Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, D.C.

TSO-C13g

Effective
Date*:* 2/3/17

Technical Standard Order

Subject: ***Life Preservers***

1. PURPOSE. This technical standard order (TSO) is for manufacturers applying for a TSO authorization (TSOA) or letter of design approval (LODA). In it, we (the Federal Aviation Administration, (FAA)) tell you what minimum performance standards (MPS) your life preserver must first meet for approval and identification with the applicable TSO marking.

2. APPLICABILITY. This TSO affects new applications submitted after its effective date.

a. TSO-C13f will also remain effective until August 3, 2018. After this date, we will no longer accept applications for TSO-C13f.

b. Life Preservers approved under a previous TSOA may still be manufactured under the provisions of its original approval.

3. REQUIREMENTS. New models of life preservers identified and manufactured on or after the effective date of this TSO must meet the requirements in SAE International Aerospace Standard (AS) 1354, *Individual Inflatable Life Preserver,* dated February 2016, as modified by Appendix 1.

a. Functionality. This TSO's standards apply to equipment intended to function as life preservers.

b. Functional Qualification. Demonstrate the required functional performance under the test conditions specified in *AS1354, Individual Inflatable Life Preserver,* dated February 2016, as modified by Appendix 1 and Appendix 2.

c. Environmental Qualification. Demonstrate the required performance under the test conditions specified in *AS1354, Individual Inflatable Life Preserver,* dated February 2016, as modified by Appendix 1.

d. **Deviations.** We have provisions for using alternate or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation pursuant to Title 14 of the Code of Federal Regulations (14 CFR) § 21.618.

4. MARKING.

a. Mark at least one major component permanently and legibly with all the information in 14 CFR § 45.15(b) and all additional marking required by AS1354 section 3.18.

b. Also, mark the following permanently and legibly, with at least the manufacturer's name, subassembly part number, and the TSO number:

(1) Each component that is easily removable (without hand tools); and,

(2) Each subassembly of the article that you determined may be interchangeable.

5. APPLICATION DATA REQUIREMENTS.

You must give the FAA aircraft certification office (ACO) manager responsible for your facility a statement of conformance, as specified in 14 CFR § 21.603(a)(1) and one copy each of the following technical data to support your design and production approval. LODA applicants must submit the same data (excluding paragraph **5.e**) through their civil aviation authority.

a. A Manual(s) containing the following:

(1) Operating instructions and article limitations sufficient to describe the equipment's operational capability.

(2) Describe in detail all deviations.

(3) Installation procedures and limitations sufficient to ensure that the life preserver, when installed according to the installation or operational procedures, still meets this TSO's requirements. Limitations must identify any unique aspects of the installation. The limitations must include a note with the following statement:

> "This article meets the minimum performance and quality control standards required by a technical standard order (TSO). Installation of this article requires separate approval."

(4) Schematic drawings, wiring diagrams, and any other documentation necessary for installation of the life preserver.

(5) List of replaceable components, by part number, that makes up the life preserver. Include vendor part number cross-references, when applicable.

b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the life preserver continues to meet the TSO approved design. Include recommended inspection intervals and service life, as appropriate. If appropriate, differentiate the required inspection intervals and service life if affected by storage and operating conditions (i.e., temperature, humidity, etc.)

c. A drawing depicting how the article will be marked with the information required by paragraph **4** of this TSO.

d. Identify functionality or performance contained in the article not evaluated under paragraph **3** of this TSO (that is, non-TSO functions). Non-TSO functions are accepted in parallel with the TSO authorization. For those non-TSO functions to be accepted, you must declare these functions and include the following information with your TSO application:

(1) Description of the non-TSO function(s), such as performance specifications, failure condition classifications, software, hardware, and environmental qualification levels. Include a statement confirming that the non-TSO function(s) do not interfere with the article's compliance with the requirements of paragraph **3**.

(2) Installation procedures and limitations sufficient to ensure that the non-TSO function(s) meets the declared functions and performance specification(s) described in paragraph **5.d.(1)**.

(3) Instructions for continued performance applicable to the non-TSO function(s) described in paragraph **5.d.(1).**

(4) Interface requirements and applicable installation test procedures to ensure compliance with the performance data defined in paragraph **5.d.(1).**

(5) Test plans, analysis and results, as appropriate, to verify that performance of the hosting TSO article is not affected by the non-TSO function(s).

