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Homeland Security

United States
Coast Guard



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JUN 22 2009

To: Inflatable PFD Manufacturers
Inflator Manufacturers
Personal Flotation Device Manufacturers Association

Subj: INFLATABLE WORK VESTS FOR USE ON COMMERCIAL VESSELS

In our letter of August 25, 2005, regarding approval of Type V inflatable lifejackets to meet USCG carriage requirements for certain uninspected commercial vessels (UCV), we indicated that the use of certain inflatable PFDs as work vests was under consideration. In view of the satisfactory operational experience with approved applications of inflatable PFDs on UCVs, we will consider devices which meet approval requirements of 46 CFR 160.076 or 46 CFR 160.176, as well as the enclosed guidelines for work vest use and specified durability requirements, for use on both inspected commercial vessels and UCVs as work vests with approval under 46 CFR 160.053.

PFDs approved under 46 CFR 160.076 or 160.176 as inflatable PFDs meeting Type I or II requirements that have an inflation system with cylinder seal indication (CSI) may be granted conditional (Type V) approvals as equivalent to 160.053 Type V PFDs which will allow their use on both inspected commercial vessels and UCVs as work vests. These PFDs, with an inflation system with CSI and a single point status indicator, are required to have a viewing window such that the status indicator can be visually checked before and after donning.

Enclosure (1) specifies additional testing that must be passed to show adequate durability for the granting of an approval equivalent to 160.053. Note that inflatable PFDs are not considered suitable for all work, especially hot work. Markings and service manual guidelines are included in enclosure (1) to address such concerns.

Manufacturers interested in applying for approval of PFD designs under these equivalence guidelines should submit their designs to our office for review. For currently approved inflatable PFDs, please include a graphic of the proposed revised label text and layout, revised user instructions, and reports of the additional tests specified in enclosure (1). When the final changes are accepted, fully documented, and incorporated in the relevant UL file/Procedures, a new approval certificate with an approval number to cover use as a work vest can be issued.

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If you have questions or wish to discuss these approval provisions, please contact Mr. Marty Jackson of my staff.

Sincerely,



C. E. RAWSON
Commander, U. S. Coast Guard
Chief, Office of Design and Engineering Standards
by direction

Encl: (1) Approval Guidelines for Inflatable Work Vest PFDs

Copy: Underwriters Laboratories, Inc., RTP

Approval Guidelines for Inflatable Work Vest PFDs

1 Introduction

- 1.1 The requirements in this guideline cover fully inflatable personal flotation devices, approved under the applicable requirements in 46 CFR 160.076 and 46 CFR 160.176, intended for use as substitutes for work vests approved under 46 CFR 160.053.
- 1.2 The requirements in this guideline also cover fully inflatable devices that are intended to also carry at least one other use approval: recreational, inspected vessel, or uninspected commercial vessel (UCV) for use in non-passenger carrying applications.

2 General

- 2.1 A fully inflatable device for use as a work vest shall comply with this guideline, and with the applicable requirements for Type I or Type II performance in the 2nd edition of UL1180, Sections 4 – 59 as revised February 13, 2009 except as modified or superseded by the requirements in this guideline.
- 2.2 Any component carrying a tensile load shall comply with the requirements for a 5WV or 2F use code in accordance with the applicable specifications in the Standard for Components for Personal Flotation Devices, UL1191. Inflators shall comply with the requirements for a 1F use code. Oral tubes, overpressure relief valves, and cylinders shall comply with the requirements for a 2F use code.

3 Sizing and Arrangement

- 3.1 A fully inflatable work vest may have one or more inflatable compartments.
- 3.2 An inflatable work vest shall not require second-stage donning.
- 3.3 An inflatable work vest shall be provided with a 1F automatic inflation system having cylinder seal indication that is visible before and after donning.
- 3.4 The visible surface area on an inflatable work vest, when packed, shall be primarily orange or vivid reddish orange (as defined in "The Color Names Dictionary" in Color: Universal Language and Dictionary Names, NBS Special Publication 440) and shall be at least:
 - a) 100-square inches (643 cm²) on the front; and
 - b) 70-square inches (450 cm²) on the back.
- 3.5 An inflatable work vest shall be provided with Type I retroreflective material in sufficient quantity and located so that at least 31 square inches (200 cm²) of the material will be visible on a wearer both in the packed condition, and when in water, in the attitude of static balance in which respiration is not impeded. If the device is reversible, this requirement necessitates the provision of reflective material on both surfaces.
- 3.6 An inflatable work vest shall be provided with a means for securing a survivor locating light on a front shoulder area to be visible with the wearer floating in a stable position. The means of attachment shall not adversely affect the in-water performance characteristics of the device, and shall not cause snagging.

