

Subject 1197

January 19, 2007

SUMMARY OF TOPICS

The following changes in requirements are being proposed:

- 1. An editorial new Third Edition of the Standard for Immersion Suits, UL 1197.**

STP BALLOTS DUE: March 20, 2007

COMMENTS DUE: March 20, 2007

- 1. An editorial new Third Edition of the Standard for Immersion Suits, UL 1197.**

RATIONALE

UL is proposing a new edition of UL 1197. The proposed new edition is a periodic re-issuance and includes the following type editorial revisions:

The units of measurement, undated reference, and component paragraphs which are common standard requirements have been added to the introduction;

Wording changes have been made in order to adhere to standards writing style; and

Sections, paragraphs, and corresponding references may have been renumbered.

If the new edition is accepted by the Standards Technical Panel for Personal Flotation Devices, STP 1123, and is adopted, the standard will gain first time approval as an American National Standard.

PROPOSAL

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INTRODUCTION

1 Scope

1.1 These requirements cover immersion suits intended for United States Coast Guard (USCG) approval under 46 CFR 160.171.

1.2 The suits covered by these requirements are intended to reduce the occurrence of shock to the wearer upon entering cold water and retard the onset of hypothermia (reduce the rate of body heat loss during periods of immersion in water). Immersion suits are required by the USCG to provide thermal protection properties in accordance with USCG regulations [see Thermal Protection Test, Section 22 in this standard and 46 CFR 160.171-17(d)].

1.3 These requirements cover immersion suits that incorporate auxiliary, inflatable means to provide buoyancy as well as suits that rely only on inherently buoyant material to provide the required flotation characteristics.

2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3 Undated References

3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this standard shall comply with the requirements for the Standard for Components for Personal Flotation Devices, UL 1191, and when the United States Coast Guard has specific requirements for the components, it shall comply with those requirements first.

4.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

5 Glossary

5.1 For the purpose of this standard the following definitions apply.

5.2 FOAM – Closed-cell, flexible, foamed polymeric material.

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5.3 FREEBOARD – A distance measured perpendicularly from the surface of the water to the lowest point where the wearer's respiration is impeded. The freeboard of a test subject wearing an immersion suit is measured with the subject in the attitude of static balance in which respiration is not impeded.

5.4 RETROREFLECTIVE MATERIAL – A material that reflects light so that the paths of the light rays are parallel to the incident rays.

5.5 STRUCTURAL SEAM – A seam that serves a functional purpose in the end product as distinguished from a decorative function.

6 Materials

6.1 Metal hardware shall:

- a) Be AISI Type 410 stainless steel; or
- b) Have at least equivalent resistance to corrosion when subject to the Corrosion Resistance Test, Section 32.

6.2 Metals shall be used in combinations that are galvanically compatible.

6.3 The primary (inherent) buoyancy of an immersion suit shall be provided by foam. Loose or granular materials shall not be relied upon to provide buoyancy; however, inflatable compartments intended to provide auxiliary buoyancy are not prohibited. See Stability and Retroreflective Material Tests, Section 17.

6.4 Adhesive shall be an all-purpose, waterproof type intended for use with the materials being bonded.

CONSTRUCTION

7 General

7.1 An oral inflation mechanism shall not be able to be locked in the open or closed position.

8 Sizing and Arrangement

8.1 General

8.1.1 An immersion suit shall be constructed to cover the entire area of a wearer's body, except the area of the nose and eyes are not required to be covered. The construction shall not permit a water spray to enter a wearer's mouth directly.

8.1.2 An adult size immersion suit shall be constructed to fit persons ranging from:

- a) 110 to 330 pounds (50 to 150 kg) in weight; and
- b) 59 to 75 inches (1.5 to 1.9 m) in height.

8.1.3 A child size immersion suit shall be constructed to fit persons ranging from:

- a) 44 to 110 pounds (20 to 50 kg) in weight; and
- b) 39 to 59 inches (1.0 to 1.5 m) in height.

8.1.4 An oversize-adult immersion suit shall be constructed to fit persons too large for the adult size immersion suit.

8.1.5 An immersion suit shall be constructed to facilitate donning by an untrained person and shall be as comfortable and nonrestrictive of motion and vision as practicable, consistent with its intended purpose. See Sections 12 – 16.

8.1.6 An immersion suit shall be accompanied by a storage case or similar protection, which shall be formed of either:

- a) Vinyl-coated fabric; or
- b) Material that provides equivalent protection to the suit when stored.

Also, see Storage-Temperature Ambient Tests, Section 23, and Flame Exposure Tests, Section 27.

8.1.7 The primary color of the exterior surface of each suit shall be vivid reddish orange (color number 34 of National Bureau of Standards Publication 440).

8.2 Gloves and feet

8.2.1 An immersion suit shall be provided with integral or removable gloves. When the gloves are removable:

- a) Each sleeve of the suit shall terminate in a wristlet seal that complies with the requirements in the Impact Test, Section 21,
- b) Each sleeve shall provide means for the attachment of a glove when being worn, and
- c) Means shall be provided for the securement of the gloves when not being worn, such as by a tether or lanyard or pockets provided on the sleeves, to avoid a loss.