(6) Test plans, analysis and results, as appropriate, to verify the function and performance of the non-TSO function(s) as described in paragraph **5.d.(1).**

e. The quality system description required by 14 CFR § 21.608, including functional test specifications. The quality system should ensure that you will detect any change to the approved design that could adversely affect compliance with the TSO MPS, and reject the article accordingly. (Not required for LODA applicants.)

f. Material and process specifications list.

g. List of all drawings and processes (including revision level) that define the article's design.

h. Manufacturer's TSO qualification report showing results of testing accomplished according to paragraph **3** of this TSO.

i. A compliance matrix identifying all of the requirements in this TSO and identification of the technical data on file at the manufacturer which substantiates compliance with each TSO requirement.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data given directly to the responsible ACO, have the following technical data available for review by the responsible ACO:

a. Functional qualification specifications for qualifying each production article to ensure compliance with this TSO.

b. Article calibration procedures.

c. Schematic drawings.

d. Wiring diagrams.

e. Material and process specifications.

f. The results of the environmental qualification tests conducted according to paragraph **3.c** of this TSO.

g. If the article contains non-TSO function(s), you must also make available items **6.a** through **6.f** as they pertain to the non-TSO function(s).

7. FURNISHED DATA REQUIREMENTS.

a. If furnishing one or more articles manufactured under this TSO to one entity (such as an operator or repair station), provide one copy or on-line access to the data in paragraphs **5.a** and **5.b** of this TSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the TSO, of the life preserver.

b. If the article contains declared non-TSO function(s), include one copy of the data in paragraphs **5.d.(1)** through **5.d.(4).**

8. HOW TO GET REFERENCED DOCUMENTS.

a. Order SAE documents from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Telephone (724) 776-4970, fax (724) 776-4970. You can also order copies online at www.sae.org.

b. Order copies of 14 CFR parts 21 and 45 from the Superintendent of Documents, Government Printing Office, P.O. 979050, St Louis, MO 63197. Telephone (202) 512-1800, fax (202) 512-2250. You can also order copies online at www.gpo.gov.

c. You can find a current list of technical standard orders and advisory circulars on the FAA Internet website Regulatory and Guidance Library at http://rgl.faa.gov/. You will also find the TSO Index of Articles at the same site.

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Appendix 1. Functional and Environmental Qualification Requirements

Appendix 1 modifies the text in SAE International's Aerospace Standard (AS) 1354, *Individual Inflatable Life Preserver,* dated February 2016. Compliance to the modified text is mandatory in order to comply with the requirements of this TSO.

When Reading AS1354…	***Do the following:***
Section 1	Disregard
Section 2	Apply all subsections unless disregarded or modified below:
	Page 4, replace subsection 2.1, with the following text: 2.1 Applicable Documents The following publications form a part of this document to the extent specified herein. The applicable issue of *cited* publications shall be the issue in effect on the date of the *publication of this document, unless otherwise specified.* In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.
	Page 6, subsection 2.3, apply as written, except replace the definition of the following terms with the new text. APPROVED: *The status of equipment that meets FAA standards.* CHILLED HANDS TEST METHOD: A technique to simulate the reduced dexterity of chilled, wet hands that may occur during an emergency in a cold and wet environment. A naïve test subject simultaneously submerges left and right forearms and hands in 50 °F (10 °C) water for 2 minutes and immediately upon removal attempts to open/operate designated packaging/equipment. The test subject *shall* be healthy and wear a loose-fitting, sleeveless upper garment that will not inhibit blood-flow to the arms and hands. (Alternate: GLOVED HANDS TEST METHOD) *SEAT PITCH: The distance from any point on one seat to the exact same point on the seat in front or behind it.* TEST SUBJECTS: Individuals who participate in life preserver tests (e.g., donning, retention, flotation). All such personnel shall be naïve; i.e., they shall have had no experience using a life preserver or specific equipment to be tested, and they shall not have viewed or talked with other persons performing the same or similar activities. *Note that individuals, who have experience*