- 3.7 The construction of a device shall acceptably reduce the likelihood of snagging, such as by providing means to secure the free ends of body straps and the like. Tie tapes, decorative "D" rings, and the like shall not be provided. An attachment point having a purpose identified in the manufacturer's manual shall comply with the Miscellaneous Fastener Strength Test, UL1180, Section 33. The attachment shall not extend more than 4 inches (101.6 mm) from the body of the device to the point of securement.
- 3.8 The excess webbing requirements in UL 1123 Sections SB5.4, SB7.3, and SB16.3 are applicable.

4 Excess Webbing Evaluation

- 4.1 The uninflated candidate device is to be given to the test participant at pool side with the instruction "Please put this on as quickly as possible, adjust to fit snugly, and DO NOT inflate." The donning attempt is not to be timed.
- 4.2 The test participant is then to be given the instructions, "This vest will be used around machinery. The loose ends of the webbing straps need to be secured to prevent becoming entangled in machinery. Read the manufacturer's donning instructions to secure loose straps." The test participant is not timed. A candidate device shall comply with the requirements in UL1123 Section SB5.4 with no more than 10 percent of the test participants being unsuccessful. When more than 10 percent of the test participants are unsuccessful, one of the following shall apply:
- a) Increase the number of test participants until the candidate device achieves a 90 percent success rate; or
 - b) A revised set of manufacturer's donning instructions is provided with all tests repeated.

5 Water Entry Tests

- 5.1 An inflatable work vest shall comply with the requirements in UL1180 Section 21.1 when tested as described in 21.4 - 21.6, modified as follows:
- a) Test Nos. 2 and 3 conditions are to be jumped from a height of 4.5 m (14.76 feet).
 - b) For multiple chamber devices, tests are to be repeated in all possible configurations in which one compartment is deflated.
 - c) After the armed uninflated jump (test no. 2 condition), the device shall comply with the requirements in UL1180 Sections 23 and 24 for Turning and Static Flotation.
- 5.2 If the device has multiple chambers, the tests specified in UL1180 Sections 24.4 and 24.5 are to be repeated by each subject with the device in each possible configuration of one deflated compartment.

6 In-Water Removal Test

- 6.1 The time required by each subject to remove the inflatable work vest shall be:
- a) Less than 15 seconds; or
 - b) If more than 15 seconds, not more than the time required to remove a hybrid reference vest (as specified in Section 4.19 of UL1517, 3rd edition, dated November 14, 2008).
- 6.2 The same test subjects used for the test specified in Section 5 of these guidelines are to be used for this test.
- 6.3 Each subject is to be positioned in a pool at a point:
- a) Where there is sufficient depth for the subject to float freely; and

b) That is at least 2 feet (0.6 m) from the edge of the pool.

6.3 (cont'd) The subject then is to be given the instructions: "At the command of "go," □ remove the device as quickly as possible...ready...go." □□ The time from the command "go" □ until complete removal of the device is to be recorded. To simulate an emergency situation, the subject may be given additional instructions during the removal attempt indicating that quick removal is imperative.

6.4 If a subject is unable to remove the reference vest within 60 seconds, the subject is to be disqualified and a new subject used for the test.

7 Dynamic Strength Test

7.1 There shall be no evidence of mechanical damage, such as tears, rips, loose seams, or broken or distorted hardware, sufficient to affect its performance when a fully inflatable device is subjected to water drops in accordance with 7.2-7.4.

7.2 For this test, a disarmed, deflated sample of the device is to be secured to a test form (see Figure 28.1 and Table 28.1 of UL1180) in the packed condition by the primary means of closure provided on the device. A device having more than one primary means of closure is to be tested using each primary means of closure independently. For example, when a device employs single or multiple body straps and a zipper, the Dynamic Strength Test is to be conducted first with all body strap(s) closed and the zipper open, then with the body strap(s) open and the zipper closed. The fastening means may be adjusted between impacts. The same sample is to be used for all drops.

7.3 The sample is to be dropped parallel to, and from approximately 18 inches (457mm) above the water surface at a speed of 50 mph (22 m/s). The device is to be dropped six times; once in each of the following orientations:

- a) face down, shoulder ahead position, followed by;
- b) Face down, shoulder astern;
- c) Back down, shoulder ahead;
- d) Back down, shoulder astern;
- e) Left side down, shoulder ahead; and
- f) Right side down, shoulder astern.

Exception: When it is determined that a particular orientation other than any of those specified is most likely to result in unacceptable performance, the device is to be dropped at least once in that orientation as a substitute for the specified orientation that most nearly approximates the most severe orientation.

7.4 The test then is to be repeated using the same sample of the device, with a discharged cylinder and inflated to the maximum value of the design pressure range.