8.2.2 A removable glove shall be designed so that only a small amount of water is capable of entering the glove during use.

8.2.3 An immersion suit shall be provided with integral feet having either:

- a) Hard soles; or
- b) Room to accommodate work shoes.

The sole or bottom of each foot shall be natural or synthetic rubber that is ribbed or bossed to provide skid resistance.

8.2.4 The construction of a suit shall restrict air from being entrapped in the leg area. See Water and Air Penetration Test, Section 20.

8.3 Retroreflective material and light

8.3.1 An immersion suit shall be provided with Type I retroreflective fabric or tape that is USCG Approved under 46 CFR 164.018 located so that at least 31 square inches (200 cm²) of the material shall be visible on the front of a wearer when in water. See 18.1 and 18.3.

8.3.2 An immersion suit shall be arranged to provide means for attachment of a survivor locating light on a front shoulder area by a method that shall not adversely affect the in-water performance characteristics of the suit. When the suit accommodates a specific light model, the suit shall be marked accordingly or reference shall be made to the instructions. See 40.4.

8.4 Retrieval

8.4.1 A belt of a lifting harness is to be constructed of any material, except leather, that complies with the requirements in the Retrieval Harness Strength Test, Section 35.

8.4.2 All hardware, except rivets, shall be of drop-forged or pressed steel provided with a corrosion resistant finish that complies with the Corrosion Resistance Test, Section 32.

Exception: The period for exposure during the Corrosion Resistance Test is to be 50 hours when a determination is made that 50 hours is representative of the conditions of intended use.

8.4.3 A D-ring or a snap hook shall have a tensile strength of at least 1500 pounds (680 kg) and shall comply with Retrieval Harness Strength Test, Section 35.

8.4.4 A body strap shall be not less than nominal 1-3/4 inch (44.5 mm) webbing.

8.4.5 A retrieval harness shall be provided with a retrieval ring with an inner diameter of not less than 2-1/4 inch (57 mm).

9 Assembly

9.1 Hardware shall be:

- a) Of a type and arrangement that facilitates operation; and
- b) Attached in a manner that reduces the risk of improper operation.

9.2 Stitching used to form a structural seam shall be a lock type and shall comply with the requirements of Federal Standard No. 751a for one of the following designations:

- a) Class 300 lockstitch; or
- b) Class 700 single-thread lockstitch.

Other stitches, which are not lockstitch, are not prohibited for use in reinforcing a glued seam when the seam has the required strength after the nonstandard stitch is removed. Also, see Seam Strength Test, Section 29 and Air Retention Test, Section 34.

9.3 For an immersion suit provided with an auxiliary means of buoyancy, each joint in the oral inflation tube shall be joined by means of a clamping device. A flange connection between the tube and the inflatable chamber shall be reinforced so that the flange is secured between the material that forms the chamber and the reinforcement.

PERFORMANCE

GENERAL

10 Required Tests

10.1 For an adult size immersion suit, representative samples of the suit are to be subjected to each of the tests described in Sections 11 – 25, 27, 28, and 33 – 35. Material specimens are required for the tests described in Sections 26, 29 – 32, and 36.

10.2 Only the tests described in 18.1 – 18.3 and Sections 25 and 28 are required for a child size immersion suit, and only the test described in Section 25 is required for an oversize-adult size immersion suit [based on prior USCG approval of the suit in the adult size – see 46 CFR 160.171-7(c)]. However, additional tests are required when construction differences between these sizes and the adult size suit affect other performance characteristics.

FLOTATION AND MOBILITY TESTS

11 General

11.1 Samples

11.1.1 For the tests described in Sections 12 – 22, the number of samples of an immersion suit to be used and the number of tests to which a particular sample is to be subjected is not specified; except that, for the Impact Test, Section 21, the same sample is to be worn by a subject in each of the subject's six jumps (a particular sample is not required to be used by more than one subject). Additionally, the same sample used for the Impact Test, Section 21, is to be used for the Thermal Protection Test, Section 22.

11.2 Subjects

11.2.1 Selection

11.2.1.1 For an adult size immersion suit, the tests described in Sections 12 – 22 are to be conducted using ten human subjects, seven of which are to be male and three female. The heaviest male and female subject shall weigh at least 254 pounds (115 kg) and the lightest male and female subject shall weigh not more than 121 pounds (55 kg). The subjects are to be representative of the range of anatomic builds (ectomorphic, endomorphic, and mesomorphic) and the sizes for which the suit is intended.

11.2.1.2 For a child size immersion suit, the tests described in 18.1 – 18.3 are to be conducted using six human subjects, whose sexes are not specified. The heaviest subject is to weigh at least 22 pounds (10 kg) more than the lightest subject. The subjects are to be representative of the range of anatomic builds and the sizes for which the suit is intended.