	using marine or boating life preservers, are considered acceptable test subjects.
Section 3	Apply all subsections unless disregarded or modified below:
	Page 7, Section 3., replace the introductory text with the following: 3. DESIGN AND PERFORMANCE REQUIREMENTS Tests and measurements performed to demonstrate compliance with this standard shall be conducted with equipment calibrated according to the original equipment manufacturer (OEM) specifications, using standards and references traceable to a recognized national authority (e.g., National Institute of Standards and Technology, NIST). The description of test results shall include the accuracy and precision of the measurement(s), e.g., measured in 5 pound increments with accuracy of ±0.10 pounds. All tests requiring timing shall use time encoded video. *In addition, tests requiring human subjects or a child test dummy, shall use time encoded video.* Demonstration life preservers *are not addressed by this TSO*. They are not intended to be functional and should be marked accordingly.
	Page 10, replace subsection 3.9, with the following text: 3.9 Donning Donning tests shall be performed to show compliance with design requirements and comprehensibility of markings. The procedure for donning the life preserver shall be simple and obvious such that it can be rapidly donned by an untrained person without any assistance. This shall be demonstrated in accordance with the test criteria and procedures in 5.3. For the adult and adult-child category, it shall be demonstrated that at least 75% of the total number of test subjects, and at least 60% of the test subjects in each age group specified in 5.3.1, can don the life preserver within 25 seconds, unassisted, starting with the *packaged* life preserver on the test participant's lap. It must also be demonstrated that an adult unassisted can install an appropriate life preserver on another adult or child within 30 seconds. For the child and infant-small child, it shall be demonstrated that at least 60% of five adult test subjects of both sexes between the ages of 20 and 40, unassisted, can install a child life preserver on a child weighing between 35 and 90 pounds (15.88 and 40.82 kg) and an infant-small child life preserver on a child dummy within 90 seconds, unassisted, starting with the *packaged* life preserver.

	The donning-time test does not apply to constant wear life preservers that are intended to be fully donned by the wearer while onboard the aircraft. The donning-time test does apply to constant wear life preservers that are intended to be partially donned by the wearer while onboard the aircraft and require an additional donning procedure prior to inflating the life preserver or entering the water. For these partially donned life preserver designs, the test shall begin with the life preserver in the partially donned condition.
	Page 10, replace subsection 3.10, with the following text: 3.10 Retention The means of retaining the life preserver on the wearer for an adult, adult-child, and child life preserver shall require that the wearer secure no more than one attachment and make only one adjustment for fit. This requirement does not apply to constant wear life preservers. The retention means shall not make use of knots. The means of retaining the life preserver shall not require any action to secure other than fastening and fit adjustment (e.g., removal of rubber bands, unfastening of attachment points). Partially donned life preservers shall not require the wearer to secure more than one attachment or make more than one adjustment for fit after the life preserver is partially donned. The means of retaining the life preserver shall be shown to be operable with chilled or gloved hands within 5 seconds (e.g., fastening/unfastening buckles, *snapping/unsnapping*, etc.). *This will be demonstrated in accordance with the Chilled Hand or Gloved Hands Test Methods in 5.4.2.* This requirement does not apply to constant wear life preservers *that are intended to be fully donned by the wearer while onboard the aircraft*. The adult, adult-child, and child category life preserver shall remain inflated, secured, and not cause injury to a wearer when tested in accordance with 5.4. There shall be no damage to the life preserver as a result of the jump. Chafing of the wearer's skin shall not be considered an injury. The infant-small child category life preserver shall remain inflated and undamaged, and the infant-small child dummy, specified in 5.3.2, shall remain properly secured in the donned life preserver, while being held by an adult *and tested in accordance with 5.4.3.*
	Page 11, replace subsection 3.11.2 with the following text: 3.11.2 Infant-Small Child The life preserver *shall* provide insulation for the wearer's head and upper torso (i.e., from the waist up) with a minimum R-value of 0.25 (equivalent to approximately 2 mm wetsuit fabric). There shall be a means, other than knots, to restrict the position of the life preserver relative to the wearer, so as to

