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supervision of the independent laboratory. The sample fails if the visual examination shows that the aid does not conform to the approved design.

(c) If a defect in the thermal protective aid is detected upon visual examination, 10 additional samples from the same lot must be selected at random and examined for the defect.

(d) If one or more of the 10 samples fails the examination, each thermal protective aid in the lot must be examined for the defect for which the lot was rejected. Only thermal protective aids that are free of defects may be sold as Coast Guard approved.

[CGD 84-069b, 51 FR 19343, May 29, 1986; 51 FR 20650, June 6, 1986]

Subpart 160.176—Inflatable Lifejackets

SOURCE: CGD 78-174b, 54 FR 50320, Dec. 5, 1989, unless otherwise noted.

§ 160.176-1 Scope.

(a) This subpart contains structural and performance standards and procedures for approval of inflatable lifejackets, as well as requirements for associated manuals, servicing programs, and shore-side service facilities.

(b) Other regulations in this chapter provide that inflatable lifejackets must be:

(1) Serviced annually at designated servicing facilities; and

(2) Maintained in accordance with their user manuals.

(c) Inflatable lifejackets approved under this subpart—

(1) Rely entirely upon inflation for buoyancy;

(2) Meet the requirements for lifejackets in the 1983 Amendments to the International Convention for the Safety of Life at Sea, 1974 (SOLAS 74/83);

(3) Have performance equivalent to Type I Personal Flotation Devices (PFD's) with any one chamber deflated; and

(4) Are designed to be worn by adults.

§ 160.176-2 Application.

(a) Inflatable lifejackets approved under this subpart may be used to meet carriage requirements for Type I PFD's only on:

(1) Uninspected submersible vessels; and

(2) Inspected vessels for which a servicing program has been approved by the Commandant.

(b) [Reserved]

§ 160.176-3 Definitions.

(a) *Commandant* means the Chief of the Lifesaving and Fire Safety Division, Marine Safety and Environmental Protection. Address: Commandant (CG-5214), U.S. Coast Guard Headquarters, 2100 2nd St., SW., Stop 7126, Washington, DC 20593-7126.

(b) *First quality workmanship* means construction which is free from any defect materially affecting appearance or serviceability.

(c) *Functional deterioration* means—

(1) Damage such as deformation in hardware or a rip, tear, or loose stitches;

(2) Decline in any performance characteristic; or

(3) Any other change making the lifejacket unfit for use.

(d) *Functional residual capacity* (FRC) means the amount of lung volume a person has remaining at the bottom of the normal breathing cycle when at rest.

(e) *Inflation medium* means any solid, liquid, or gas, that, when activated, provides inflation for buoyancy.

(f) *Inspector* means an independent laboratory representative assigned to perform the duties described in § 160.176-15 of this subpart.

(g) *PFD* means personal flotation device as defined in 33 CFR 175.13.

(h) *Reference vest* means a model AK-1 PFD meeting subpart 160.047 of this part, except that, in lieu of the weight and displacement values prescribed in Tables 160.047-4(c)(2) and § 160.047-4(c)(4), each front insert must have a weight of kapok of at least 8.25 oz. and a volume displacement of 9.0 \pm 0.25 lb., and the back insert must have a weight of kapok of at least 5.5 oz. and a volume displacement of 6.0 \pm 0.25 lb. To achieve the specified volume displacement, front insert envelopes may be larger than the dimensions prescribed by § 160.047-1(b).

(i) [Reserved]

(j) *Second stage donning* means adjustments or steps necessary to make a

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lifejacket provide its intended flotation characteristics after the device has been properly donned and then inflated.

[CGD 78-174b, 54 FR 50320, Dec. 5, 1989, as amended by CGD 95-072, 60 FR 50466, Sept. 29, 1995; CGD 96-041, 61 FR 50733, Sept. 27, 1996; USCG-2009-0702, 74 FR 49238, Sept. 25, 2009]

§ 160.176-4 Incorporation by reference.

(a) Certain materials are incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a). To enforce any edition other than the one listed in paragraph (b) of this section, notice of the change must be published in the FEDERAL REGISTER and the material made available to the public. All approved material is on file at the National Archives and Records Administration (NARA), and at the U.S. Coast Guard, Lifesaving and Fire Safety Division (CG-5214), 2100 2nd St., SW., Stop 7126, Washington, DC 20593-7126, and is available from the sources indicated in paragraph (b) of this section. For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(b) The materials approved for incorporation by reference in this subpart, and the sections affected are:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 117-97, Standard Practice for Operating Salt Spray (Fog) Apparatus—160.176-8; 160.176-13

ASTM D 751-95, Standard Test Methods for Coated Fabrics—160.176-13

ASTM D 975-98, Standard Specification for Diesel Fuel Oils—160.176-13

ASTM D 1434-82 (1988), Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting—160.176-13

FEDERAL AVIATION ADMINISTRATION TECHNICAL STANDARD ORDER
Policy and Procedure Br., AWS-110, Aircraft Engineering Division, Office of Airworthiness, 800 Independence Ave., SW., Washington, DC 20591

TSO-C13d, Federal Aviation Administration Standard for Life Preservers, January 3, 1983—160.176-8

FEDERAL STANDARDS

46 CFR Ch. I (10-1-11 Edition)

Naval Publications and Forms Center, Customer Service, Code 1052, 5801 Tabor Ave., Philadelphia, PA 19120

In Federal Test Method Standard No. 191A (dated July 20, 1978) the following methods:

(1) Method 5100, Strength and Elongation, Breaking of Woven Cloth; Grab Method—160.176-13

(2) Method 5132, Strength of Cloth, Tearing; Falling-Pendulum Method—160.176-13

(3) Method 5134, Strength of Cloth, Tearing; Tongue Method—160.176-13

(4) Method 5804.1, Weathering Resistance of Cloth; Accelerated Weathering Method—160.176-8

(5) Method 5762, Mildew Resistance of Textile Materials; Soil Burial Method—160.176-8

Federal Standard No. 751a, Stitches, Seams, and Stitching, January 25, 1965—160.176-9