11.2.1.3 Each subject is to be unfamiliar with the particular immersion suit being tested.

11.2.1.4 A youth test participant may be used to satisfy specific anthropomorphic characteristics for weight, chest size, or girth of an adult-size device. When testing an adult-size device, when the youth is less than 13 years of age, his or her test results are able to be excluded for Donning Test, Section 12, or Hand Dexterity Test, Section 14 due to the participant's inherent limitations in dexterity, strength, and maturity. For an adult-size device, where the results for a youth test participant are excluded, a substitute test participant shall be used for the excluded test. The substitute participant shall have anthropomorphic characteristics within the candidate devices specified range, that are similar to, and not necessarily identical to the excluded participant.

11.2.2 Attire

11.2.2.1 For the tests, each subject is to wear the following:

- a) Underwear (short sleeved, short legged);
- b) Shirt (long sleeved);
- c) Trousers (not woolen);
- d) Woolen or equivalent synthetic socks; and
- e) Rubber-soled work shoes.

12 Donning Test

12.1 Complete donning of an immersion suit, including the gloves and other accessories, and removal from the package shall be accomplished in 2 minutes or less by at least nine of the ten subjects when the suit is tested as described in 12.2 and 12.3.

12.2 Each subject is to be allowed to examine the suit and read the instructions provided by the manufacturer in accordance with 40.1 for 60 seconds. At the end of this period, the subject is to remove the suit from its storage case and attempt to don the suit as rapidly as possible. When the subject does not remove the suit from the storage case and don the suit completely within 2 minutes, the subject is to remove the suit, reread the instructions for an additional 60 seconds, and again attempt to don the suit. The subject is to be given a demonstration of correct donning at this point.

12.3 A subject is not to use the aid of a chair or lean on a support during a donning attempt; however, the subject is not prohibited from sitting on the floor. No subject is to view the examination or donning attempts by another subject prior to the subject's own donning attempt.

13 Field of Vision Tests

13.1 Horizontal field tests

13.1.1 An immersion suit shall not restrict a subject's vision throughout the horizontal arc of 60 degrees to either side of the straight-ahead line of sight with the subject's head turned to any angle up to 30 degrees to either side of straight ahead, as determined by the tests described in 13.1.2 and 13.1.3.

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13.1.2 Each subject is to don the suit, stand upright, and face straight ahead. An observer is to assume a position at least 3 feet (0.9 m) from the subject and along the line at an angle of 60 degrees to the subject's straight-ahead line of sight. The observer is to walk past the front of the subject to a position on the line 60 degrees to the opposite side of the subject's straight-ahead line of sight. The suit shall not obstruct the observer's view of the subject's closest eye at any point along the path traveled.

13.1.3 With the subject facing straight ahead, an observer is to assume a position at least 3 feet (0.9 m) from and to the side of the subject and on a line 90 degrees to the subject's straight-ahead line of sight. The subject is to turn the head to look straight along a line 30 degrees towards the observer. This procedure then is to be repeated on the opposite side of the subject. The suit shall not obstruct the observer's view of the subject's closest eye on either side with the subject's head turned the full 30 degrees.

13.2 Vertical field test

13.2.1 An immersion suit shall not restrict or obstruct a subject's ability to view a spot directly:

- a) Above the subject; and
- b) On or between the subject's feet;

when the subject attempts to look at these spots through the combination of head and eye movement only while wearing the suit and standing upright.

14 Hand Dexterity Test

14.1 Following a subject's immersion in water at 5°C (41°F) for one hour, an immersion suit shall permit at least eight of ten subjects to pick up and write with a 3/8 inch diameter (9.5 mm), cylindrical wooden pencil, with the subjects wearing the complete suit (including gloves) and the pencil initially placed on a flat, hard-surfaced table. Each subject is to use only one hand for the attempt, and then attempt to lift the pencil off the table, position it, and write with it. A physician is to be present during the test.

Exception: This test is capable of being conducted in conjunction with the Thermal Protection Test, Section 22, in which five of six test subjects shall comply with the requirement.

15 Walking Test

15.1 While wearing the immersion suit, a subject shall not slip or increase the average travel time over two attempts of the course specified in 15.2 to more than 125 percent of the average time taken on the two attempts while not wearing the suit.

15.2 A 100 foot (30 m) long walking course is to be laid out on a smooth linoleum floor, the finish of which allows water to lie on it in a sheet rather than in beads. The course is not to have any abrupt changes in direction. Each subject is to be timed walking the course at a normal pace, with the floor dry. The subject then is to be timed walking the course at a normal pace, with the suit donned and the course wet. The subject is to rest until no longer fatigued prior to the second traversal of the course.

16 Climbing Test

16.1 The average time required for a subject to climb a ladder while wearing an immersion suit shall not be more than 125 percent of the average time required without wearing the suit when tested as described in 16.2.

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16.2 A rigid vertical ladder extending at least 17 feet (5.2 m) above a level floor is to be used for this test. See Figure 16.1. Each subject is to be timed two times climbing the ladder to a rung at least 10 feet (3.0 m) above the floor. The subject is then to don the suit and again be timed two times climbing to the same rung. The subject is to rest between climbs until no longer fatigued.

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