	provide proper function and prevent the wearer from releasing the restricting means. Means shall be provided to prevent the introduction and/or entrapment of water. This shall be demonstrated in accordance with the Flotation Attitude test procedure in 5.5.2.
	Page 11, replace subsection 3.13 with the following text: 3.13 Tether, Infant-Small Child Category A tether of PIA-C-5040, Type 3 cord or equivalent, at least 72 inches (182.88 mm) long, shall be attached to the infant-small child life preserver. The attachment shall be located such that the flotation attitude specified in 3.11.2 is maintained when the line is held taut in the water. The attachment shall be shown to withstand a 70 pound (31.75 kg) pull for at least 3 seconds without failure of the line or the attachment. A positive-buoyancy attachment means shall be provided at the free end of the tether. The attachment means shall be shown to be operable with cold, wet hands, using either the Chilled Hands or Gloved Hands Test Method. *This must be demonstrated in accordance with subsection 5.9.* There shall be a provision for stowing or securing the tether during use so that it remains readily accessible and does not dangle loosely.
	Page 11, replace subsection 3.14 with the following text: 3.14 Survivor Locator Light The life preserver shall be equipped with a survivor locator light meeting the requirements of *TSO-C85b, Survivor Locator Lights, dated October 22, 2007*. The light shall automatically activate upon initial immersion in the water or by other means not requiring additional action by the wearer once the life preserver is fully donned. The light shall be located so to enhance visibility from a surface vessel or from an aircraft.
	Page 12, replace subsection 3.17.2, with the following text: 3.17.2 Package Opening Package Opening shall be demonstrated in accordance with the Package Opening test *procedures in* 5.7.
	Page 12, replace subsection.3.18.1 3.18.1 Instructions The proper donning procedure and other operational instructions shall be simple, obvious, and *shall* be presented pictorially with minimum use of words. Instructions pertaining to operations normally accomplished after the life preserver has been donned shall be oriented so that the wearer, or the

	person assisting a child or an infant-small child wearer, can see them while in the water. Instructions shall be sized, positioned, and contrasted with the background to make them easily readable and comprehensible at a viewing distance of 24 inches with illumination no greater than 0.05 ft-c (0.54 lux) by a person having 20/20 vision. Written instructions shall use bold lettering at least 0.22 inches (5.6 mm) high with a stroke width of at least 0.047 inches (1.2 mm). Comprehensibility shall be demonstrated in accordance with the Comprehensibility test procedure in 5.8.
Section 4	Apply all subsections unless disregarded or modified below:
	Page 13, replace subsection 4.2.1 with the following text: 4.2.1 Permeability Materials used in the construction of the air holding cell shall have a maximum permeability to helium of 5 L/m2 in 24 hours at 77 °F (25 °C) when tested in accordance with 5.6.3.
Section 5	Apply all subsections unless disregarded or modified below:
	Page 15, replace subsection 5.1.2 with the following text: 5.1.2 Overpressure *The life preserver shall meet the minimum buoyancy requirements defined in 3.4 when subjected to overpressure.* Inflate each flotation chamber via the oral inflation tube to 1 psig (6.89 kPa), *then* manually actuate the discharge of the gas reservoir for each chamber. *Submerge the life preserver in 70 °F ± 5 °F (21.1 °C ± 2.8 °C) fresh water, so that no part of it is less than 24 inches (60.96 cm) below the surface of the water. Measure the buoyancy to show compliance with the applicable requirement in Table 1. Maintain submersion of the life preserver for at least 8 hours, after which time it shall be shown to meet or exceed the requirement in Table 1.* *Alternatively, the test may be discontinued in less than 8 hours if buoyancy measurements taken at four successive 30-minute intervals show that the buoyant force of the life preserver has stabilized at or above the value specified in Table 1.*
	Pages 15-16, replace subsection 5.3.1 with the following text: 5.3.1 Test Subjects At least 25 test subjects shall be employed in tests of an adult or adult-child preserver. At least five of those test subjects shall be from each of the following age groups: 20 to 29 years; 30 to 39 years; 40 to 49 years; 50 to 59 years; and 60 to 69 years. No more than 60% of the test subjects in any age group may be of the same sex. The number of test subjects in any age group