MILITARY SPECIFICATIONS

Naval Publications and Forms Center, Customer Service, Code 1052, 5801 Tabor Ave., Philadelphia, PA 19120

MIL-L-24611—Life Preserver Support Package For Life Preserver, MK 4, dated May 18, 1982—160.176-8

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) (FORMERLY NATIONAL BUREAU OF STANDARDS)

C/O Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402

Special Pub. 440, *Color: Universal Language and Dictionary of Names*; “The Universal Color Language” and “The Color Names Dictionary”, 1976—160.176-9

UNDERWRITERS LABORATORIES (UL)

Underwriters Laboratories, Inc., 12 Laboratory Drive, Research Triangle Park, NC 27709-3995, P.O. Box 13995, Research Triangle Park, NC 27709-3995

UL 1191, “Components for Personal Flotation Devices”, November 11, 1984—160.176-8; 160.176-13

[CGD 78-174b, 54 FR 50320, Dec. 5, 1989, as amended by CGD 95-072, 60 FR 50467, Sept. 29, 1995; CGD 96-041, 61 FR 50733, Sept. 27, 1996; CGD 97-057, 62 FR 51049, Sept. 30, 1997; USCG-1999-5151, 64 FR 67185, Dec. 1, 1999; 69 FR 18803, Apr. 9, 2004; USCG-2009-0702, 74 FR 49238, Sept. 25, 2009]

§ 160.176-5 Approval procedures.

(a) *Modifications to general procedures.* Subpart 159.005 of this chapter contains the approval procedures. Those procedures must be followed, except as modified in this paragraph.

(1) Preapproval review under §§ 159.005-5 and 159.005-7 may be omitted if a similar design has already been approved.

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(2) The information required under § 159.005-5(a)(2) (i) through (iii) of this chapter must be included in the application.

(3) The application must also include the following:

(i) The Type of performance (i.e. Type I or Type V) that the lifejacket is designed to provide.

(ii) Any special purpose(s) for which the lifejacket is designed and the vessel(s) or vessel type(s) on which its use is planned.

(iii) Buoyancy and torque values along with tolerances to be allowed in production. The Coast Guard normally will approve tolerances of up to $\pm 10\%$ unless prototypes are tested at greater extremes or greater tolerances are otherwise justified.

(iv) The text of any optional marking to be provided in addition to required text.

(v) The service manual and written guidelines required by §§ 160.176-19(c) and 160.176-19(d) of the part and the user's manual required by § 160.176-21 of this part.

(vi) A list of proposed servicing facilities.

(4) The description of quality control procedures required by § 159.005-9 of this chapter to be submitted with the test report may be omitted as long as the manufacturer's planned quality control procedures comply with § 160.176-15 of this part.

(5) The test report must include, in addition to information required by § 159.005-9 of this chapter, a report of inspection of each proposed servicing facility. The report must include the time, date, place, and name of the person doing the inspection and observations that show whether the facility meets §§ 160.176-19(b)(2), 160.176-19(b)(4), and 160.176-19(d) of this part.

(6) The certificate of approval, when issued, is accompanied by a letter to the manufacturer listing the servicing facilities that have been approved. Copies of the letter are also provided for each facility.

(7) An approval will be suspended or terminated under § 159.005-15 of this chapter if the manufacturer fails to maintain approved servicing facilities that meet § 160.176-19 of this part.

(b) *Manuals and guidelines.* The manuals and servicing facility guidelines required by this subpart are reviewed with the application for lifejacket approval. Changes will be required if needed to comply with §§ 160.176-19 and 160.176-21 of this part.

(c) *Approval of servicing facilities.* (1) Approval of servicing facilities initially proposed for use is considered during and as a part of the lifejacket approval process described in paragraph (a) of this section.

(2) Other servicing facilities may subsequently be considered for approval, upon submission of a letter of application to Commandant containing each of the applicable items required of manufacturers and laboratories under § 159.005-5 of this chapter and the following:

(i) A copy of guidelines meeting § 160.176-19(d) of this part, if different from those originally approved with the lifejacket;

(ii) A list of the sources the servicing facility proposes to use for parts and manuals for the servicing of the make and model of lifejacket applied for; and

(iii) A report of inspection prepared by an independent laboratory which includes the time, date, and place of the inspection, the name of the inspector, and observations that show whether the facility meets §§ 160.176-19(b)(2) through 160.176-19(b)(4) and 160.176-19(d) of this part.

(3) To conduct servicing at a remote or mobile site, the servicing facility must be authorized in its letter of approval to conduct this type of servicing. Approval for servicing at these sites is obtained according to paragraph (c)(2) of this section except that portable or mobile equipment must be available when evaluating the compliance with § 160.176-19(b)(3) of this part.

(4) Each change to equipment, procedure, or qualification and training of personnel of an approved servicing facility must be also approved.

(d) *Waiver of tests.* If a manufacturer requests that any test in this subpart be waived, one of the following must be provided to the Commandant as justification for the waiver:

(1) Acceptable test results on a lifejacket of sufficiently similar design.

(2) Engineering analysis showing that the test is not applicable to the particular design or that by design or construction the lifejacket can not fail the test.

(e) *Alternative requirements.* A lifejacket that does not meet requirements in this subpart may still be approved if the device—

(1) Meets other requirements prescribed by the Commandant in place of or in addition to requirements in this subpart; and

(2) Provides at least the same degree of safety provided by other lifejackets that do comply with this subpart.

[CGD 78-1746, 54 FR 50320, Dec. 5, 1989, as amended by CGD 78-174b, 56 FR 29441, June 27, 1991]

§ 160.176-6 Procedure for approval of design or material revision.

(a) Each change in design, material, or construction must be approved by the Commandant before being used in lifejacket production.

(b) Determinations of equivalence of design, construction, and materials may only be made by the Commandant.

§ 160.176-7 Independent laboratories.

A list of independent laboratories which have been accepted by the Commandant for conducting or supervising the following tests and inspections required by this subpart, may be obtained from the Commandant:

(a) Approval tests.

