Portable Kerosene and Diesel Containers for Consumer Use](#)

[F2234 Specification for Spill Resistant Fueling Systems for Portable Fuel Containers for Consumer Use](#)

3. Requirements

3.1 *General Requirements:*

¹ This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.10 on Standards for Flammable Liquid Containers.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.1 Containers and closures shall first meet all requirements of Specifications F852 and F976 where applicable, and also those feasible and appropriate test requirements of Specification F2234 capable of being adapted to portable fuel containers having CR closures, including ultraviolet (UV) exposure (5.13.1) and immersion (5.11) tests of the closures.

3.1.2 Containers, components, and closures shall be new with container half full of water for testing in accordance with Sections 4 and 5.

3.1.3 Individual containers, closed with closures shall be tested as described in Section 4 after having been subjected, in sequence, to:

3.1.3.1 Low-temperature exposure at 0°F (–17.8°C) for 8 h.

3.1.3.2 Elevated temperature exposure at 140°F (60°C) for 8 h.

3.1.3.3 Opening and closing of each closure for 250 cycles.

3.1.4 Containers shall then be inverted and inspected visually before and after testing to determine any leakage.

3.1.5 Containers tested by the methods described in Sections 4 and 5 shall meet the following specifications:

3.1.5.1 Child-resistant effectiveness for each and every closure on a container. of not less than 85 %, without a demonstration, and not less than 80 % after a demonstration, of the proper means of opening when 200 children are tested per closure.

3.1.5.2 *Senior Adult Test*—Containers shall have a senior adult-use effectiveness (SAUE) of not less than 90 % for the senior adult panel test of Section 5 for all closures of the container.

4. Test Procedure

4.1 *General:*

4.1.1 For testing in accordance with Section 4, containers with multiple closures shall have each closure tested separately. Closure(s) not being tested shall be sealed off so they will not function but will appear as they would normally.

4.1.2 Reclosable containers, if assembled by the testing agency, shall be properly secured at least 72 h before beginning the test to allow the materials (for example, the closure liner) to “take a set.” Torque-dependent closures shall be secured at the same torque as applied normally by adult consumers.

4.1.3 All containers shall be handled so that no damage or jarring will occur during storage or transportation.

4.1.4 The containers shall be tested at room temperature (22¼ °C).

4.2 Child-Resistant Test (Test Subjects/Selection Criteria):

4.2.1 Use from 1 to 4 groups of 50 children, as required under the sequential testing criteria in **Table 1**.

4.2.2 No more than 20 % of the children in each group shall be tested at or obtained from any given site.

4.2.3 Each group of children shall be randomly selected as to age, subject to the limitations set forth below.

4.2.4 Thirty percent of the children in each group shall be of age 42 to 44 months, 40 % of the children in each group shall be of age 45 to 48 months, and 30 % of the children in each group shall be of age 49 to 51 months.

4.2.5 The children’s ages in months shall be calculated as follows:

4.2.5.1 Arrange the birth date and test date by the numerical designations for month, day, and year (for example, test date: 8/3/1990; birth date: 6/23/1986).

4.2.5.2 Subtract the month, day, and year numbers for the birth date from the respective numbers for the test date. It is possible that this will result in negative numbers for the months or days.

4.2.5.3 Multiply the difference in years by 12 to obtain the number of months in the difference in years and add this value to the number of months that was obtained when the birth date was subtracted from the test date (that is, $4 \times 12 = 48$; $48 + 2 = 50$). This figure either will remain the same or be adjusted up or down by one month, depending on the number of days obtained in the subtraction of the birth date from the test date.

4.2.5.4 If the number of days obtained by subtracting the days in the birth date from the days in the test date is +16 or more, one month is added to the number of months obtained above. If the number of days is –16 or less, subtract 1 month. If the number of days is between –15 and +15 inclusive, no change is made in the number of months. Thus, for the example given above, the number of days is –20 and the number of months is therefore $50 - 1 = 49$ months.