	may not exceed 30% of the total number of test subjects. Child donning tests shall be performed by a minimum of 5 adult test subjects of both sexes between the ages of 20 and 40. Tests shall be performed using a child weighing between 35 and 90 pounds (15.88 and 40.91 kg). Infant-small child donning tests shall be performed by a minimum of five adult test subjects of both sexes between the ages of 20 and 40. Tests shall be performed using an articulating infant-small child dummy per 5.3.2. Adult test subjects shall have no experience with inflatable life preservers or donning tests. Test subjects shall not be familiar with the manufacture, production, or maintenance of inflatable life preservers. Test subjects shall receive no donning instructions other than *the general introduction briefing and* preflight video briefing on the use of the life preserver *per Appendix D – Donning Test Briefings*. Instructions for the child and infant-small child category life preserver shall be the typical briefing given to a parent/guardian accompanying a child or infant on a flight by a flight attendant. *Test subjects may be informed (during the pre-test introduction briefing) that this is a timed test, and that their task is to don the life preserver within the applicable timeframe specified in subsection 3.9.* *Furthermore, per paragraph 5.a. of this TSO, the installation, operating and maintenance instructions shall also reflect the requirements of this section. The operating instructions must report the detailed content of the simulated preflight briefing and any special instructions for unique aspects of the design operation that should be considered for operational use and continued performance.*
	Page 16, replace subsection 5.3.3 with the following text: 5.3.3 Arrangement Subjects in tests of an adult, adult-child, or child life preserver shall be seated in previously approved air carrier coach class seating, with a seat row in front of the test subjects, creating a seat pitch not exceeding 31 inches (78.74 cm). Subjects shall be seated one per row. All subjects shall have their seat belts fastened. Infant-small child life preserver donning tests shall be performed with the adult test subject holding the infant on his lap, seated between two other adult subjects who shall not assist or hamper the test subject performing the donning test. The adult test subject *shall* be wearing his own life preserver.
	Page 16, replace subsection 5.3.4, with the following text: 5.3.4 Procedure

	The donning test shall start *on signal* with the *packaged* life preserver held on the test subject's lap, *or for a constant wear life preserver, the test shall start in the partially donned configuration*. Timing stops when the life preserver is properly donned, secured, and adjusted for fit (the means of adjustment shall be adjusted for a snug fit on the test subject). Donning tests shall be video captured; separate timing shall be recorded for each individual subject.
	Page 16, add two new subsections to 5.4, with the following text: *5.4.2 Retention Mechanism Test* *Demonstrate the operability of the life preserver retention mechanism using either the Chilled Hands or Gloved Hands Test Method (see 2.3 Definitions). At least 4 out of 5 test subjects shall secure the life preserver retention mechanism (e.g., fasten then unfasten) within 5 seconds. In cases for which additional participants are required, 75% of the total number of test participants for each demonstration must complete the retention mechanism task within the allowed time.* *5.4.3 Infant-Small Child Life Preserver* *The infant-small child category life preserver shall remain inflated and undamaged, and the infant-small child dummy, specified in 5.3.2, shall remain properly secured in the donned life preserver, while being held by an adult who jumps into the water from a height of 5 feet (1.52 m) above the water. The adult shall wear an inflated life preserver for this test.*
	Page 17, replace subsection 5.6.2 with the following text: 5.6.2 Flammability *The life preserver and package shall be constructed of material meeting the requirements of 14 CFR 25, Appendix F, Part I, [Amendment 25-142, effective April 18, 2016]. The definition and use of parts that are considered small parts (e.g., oral inflation tubes, clips, etc.) that would not contribute significantly to the propagation of a fire must be approved in advance by the manager of the FAA aircraft certification office (ACO) to which this TSO data is to be submitted.*
	Page 17, replace subsection 5.6.3 with the following text: 5.6.3 Permeability The permeability shall be tested in accordance with the Permeability test procedure in FTMS 191, Method 5460 or alternatively, ASTM D1434-82, Procedure V may be used. The permeameter shall be calibrated for the gas used.

	Page 18, replace subsection 5.7.1 with the following text: 5.7.1 Pull Force The pull force necessary to operate the opening mechanism *shall* be mechanically demonstrated not to exceed 9 pounds (40 N), or opening shall be demonstrated in less than 7 seconds by at least 8 of 10 females over the age of 60, without preview of instructions. Timing *shall* start when the test participant has both hands on the package, ready to open, and end when the package is fully opened (e.g., the pull tab/strip is completely removed). A nick or cut shall not be introduced in the edge of the material at the tear line unless it is normally a part of the package design. In cases for which additional participants are required, 75% of the total number of test participants for each demonstration must complete package opening within the allowed time.
	Page 18, replace subsection 5.7.2 with the following text: 5.7.2 Operation of the Opening Mechanism Operation of the opening mechanism *shall* be demonstrated within 10 seconds by 8 of 10 females with reduced dexterity simulated by the chilled-hands or gloved-hands, and without preview of instructions. Timing *shall* start when the test participant has both hands on the package, ready to open, and end when the life preserver is fully removed from the package. In cases for which additional participants are required, 75% of the total number of test participants for each demonstration must complete package opening within the allowed time.
	Page 18, replace subsection 5.8 with the following text: 5.8 Comprehensibility Comprehensibility shall be demonstrated by five out of six test subjects, tested independently, using open-ended-answer format (see *examples in* ANSI Z535 or ISO 9186:2001) and/or successful empirical demonstration of equipment or feature.
	Page 18, add new subsection 5.9 with the following text: 5.9 Tether Attachment Test *Demonstrate that the attachment means, on the tether of the infant-small child life preserver, is operable using either the Chilled Hands or Gloved Hands Test Method (see 2.3 Definitions). At least 4 out of 5 test subjects shall secure the life preserver attachment means. In cases for which additional participants are required, 75% of the total number of test participants for each demonstration must complete the attachment task. This test may be performed on dry land.*