(b) Production tests and inspections.

(c) Inspection of approved servicing facilities.

(d) Testing of materials for the purpose of making the certification required by § 160.176-8(a)(3) of this part.

§ 160.176-8 Materials.

(a) *General*—(1) *Acceptance, certification, and quality.* All components used in the construction of lifejackets must meet the requirements of subpart 164.019 of this chapter.

(2) *Condition of materials.* All materials must be new.

(3) *Temperature range.* Unless otherwise specified in standards incorporated by reference in this section, all materials must be usable in all weather conditions throughout a temperature

range of -30°C to $+65^{\circ}\text{C}$ (-22°F to $+150^{\circ}\text{F}$).

(4) *Weathering resistance.* Each non-metallic component which is not suitably covered to shield against ultraviolet exposure must retain at least 40% of its strength after being subjected to 300 hours of sunshine carbon arc weathering as specified by Method 5804.1 of Federal Test Method Standard Number 191A.

(5) *Fungus resistance.* Each non-metallic component must retain at least 90% of its strength after being subjected to the mildew resistance test specified by Method 5762 of Federal Test Method Standard No. 191A when untreated cotton is used as the control specimen. Also, the gas transmission rate of inflation chamber materials must not be increased by more than 10% after being subjected to this test. Materials that are covered when used in the lifejacket may be tested with the covering material.

(6) *Corrosion resistance.* Each metal component must—

(i) Be galvanically compatible with each other metal part in contact with it; and

(ii) Unless it is expendable (such as an inflation medium cartridge), be 410 stainless steel, have salt water and salt air corrosion characteristics equal or superior to 410 stainless steel, or perform its intended function and have no visible pitting or other damage on any surface after 720 hours of salt spray testing according to ASTM B 117 (incorporated by reference, see § 160.176-4).

(7) *Materials not covered.* Materials having no additional specific requirements in this section must be of good quality and suitable for the purpose intended.

(b) *Fabric*—(1) *All fabric.* All fabric must—

(i) Be of a type accepted for use on Type I life preservers approved under subpart 160.002 of this part; or

(ii) Meet the Type V requirements for “Fabrics for Wearable Devices” in UL 1191 except that breaking strength must be at least 400 N (90 lb.) in both directions of greater and lesser thread count.

(2) *Rubber coated fabric.* Rubber coated fabric must be of a copper-inhibiting type.

(c) *Inflation chamber materials*—(1) *All materials*. (i) The average permeability of inflation chamber material, determined according to the procedures specified in §160.176-13(y)(3) of this part, must not be more than 110% of the permeability of the materials determined in approval testing prescribed in §160.176-13(y)(3) of this part.

(ii) The average grab breaking strength and tear strength of the material, determined according to the procedures specified in §§160.176-13(y)(1) and 160.176-13(y)(2) of this part, must be at least 90% of the grab breaking strength and tear strength determined from testing prescribed in §§160.176-13(y)(1) and 160.176-13(y)(2) of this part. No individual sample result for breaking strength or tear strength may be more than 20% below the results obtained in approval testing.

(2) *Fabric covered chambers*. Each material used in the construction of inflation chambers that are covered with fabric must meet the requirements specified for—

(i) “Bladder” materials in section 3.2.6 of MIL-L-24611(SH) if the material is an unsupported film; or

(ii) Coated fabric in section 3.1.1 of TSO-C13d if the material is a coated fabric.

(3) *Uncovered chambers*. Each material used in the construction of inflation chambers that are not covered with fabric must meet the requirements specified in paragraph (c)(2)(ii) of this section.

(d) *Thread*. Each thread must meet the requirements of subpart 164.023 of this chapter. Only one kind of thread may be used in each seam. Thread and fabric combinations must have similar elongation and durability characteristics.

(e) *Webbing*. Webbing used as a body strap, tie tape or drawstring, or reinforcing tape must meet §160.002-3(e), §160.002-3(f), §160.002-3(h) of this part respectively. Webbing used for tie tape or drawstring must easily hold a knot and be easily tied and untied. Webbing used as reinforcing tape must not chafe the wearer.

(f) *Closures*—(1) *Strength*. Each buckle, snap hook, dee ring or other type of fastening must have a minimum breaking strength of 1600 N (360 lbs). The

width of each opening in a closure, through which body strap webbing passes, must be the same as the width of that webbing.

(2) *Means of Locking*. Each closure used to secure a lifejacket to the body, except a zipper, must have a quick and positive locking mechanism, such as a snap hook and dee ring.

(3) *Zipper*. If a zipper is used to secure the lifejacket to the body, it must be—

(i) Easily initiated;

(ii) Non-jamming;

(iii) Right handed;

(iv) Of a locking type; and

(v) Used in combination with another type of closure that has a quick and positive means of locking.

(g) *Inflation medium*. (1) No inflation medium may contain any compound that is more toxic than CO₂ if inhaled through any of the oral inflation mechanisms.

(2) Any chemical reaction of inflation medium during inflation must not produce a toxic residue.

(h) *Adhesives*. Adhesives must be waterproof and acceptable for use with the materials being bonded.

(i) [Reserved]

(j) *Retroreflective Material*. Each lifejacket must have at least 200 sq. cm. (31 sq. in.) of retroreflective material on its front side, at least 200 sq. cm. on its back side, and at least 200 sq. cm. of material on each reversible side. The retroreflective material must be Type I material that is approved under subpart 164.018 of this chapter. The retroreflective material attached on each side must be divided equally between the upper quadrants of the side. Attachment of retroreflective material must not impair lifejacket performance or durability.

(k) *PFD light*. Each lifejacket must have a PFD light that is approved under subpart 161.012 of this chapter and that meets the requirements of Regulations III/30.2 and III/32.3 of the 1983 Amendments to the International Convention for the Safety of Life at Sea, 1974 (SOLAS 74/83). The light must be securely attached to the front shoulder area of the lifejacket. Attachment of the light must not impair lifejacket performance.