8 Tensile Test

8.1 For a Type II performance device, the Body, Primary Closure, Shoulder, and Collar Strength Tests as specified in UL1180 Section 31, shall be conducted with a 10 minute test load duration for the primary closure body strap.

9 Oil Resistance Test (from UL1517)

9.1 All outermost covering materials are to undergo testing with 70 hours immersion in IRM 902 (Calumet Oil No. 2). Upon removal, the specimens are to be blotted with filter paper and compared with unconditioned specimens of the same dimensions for evidence of volume

change, softening, or deterioration. The specimens are to stand for 30 minutes at 23 +/- 2 deg C (73 +/- 4 deg F). The specimens are then examined again for the same signs of deterioration. Two specimens of the cover material shall be tested in accordance with 10.1 with an average of six values of not less than 75% of those recorded in 10.1.

10 Puncture Resistance Test

10.1 The cover material for the inflatable chamber is to be tested in accordance with ASTM F1342 Test Method for Protective Clothing Material Resistance to Puncture, with the following specifications:

- a) Probe 'A' shall be used for all punctures.
- b) The 3-puncture mounting plate shall be used.
- c) Two specimens shall be mounted to provide a total of six puncture values.
- d) The average of the six values shall be more than 10 lbf.

11 Abrasion Resistance Test

11.1 Specimens of any outer envelope fabric exposed when packed and worn shall be abraded in accordance with ASTM D4157 Standard Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method) in accordance with the following specifications:

- a) A minimum of four 9 x 9 inch (229 x 229 mm) envelope samples, two with the outer ply in the warp direction (machine direction) and two with the outer ply in the filling direction (across machine direction) shall be evaluated. Each sample shall consist of the cover fabric located between the layer of inflatable cell fabric (coated side down) and the abradant. Samples may be secured together along one side no more than 1/2 inch from the edge.
- b) The specimen assembly shall withstand 5,000 cycles (double rubs) against 60-grit sandpaper secured in one test arm with 4 lbf of tension and a 2 lbf load. The sample is secured across the oscillator with the outer ply facing the sandpaper.
- c) The sandpaper shall be cleaned by a soft brush, and any fabric mass rubbed loose shall be removed by compressed air at every 500 cycles.
- d) The layer of inflatable cell fabric for all samples shall comply with the requirements of the Air Leakage Test outlined in UL1191 Section 26.2 when subjected to an air pressure of 2 psig for 5 minutes.

12 Rotating Shock Bin

12.1 Perform the rotating shock bin test as specified in ISO 12402-9 Personal Flotation Devices Part 9: Test Methods, Section 5.5.2 Rotating Shock Bin Test Method, using 300 revolutions instead of 150. The device is considered to have passed if all hardware is intact and the device is operable.

13 Markings

13.1 The markings of the fully inflatable work vest shall comply with the requirements of Section 10 of UL1180 except as modified or superseded by the requirements in this section:

- a) "ADULT – For a person weighing more than 80 pounds."
- b) "TYPE V PFD – APPROVED ONLY WHEN WORN as a substitute for a Work Vest approved under Subpart 160.053 for use on Merchant Vessels. See manual for additional information."
- c) Remove "Not approved to meet carriage requirements on commercial vessels." from Figure 46.1, UL1180.
- d) "This PFD requires maintenance according to the manufacturer's manual".
- e) "When new, this PFD provides a minimum buoyant force of 35 pounds when inflated."

- f) "NOT SUITABLE FOR HOT WORK"
- g) "U.S. Coast Guard Approval No. 160.053/xxxx/xx", in which x is assigned by USCG
- h) "WARNING: Damage to the device may require servicing in accordance with the manual."

13.2 In addition to the wording included on the marking tag, on a front compartment of each work vest there shall be stenciled in waterproof ink in letters not less than 3/4 inch in height, the words, "WORK VEST ONLY." If approved for additional applications, this marking may be modified accordingly.

14 Manufacturer's Service Manual

14.1 An inflatable work vest shall be provided with a service manual in combination with the owner's manual required by Section 58 of UL1180. The service manual shall be provided to be read after purchase, and shall include the following:

- a) Instructions for the proper stowage of the device.
- b) Information on observations or tests to be completed during servicing with subsequent follow-up actions including repairs or restrictions on use, or other necessary information not covered in the markings on the device or the owner's manual.
- c) If the instructions specify that the device is to be inspected by personnel on the vessel on which the device is used:
 - 1) Specific information regarding the necessary training and qualification procedures for the personnel;
 - 2) Procedures for identification of devices that require servicing, have completed servicing, and the servicing time interval; and
 - 3) Specific information regarding a record keeping system for servicing inspections located on the device.