	NOTE: The attachment should be demonstrated in the manner it is designed to be used; it should be attached <u>to</u> something as designed.
Appendix A	No changes
Appendix B	No changes
Appendix C	Page 24, replace Appendix C with Appendix 2 Tests Involving Subjects. See Appendix 2 on final page.
	Page 25, add a new Appendix D, with the following text: Appendix D - Donning Test Briefings You must use the following scripts for the donning test briefing. For the assisted donning tests, substitute the appropriate donning time requirement as specified in 3.9. The scripts may be modified as applicable for constant wear life preservers that are designed to be partially donned during flight. <u>General introduction briefing script</u>: *You are participating in a passenger safety study to determine how long it takes to put on an aircraft life preserver. You are seated in a seat that is similar to those found on passenger airplanes; please fasten your seatbelt [pause until all seatbelts are fastened].* *The test will simulate an actual airline emergency; your goal is to put on the life preserver as quickly as possible within 25 seconds or less. Video cameras will record your actions.* *To start the test, your instructor will say, 3, 2, 1, go! This is your signal to open the package and put on the life preserver.* *Following this introduction, a video of a simulated passenger information briefing will be presented. You will be handed your life preserver package, after the video.* *[Optional: Before the video, please review the safety information card for additional instructions on putting on the life preserver.]* <u>Preflight video briefing script</u>: *This test will simulate an actual airline emergency; your goal is to put on the life preserver as quickly as possible within 25 seconds or less. To start the test, your instructor will say, 3, 2, 1, go! This is your signal to open the package and put on the life preserver.* *To put on your life preserver,* • *Pull the tab and tear open the package.* • *Remove the life preserver from the package.* • *Pull the life preserver over your head.*

	• *Grab the waist strap and wrap it around your waist.* • *Insert the clip into the buckle and pull the end of the waist strap to tighten the belt.* • *Raise your arms when you are finished.*

Appendix 2. TESTS INVOLVING SUBJECTS*

**NOTE: Tests requiring human subjects or a child test dummy shall use time encoded video.*

Test Name	Paragraph	Number of Subjects
Donning Test	**5.3**	
• Adult or Adult-Child	5.3.1	- 25 *adults* minimum - Age groups: 20-29, 30-39, 40-49, 50-59, 60-69 yrs. (see 5.3.1 for more details)
• Child	5.3.1	- 5 adults: Ages: 20-40 years, male and female - 5 children: Each child: 35-90 lbs. (15.88-40.91kg.)
• Infant-Small Child	5.3.1 5.3.2	- 5 adults: Ages: 20-40 years, male and female - 1 anthropometric, *infant-small child* test dummy or child
Retention Test	**5.4**	
• Adult, Adult-Child, and Child	*5.4.1*	- 3 *adults* minimum, including at least one 5th percentile female and one 95th percentile male (measured by weight and head circumference)
• *Chilled Hands or Gloved Hands Test Method*	*5.4.2*	*- 5 adults minimum (see 2.3)*
• *Infant-Small Child*	*5.4.3*	*- 1 adult holding child test dummy or child (see 5.3.2)*
Flotation Attitude Test	**5.5**	
• Adult, Adult-Child, or Child	5.5.1	- 3 minimum, including at least one 5th percentile female and one 95th percentile male (measured by weight and head circumference)
Packaging Opening	**5.7**	
• Pull Force (2 methods)	*5.7.1*	- Mechanical: not to exceed 9lbs (40N) **OR** - 10 minimum, female, older than 60
• Operation of the Opening Mechanism	*5.7.2*	-10 minimum, female with reduced dexterity simulated by chilled or gloved hands (see 2.3)
Comprehensibility	**5.8**	- 6 *adults*
Tether Attachment	**5.9**	*- 5 adults minimum*