(l) [Reserved]

(m) *Whistle.* Each lifejacket must have a whistle of the ball type or multi-tone type and of corrosion-resistant construction. The whistle must be securely attached to the lifejacket by a lanyard. The lanyard must be long enough to permit the whistle to reach the mouth of the wearer. If the lanyard would normally allow the whistle to hang below the waist of the average size wearer, the whistle must be stowed in a pocket on the lifejacket. The attachment of the whistle must not impair lifejacket performance.

[CGD 78-1746, 54 FR 50320, Dec. 5, 1989, as amended by CGD 78-174b, 56 FR 29441, June 27, 1991; CGD 84-068, 58 FR 29494, May 20, 1993; USCG-2000-7790, 65 FR 58464, Sept. 29, 2000]

§ 160.176-9 Construction.

(a) *General Features.* Each inflatable lifejacket must—

- (1) Have at least two inflation chambers;
- (2) Be constructed so that the intended method of donning is obvious to an untrained wearer;
- (3) If approved for use on a passenger vessel, be inside a sealed, non-reusable package that can be easily opened;
- (4) Have a retainer for each adjustable closure to prevent any part of the closure from being easily removed from the lifejacket;
- (5) Be universally sized for wearers weighing over 40 kg. (90 pounds) and have a chest size range of at least 76 to 120 cm. (30 to 52 in.);
- (6) Unless the lifejacket is designed so that it can only be donned in one way, be constructed to be donned with either the inner or outer surface of the lifejacket next to the wearer (be reversible);
- (7) Not have a channel that can direct water to the wearer's face to any greater extent than that of the reference vest defined in § 160.176-3(h) of this part;
- (8) Not have edges, projections, or corners, either external or internal, that are sharp enough to damage the lifejacket or to cause injury to anyone using or maintaining the lifejacket;
- (9) Have a means for drainage of entrapped water;
- (10) Be primarily vivid reddish orange, as defined by sections 13 and 14 of

the "Color Names Dictionary," on its external surfaces;

- (11) Be of first quality workmanship;
 - (12) Unless otherwise allowed by the approval certificate—
 - (i) Not incorporate means obviously intended for attaching the lifejacket to the vessel; and
 - (ii) Not have any instructions indicating attachment to a vessel is intended; and
 - (13) Meet any additional requirements that the Commandant may prescribe, if necessary, to approve unique or novel designs.
- (b) *Inflation mechanisms.* (1) Each inflatable lifejacket must have
- (i) At least one automatic inflation mechanism;
 - (ii) At least two manual inflation mechanisms on separate chambers;
 - (iii) At least one oral inflation mechanism on each chamber; and
 - (iv) At least one manual inflation mechanism or one automatic inflation mechanism on each inflation chamber.
- (2) Each inflation mechanism must
- (i) Have an intended method of operation that is obvious to an untrained wearer;
 - (ii) Not require tools to activate the mechanism;
 - (iii) Be located outside its inflation chamber; and
 - (iv) Be in a ready to use condition.
- (3) Each oral inflation mechanism must
- (i) Be easily accessible after inflation for the wearer to "top off" each chamber by mouth;
 - (ii) Operate without pulling on the mechanism;
 - (iii) Not be able to be locked in the open or closed position; and
 - (iv) Have a non-toxic mouthpiece.
- (4) Each manual inflation mechanism must
- (i) Provide an easy means of inflation that requires only one deliberate action on the part of the wearer to actuate it;
 - (ii) Have a simple method for replacing its inflation medium cartridge; and
 - (iii) Be operated by pulling on an inflation handle that is marked "Jerk to Inflate" at two visible locations.
- (5) Each automatic inflation mechanism must

(i) Have a simple method for replacing its inflation medium cartridge and water sensitive element;

(ii) Have an obvious method of indicating whether the mechanism has been activated; and

(iii) Be incapable of assembly without its water sensitive element.

(6) The marking required for the inflation handle of a manual inflation mechanism must be waterproof, permanent, and readable from a distance of 2.5 m (8 feet).

(c) *Deflation mechanism.* (1) Each chamber must have its own deflation mechanism.

(2) Each deflation mechanism must

(i) Be readily accessible to either hand when the lifejacket is worn while inflated;

(ii) Not require tools to operate it;

(iii) Not be able to be locked in the open or closed position; and

(iv) Have an intended method of operation which is obvious to an untrained wearer.

(3) The deflation mechanism may also be the oral inflation mechanism.

(d) *Sewn seams.* Stitching used in each structural seam of a lifejacket must provide performance equal to or better than a Class 300 Lockstitch meeting Federal Standard No. 751a.

(e) *Textiles.* All cut edges of textile materials must be treated or sewn to minimize raveling.

(f) *Body strap attachment.* Each body strap assembly must be securely attached to the lifejacket.

§ 160.176-11 Performance.

(a) *General.* Each inflatable lifejacket must be able to pass the tests in § 160.176-13 of this part.

(b) *Snag Hazard.* The lifejacket must not present a snag hazard when properly worn.

(c) *Chamber Attachment.* Each inflation chamber on or inside an inflatable lifejacket must not be able to be moved to a position that-

(1) Prevents full inflation; or

(2) Allows inflation in a location other than in its intended location.

(d) *Comfort.* The lifejacket must not cause significant discomfort to the wearer during and after inflation.

§ 160.176-13 Approval Tests.

(a) *General.* (1) This section contains requirements for approval tests and examinations of inflatable lifejackets. Each test or examination must be conducted or supervised by an independent laboratory. The tests must be done using lifejackets that have been constructed in accordance with the plans and specifications in the application for approval. Unless otherwise specified, only one lifejacket, which may or may not have been subjected to other tests, is required to be tested in each test. One or more lifejackets that have been tested as prescribed in paragraph (h) of this section must be used for the tests prescribed in paragraphs (j), (n), (q), and (r) of this section. The tests prescribed in paragraph (y) of this section require one or more lifejackets as specified in that paragraph.

(2) All data relating to buoyancy and pressure must be taken at, or corrected to, an atmospheric pressure of 760 mm (29.92 inches) of mercury and a temperature of 20 °C (68 °F).