4.2.5.5 The difference between the number of boys and the number of girls in each age range shall not exceed 10 % of the number of children in that range. Select children without an obvious or overt physical or mental handicap.

4.3 Child-Resistant Tests (Test Failures)—A test failure shall be any child who opens the closure or gains access to the container’s contents.

4.4 Sequential Test—The sequential test is initially conducted using 50 children, and depending on the results, the criteria in **Table 1** determines whether the container is either

child resistant or not child resistant or whether further testing is required. Further testing is required if the results are inconclusive and involves the use of one or more additional groups of 50 children each, up to a maximum of 200 children. No individual shall administer the test to more than 30 % of the children tested in each group. **Table 1** gives the acceptance (pass), continue testing, and rejection (fail) criteria to be used for the first 5 min and the full 10 min of the children’s test. If the test continues past the initial 50-child panel, the container openings shown in **Table 1** are cumulative.

4.5 Test Procedures—The children shall be divided into groups of two. The testing shall be done in a location that is familiar to the children, for example, their customary nursery school or regular kindergarten. No child shall test more than two closures. When more than one closure is being tested, each closure shall be dissimilar, and they shall be presented to the paired children in random order. This order shall be recorded. The children shall be tested by the procedure incorporated in the following test instructions:

4.6 Detailed Standardized Child Test Instructions:

4.6.1 The children shall have no overt physical or mental handicaps. No child with a permanent or temporary illness, injury, or handicap that would interfere with his/her effective participation shall be included in the test.

4.6.2 The testing shall take place in a well-lit location that is familiar to the children and is isolated from all distractions.

4.6.3 The tester, or another adult, shall escort a pair of children to the test area. The tester shall seat the two children so that there is no visual barrier between the children and the tester.

4.6.4 The tester shall talk to the children to make them feel at ease.

4.6.5 The children shall not be given the impression that they are in a race or contest. They are not to be told that the test is a game or that it is fun. They are not to be offered a reward.

4.6.6 The tester shall record all data before, or after, the test so that full attention can be on the children during the test period.

4.6.7 The tester shall use a stopwatch(s) or other timing devices to time the number of seconds it takes the child to open the container and to time the 5-min test periods.

4.6.8 To begin the test, the tester shall hand the children identical containers, indicate by gesture which opening is being tested and say, “Please try to open this for me.”

4.6.9 If a child refuses to participate after the test has started, the tester shall reassure the child and gently encourage the child to try. If the child continues to refuse, the tester shall

TABLE 1 Number of Closure Openings: Acceptance (Pass), Continue Testing, and Rejection (Fail) Criteria for the First 5 min and the Full 10 min of the Children’s Protocol Test

Test Panel	Cumulative Number of Children	Closure Openings					
		First 5 min			Full 10 min		
		Pass	Continue	Fail	Pass	Continue	Fail
1	50	0–3	4–10	11+	0–5	6–14	15+
2	100	4–10	11–18	19+	6–15	16–24	25+
3	150	11–18	19–25	26+	16–25	26–34	35+
4	200	19–30		31+	26–40		41+

ask the child to hold the container in his/her lap until the other child is finished. This pair of children shall not be eliminated from the results unless the refusing child disrupts the participation of the other child.

4.6.10 Each child shall be given up to 5 min to open his/her container. The tester shall watch the children at all times during the test. The tester shall minimize conversation with the children as long as they continue to attempt to open their containers. The tester shall not discourage the children verbally or with facial expressions. If a child gets frustrated or bored and stops trying to open his/her container, the tester shall reassure the child and gently encourage the child to keep trying (for example, *“Please try to open the container.”*).

4.6.11 The children shall be allowed freedom of movement to work on their containers as long as the tester can watch both children (for example, they can stand up, get down on the floor, or bang or pry the package).

4.6.12 If a child is endangering himself or others at any time, the test shall be stopped and the pair of children eliminated from the final results.

4.6.13 The children shall be allowed to talk to each other about opening the containers and shall be allowed to watch each other try to open the containers.