(3) The tests in this section are not required to be run in the order listed, except where a particular order is specified.

(4) Some tests in this section require a lifejacket to be tested while being worn. In each of these tests the test subjects must represent a range of small, medium, and large heights and weights. Unless otherwise specified, a minimum of 18 test subjects, including both males and females, must be used. The test subjects must not be practiced in the use of the lifejacket being tested. However, they must be familiar with the use of other Coast Guard approved lifejackets. Unless specified otherwise, test subjects must wear only swim suits. Each test subject must be able to swim and relax in the water.

NOTE: Some tests have inherent hazards for which adequate safeguards must be taken to protect personnel and property in conducting the tests.

(b) *Donning.* (1) No second stage donning is allowed in the tests in this paragraph. Test subjects may read the donning instructions to be provided with the device, if any. An uninflated lifejacket with size adjustment at its

mid-range is given to each test subject with the instruction: "Please don as quickly as possible, adjust to fit snugly, and inflate." Each subject must, within one minute, don the uninflated lifejacket, adjust it to fit snugly, and then activate the manual inflation mechanism.

NOTE: For this test the manual inflation mechanism may be disabled.

(2) The average time of all subjects to complete the test in paragraph (b)(1) of this section must not exceed 30 seconds. The criteria in this paragraph do not apply to the tests in paragraphs (b)(3) and (b)(4) of this section.

(3) The test in paragraph (b)(1) of this section is repeated with each subject wearing an insulated, hooded parka and gloves made from heavy, cotton-jersey (knit) fabric.

(4) The test in paragraph (b)(1) of this section is then repeated twice more with a fully inflated lifejacket. In the first test the subjects must wear swim suits and in the second test, parka and gloves.

(c) *Inflation Testing.* No second stage donning is allowed in the tests in this paragraph. A lifejacket with each automatic inflation mechanism disabled must be used for the tests prescribed in paragraphs (c)(1) and (c)(2) of this section. For the tests prescribed in paragraph (c)(4) of this section, remove any non-reusable cover or packaging from the lifejacket, but do not open any cover or closure which is intended to be closed when the lifejacket is worn in the uninflated condition.

(1) Each test subject dons an uninflated lifejacket and is instructed to enter the water and swim for approximately 30 seconds and then, on command, inflate the lifejacket using only oral inflation mechanisms. Within 30 seconds after the command is given, the lifejacket must be sufficiently inflated to float each subject with respiration unimpeded.

(2) Each test subject dons an uninflated lifejacket and is instructed to enter the water and swim for approximately 30 seconds, bring both hands to the surface, and then, on command, inflate the lifejacket using each manual inflation mechanism. Each test subject must find and operate all the

manual inflation mechanisms within 5 seconds after the command is given. The manual inflation mechanisms must inflate the lifejacket sufficiently to float the wearers within 5 seconds after the mechanisms are operated. Within 20 seconds after activation each subject must be floating in the position described in paragraph (d)(3) of this section.

(3) One small and one large test subject don uninflated lifejackets and jump feet first from a height of 1 meter into the water. The automatic inflation mechanisms must inflate the lifejackets sufficiently to float the wearers within 10 seconds after the subjects enter the water. Within 20 seconds after entering the water each subject must be floating in the position described in paragraph (d)(3) of this section.

(4) Air at a pressure of 4.2 kPa (0.6 psig) is applied separately to each oral inflation mechanism of the lifejacket. In each application the chamber must fully inflate within 1 minute.

(5) Each oral inflation mechanism of an unpacked lifejacket is connected to a regulated air source constantly supplying air at a pressure of 7 kPa (1 psig). Each mechanism must pass at least 100,000 cc of air per minute.

(d) *Flotation stability*—(1) *Uninflated flotation stability.* Lifejackets with their automatic inflation mechanisms disabled must be used for this test. Each subject dons an uninflated lifejacket, enters the water, and assumes an upright, slightly back of vertical, position. Each subject then relaxes. For each subject that floats, the uninflated lifejacket must not tend to turn the wearer face-down when the head is allowed to fall back.

(2) *Righting action.* (i) Each test subject dons an uninflated lifejacket, enters the water, allows the automatic inflation mechanism to inflate the lifejacket, and swims for 30 seconds. While swimming, freedom of movement and comfort are observed and noted by the person conducting the test. Freedom of movement and comfort must comply with §160.176-11(d). Also, each subject must demonstrate that the lifejacket can be adjusted while the subject is in the water.

(ii) Each subject then takes three gentle breast strokes and while still face-down in the water, relaxes completely while slowly exhaling to FRC. Each subject remains in this limp position long enough to determine if the lifejacket will turn the subject from the face-down position to a position in which the subject's breathing is not impaired. The time from the last breast stroke until breathing is not impaired is recorded. Each subject repeats these steps two additional times, and the average time for the three righting actions is calculated. This average time must not exceed 5 seconds.

(iii) If the lifejacket does not have automatic inflation mechanisms for all chambers, the tests in paragraphs (d)(2)(i) and (d)(2)(ii) of this section are repeated with each lifejacket fully inflated.

(iv) Each subject then performs the test in paragraph (d)(2)(ii) of this section with one chamber of the lifejacket deflated. This test is then repeated as many times as necessary to test the lifejacket with a different chamber deflated until each chamber has been tested in this manner.

(v) Each subject then performs the test in paragraph (d)(2)(ii) of this section but exhales to FRC at the end of the third breast stroke and holds the breath prior to relaxing.

(3) *Static measurements.* At the end of each test with each subject in § 160.176-13(d)(2)(ii), through § 160.176-13(d)(2)(v)—

(i) The freeboard (the distance from the water surface to the bottom of the mouth) must be at least 100 mm (4.0 in.) without repositioning of any part of the body and at least 120 mm (4.75 in.) after the head is positioned on the lifejacket for maximum freeboard and then relaxed;

(ii) The distance from water surface to the lower portion of the ear canal must be at least 50 mm (2 in.);

(iii) The torso angle (the angle between a vertical line and a line passing through the shoulder and hip) must be between 20° and 65° (back of vertical);

(iv) The face-plane angle (the angle between a vertical line and a line passing through the most forward part of the forehead and chin) must be between 15° and 60° (back of vertical);

(v) The lowest mark on a vertical scale 6 m (20 ft.) from and in front of the subject which the subject can see without moving the head must be no higher than 0.3 m (12 in.) from the water level.

(vi) The subject when looking to the side, must be able to see the water within 3 m (10 ft.) away; and

(vii) At least 75% of the retroreflective material on the outside of the lifejacket, and the PFD light, must be above the water.

(4) *Average requirements.* The test results for all subjects must be averaged for the following static measurements and must comply with the following:

(i) The average freeboard prior to positioning the head for maximum freeboard must be at least 120 mm (4.75 in.);

(ii) The average torso angle must be between 30° and 50° (back of vertical); and

(iii) The average face-plane angle must be between 20° and 50° (back of vertical).

(5) *“HELP” Position.* Starting in a relaxed, face-up position of static balance, each subject brings the legs and arms in towards the body so as to attain the “HELP” position (a fetal position, but holding the head back). The lifejacket must not turn the subject face down in the water.

(e) *Jump test.* (1) Each test subject dons an uninflated lifejacket and with hands above head, jumps feet first, into the water from a height of 4.5 m (15 ft.). No second stage donning is allowed during this test and the lifejacket must—

(i) Inflate automatically, float the subject to the surface, and stabilize the body with the mouth out of the water;

(ii) Maintain its intended position on the wearer;

(iii) Not be damaged; and

(iv) Not cause injury to the wearer.

(2) The jump test in paragraph (e)(1) of this section is repeated using a lifejacket which has been fully inflated manually.

(3) The jump test in paragraph (e)(2) of this section is then conducted with one chamber deflated. This test is then repeated as many times as necessary to test the lifejacket with a different

chamber deflated until each chamber has been tested in this manner.

NOTE: Before conducting these tests at the 4.5 m height, subjects should first do the test from heights of 1 m and 3 m to lessen the possibility of injury. It is suggested that subjects wear a long-sleeve cotton shirt to prevent abrasions when testing the device in the inflated condition and that the teeth should be tightly clenched together when jumping.

(f) *Water emergence*—(1) *Equipment*. A pool with a wooden platform at one side must be used for this test. The platform must be 300 mm (12 in.) above the water surface and must not float on the water. The platform must have a smooth painted surface. Alternatively, a Coast Guard approved inflatable liferaft may be used in lieu of a platform.

(2) *Qualifying*. Each test subject enters the water wearing only a bathing suit and swims 25 m. The subject must then be able to emerge from the pool onto the platform using only his or her hands on the top of the platform as an aid and without pushing off of the bottom of the pool. Any subject unable to emerge onto the platform within 30 seconds is disqualified for this test. If less than 2/3 of the test subjects qualify, substitute subjects must be used.

(3) *Test*. Each qualified subject dons an inflated lifejacket, enters the water and swims 25 m. Afterward, at least 2/3 of the qualified subjects must then be able to climb out of the pool in the manner prescribed in paragraph (f)(2) of this section within 45 seconds while wearing the lifejacket. If marking on the lifejacket so indicates, and if the wearer can read the marking while the lifejacket is being worn, the subjects may deflate the device during the 45 second attempt.

(g) *Lanyard pull test and strength*. (1) An uninflated lifejacket is placed on a rigid metal test form built according to Figure 160.176-13(n)(2) and suspended vertically.

(2) The inflation handle of each manual inflation mechanism is attached to a force indicator. The force indicator is then used to activate each manual inflation mechanism separately. The force required to activate each mechanism is recorded. In each test the force must be between 25 and 70 N (5 and 15 lb.).

(3) A weight of 225 N (50 lb.) is in turn attached to the inflation handle of each manual inflation mechanism. The weight is then allowed to hang freely for 5 minutes from each manual inflation mechanism. The handle must not separate from the mechanism.

(h) *Temperature cycling tests*. (1) Three uninflated lifejackets, 2 packed and 1 unpacked, are maintained at room temperature ($20 \pm 3^\circ\text{C}$ ($68 \pm 6^\circ\text{F}$)) for 4 hours and then at a temperature of $65 \pm 2^\circ\text{C}$ ($150 \pm 5^\circ\text{F}$) for 20 hours. The lifejackets are then maintained at room temperature for at least 4 hours, after which they are maintained at a temperature of $\text{minus } 30 \pm 2^\circ\text{C}$ ($-22 \pm 5^\circ\text{F}$) for 20 hours. This cycle is then repeated once.

(2) Upon the completion of the conditioning in paragraph (h)(1) of this section all sealed or non-reusable packaging is removed from the two packed units. The lifejackets must show no functional deterioration after being inflated immediately after removal from the conditioning. The lifejackets must be inflated as follows:

(i) One unit which was packed during conditioning must fully inflate within 2 minutes using only oral inflation.

(ii) The other unit which was packed during conditioning must fully inflate within 45 seconds of submersion in water at $2 \pm 2^\circ\text{C}$ ($37 \pm 5^\circ\text{F}$) as a result of automatic inflation.

(iii) The unit which was unpacked during conditioning must fully inflate within 30 seconds of activation of the manual inflation mechanisms.

(3) The same 3 lifejackets used for the test in paragraph (h)(1) of this section are deflated and, with 2 repacked and 1 unpacked, are maintained at room temperature for 4 hours and then at a temperature of $\text{minus } 30 \pm 2^\circ\text{C}$ ($-22 \pm 5^\circ\text{F}$) for 20 hours. The lifejackets are then stored at room temperature for at least 4 hours, after which they are maintained at a temperature of $65 \pm 2^\circ\text{C}$ ($150 \pm 5^\circ\text{F}$) for 20 hours. This cycle is then repeated once. The steps in paragraph (h)(2) of this section are then repeated, and the lifejackets must meet the criteria in that paragraph.