4.6.14 A child shall not be allowed to try to open the other child’s container.

4.6.15 If a child opens his/her container, the tester shall say, *“thank you,”* take the container from the child and put it out of the child’s reach. The child shall not be asked to open the container a second time.

4.6.16 At the end of the 5-min period, the tester shall demonstrate how to open the container if either child has not opened his or her container. A separate “demo” package shall be used for the demonstration.

4.6.17 Before beginning the demonstration, the tester shall ask the children to set their containers aside. The children shall not be allowed to continue to try to open their containers during the demonstration period.

4.6.18 The tester shall say, *“Watch me open my container.”*

4.6.19 Once the tester gets the children’s full attention, the tester shall hold the demo container approximately 2 ft (0.6 m) from the children and open the container at a normal speed as if the tester were going to use the contents. There shall be no exaggerated opening movements.

4.6.20 The tester shall not discuss or describe how to open the container.

4.6.21 To begin the second 5-min period, the tester shall say, *“Now you try to open your containers.”*

4.6.22 If one or both children have not used their teeth to try to open their containers during the first 5 min, the tester shall say immediately before beginning the second 5-min period, *“You can use your teeth if you want to.”* This is the only statement that the tester shall make about using teeth.

4.6.23 At the end of the test period, the tester shall say, *“Thank you for helping.”* If children were told that they could use their teeth, the tester shall say, *“I know I told you that you could use your teeth today, but you should not put things like this in your mouth again.”* In addition, the tester shall say,

“Never open containers like this when you are by yourself. This kind of container might have something in it that would you sick.”

4.6.24 The children shall be escorted back to their classroom or other supervised area by the tester or another adult.

4.6.25 If the children are to participate in a second test, the tester shall have them stand up and stretch for a short time before beginning the second test. The tester shall take care that the children do not disrupt other tests in progress.

5. Senior Testing

5.1 *Senior Adult Panel, Test Subjects*—Use a group of 100 senior adults. Not more than 24 % of the senior adults tested shall be obtained from or tested at any one site. Each group of senior adults shall be randomly selected as to age, subject to the limitations set forth below. Twenty-five percent of the participants shall be 50 to 54 years of age, 25 % of participants shall be 55 to 59 years of age, and 50 % of the participants shall be 60 to 70 years old. Seventy percent of the participants of ages 50 to 59 and ages 60 to 70 shall be female (17 or 18 females shall be apportioned to the 50- to 54-year age group). No individual tester shall administer the test to more than 35 % of the senior adults tested. Select adults with no obvious or overt physical or mental disability.

5.2 *Screening Procedures*—Participants who are unable to open the container being tested in the first 5-min time period are given a screening test. The screening tests for this purpose shall use two containers with conventional (not child-resistant (CR) or “special”) closures. The containers shall be the same as those being tested for child resistance but shall have conventional (not child-resistant) closures. Persons who cannot open and close both of the screening containers in 1-min screening tests shall not be counted as participants in the senior adult panel.

5.3 *Senior Adult Use Effectiveness (SAUE)*—The percentage of adults who both opened all closures of the container in the first (5-min) test period and opened and (if appropriate) properly resecured all closures of the container in the 1-min test period.

5.4 *Test Procedures*—The senior adults shall be tested individually rather than in groups of two or more. The senior adults shall receive only such printed instructions on how to open and secure properly the special packaging as will appear on or accompany the container as it is delivered to the consumer. The senior adult panel is tested according to the procedure incorporated in the following senior adult panel test instructions:

5.5 *Test Instructions*—The following test instructions are used for all senior tests. If non-reclosable containers are being tested, the commands to close the package are eliminated.

5.5.1 No adult with a permanent or temporary illness, injury, or disability that would interfere with his/her effective participation shall be included in the test.

5.5.2 Each adult shall read and sign a consent form (Appendix X1) before participating. Use any appropriate language from the consent form to recruit potential participants. Before beginning the test, the tester shall say, *“Please read and sign*