(i) [Reserved]

(j) *Buoyancy and inflation medium retention test*. A lifejacket which has been

used in the tests in paragraph (h) of this section must be used for this test.

(1) *Equipment.* The following equipment is required for this test:

(i) A wire mesh basket that is large enough to hold the inflated lifejacket without compressing it, is designed not to allow the lifejacket to float free, and is heavy enough to overcome the buoyancy of the lifejacket.

(ii) A scale that is sensitive to 14 g (0.5 oz.) and that has an error of less than ± 14 g (0.5 oz.).

(iii) A test tank, filled with fresh water, that is large enough to hold the basket with its top 50 mm (2 in.) below the surface without the basket touching the tank.

(2) *Method.* One inflation chamber is inflated using its automatic inflation mechanism. The lifejacket is placed in the basket. The basket is then suspended from the scale and submerged in the test tank with the lifejacket and basket completely below the water surface. An initial reading of the scale is taken after 30 minutes and again after 24 hours. The buoyancy of the lifejacket is the submerged weight of the basket minus the submerged weight of the basket with the lifejacket inside. This test is repeated as many times as necessary until each chamber has been tested. On each chamber that does not have an automatic inflation mechanism the manual or oral inflation mechanism may be used.

(3) *Requirement.* The buoyancy of each inflation chamber must be within the tolerances specified in the plans and specifications for the lifejacket required by § 160.176-5(a)(2) of this part. Each inflation chamber must retain at least 95% of its initial buoyancy after being submerged for 24 hours.

(k) *Uninflated floatation test.* A packed lifejacket, with all automatic inflation mechanisms disabled, is dropped from a height of 1 m (3 ft.) into fresh water. The lifejacket must remain floating on the surface of the water for at least 30 minutes. This test is repeated with an unpacked, uninflated lifejacket, with all automatic inflation mechanisms disabled.

(l) [Reserved]

(m) *Environmental tests—(1) Salt spray exposure.* An uninflated lifejacket is subjected to 720 hours of salt spray as

specified by ASTM B 117 (incorporated by reference, see § 160.176-4). The automatic inflation mechanism(s) must not be activated by the salt spray. The lifejacket is then inflated first using the automatic inflation mechanism(s) and then twice more using first the manual mechanisms and then the oral mechanisms. The lifejacket must show no functional deterioration.

(2) *Rain exposure.* An uninflated lifejacket is mounted on a rigid metal test form built according to Figure 160.176-13(n)(2). The test form must be vertical. Spray nozzles that deliver 0.05 mm of water per second (0.7 inch/hour) over the area of the lifejacket at a temperature between 2 and 16 °C (35 and 60 °F) and at a 45° angle below horizontal toward the lifejacket are mounted 1.5 m (4.5 ft.) above the base of the test form. There must be at least 4 nozzles evenly spaced around the lifejacket at a horizontal distance of 1 m from the center of the lifejacket and each nozzle must deliver water at the same rate. Water is then sprayed on the lifejacket for 1 hour. The lifejacket must not inflate during the test.

(n) *Tensile tests.* Two lifejackets that have been subjected to the tests in paragraph (h) of this section must be used for these tests.

(1) *Body tensile test.* (i) In this test one lifejacket must be fully inflated and the other deflated.

(ii) Two unconnected rigid cylinders are passed through the body portion of each lifejacket, or through the encircling body strap for yoke style devices, with one closure fastened and adjusted to its mid range, as shown in Figure 160.176-13(n)(1). Each cylinder must be 125 mm (5 inches) in diameter. The top cylinder is connected to a winch or pulley system. The bottom cylinder is connected to a test load which when combined with the weight of the lower cylinder and the linkage equals 325 kg (720 lb.). The winch or pulley system lifts the top cylinder so the test load is raised off of its support. The test load is left suspended for 30 minutes.

(iii) There must be no functional deterioration of any component of either lifejacket during the test. Each friction type closure must not permit slippage of more than 25 mm (1 in.).

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(iv) If a lifejacket has friction type closures, the test must be repeated immediately after the lifejacket has been immersed in water for a least 2 minutes.

(v) The test is repeated until each different type of closure is tested separately.

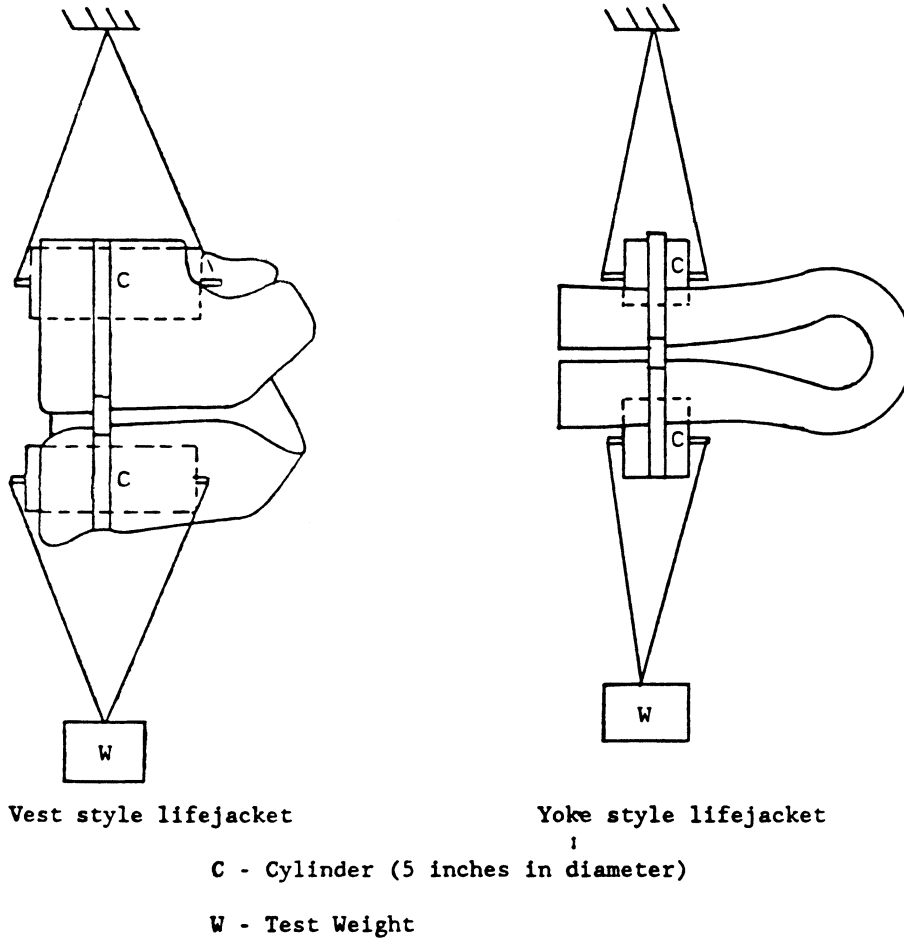


Figure 160.176-13(n)(1) Body Tensile Test Arrangement

(2) *Shoulder tensile test.* Each shoulder section of a lifejacket is subjected to this test separately. A fully inflated lifejacket, with all closures fastened, must be secured to a rigid metal test

form built according to Figure 160.176-13(n)(2). A $2 \pm \frac{1}{4}$ in. wide web is passed through the shoulder section of the lifejacket and is connected to a winch or pulley system. The bottom portion

of the form is connected to a dead weight load which when combined with the weight of the form and the linkage equals 90 kg. (200 lb.). The winch or pulley system is operated to raise the

weight off of its support. The weight is left suspended for 30 minutes. There must be no functional deterioration of any component of the lifejacket during the test.

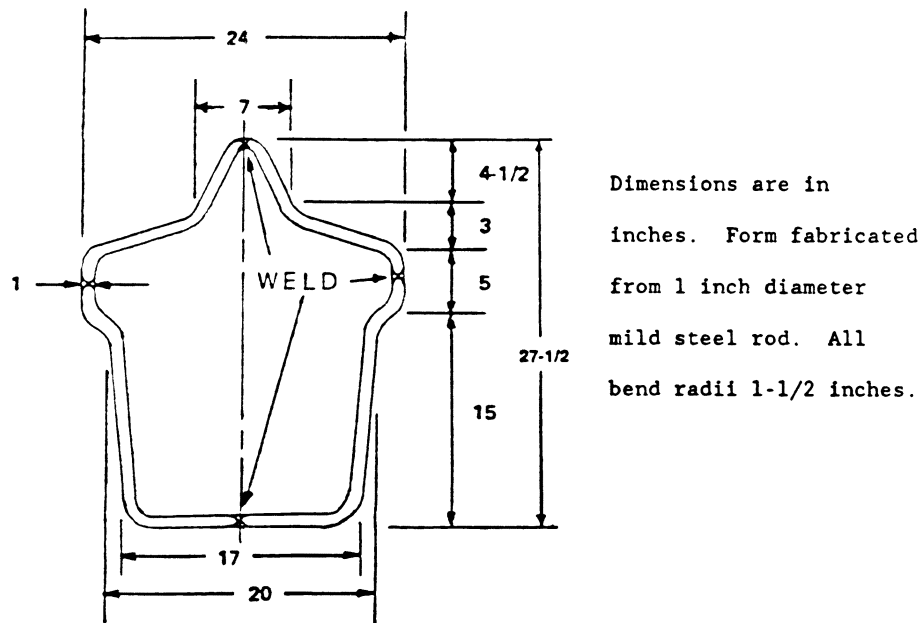


Figure 160.176-13(n)(2) Test Form

(3) *Strength of attachment of inflation mechanism.* (i) A fully inflated life-jacket is secured to a rigid metal test form as in Figure 160.176-13(n)(2), and the pressure of each inflated chamber is measured. The top portion of the form is then connected to a winch or pulley system. A 35 kg (75 lb.) weight is attached by a line to one of the inflation mechanisms as close as possible to the point of attachment on the life-jacket. The winch or pulley system is operated to raise the weight off of its support. The weight is left suspended for 5 minutes and then released. The inflation chamber to which the inflation mechanism is attached must not lose more than 3 kPa (0.4 psig) or 20% of its original pressure.

(ii) The test is paragraph (n)(3)(i) of this section is repeated until each type of inflation mechanism has been tested separately.

(iii) The test is then repeated as many additional times as necessary to test each joint in each type of inflation mechanism beyond its point of attachment to an inflation chamber. In each test the point of attachment must be as close as possible to the joint being tested.

(o) [Reserved]

(p) *Impact test.* (1) an uninflated life-jacket is secured to the test form shown in Figure 160.176-13(n)(2). The lifejacket, with the automatic inflation mechanism disabled, is secured to the form as it is intended to be worn. The lifejacket is accelerated to 25 m/s

(50 mph) horizontally and is then dropped from a height of not more than 0.5 m (1.5 ft.) into the water in the following positions:

- (i) Face down, shoulder forward.
- (ii) Face down, shoulder back.
- (iii) Back down, shoulder forward.
- (iv) Back down, shoulder back.
- (v) Left side down, shoulder forward.
- (vi) Right side down, shoulder back.

(2) Following each impact, there must be no sign of functional deterioration, and the lifejacket must not come off of the test form. After each impact the closures may be readjusted as necessary.

(3) Following the six impacts, the lifejacket must fully inflate using only its oral inflation mechanisms.

(4) The test in this paragraph is repeated on the same lifejacket after inflating, with manual inflation mechanisms, all chambers that have those mechanism.

(q) *Flame exposure test.* A lifejacket that has been subjected to the tests in paragraph (h) of this section must be used for this test.

(1) *Equipment.* The following equipment is required for this test:

(i) A test pan 300 mm by 450 mm by 60 mm (12 in. by 18 in. by 2½ in.) containing 12 mm (½ in.) of water under 25 mm (1 in.) of N-heptane.

(ii) an arrangement to hold the lifejacket over the N-heptane.

(2) *Method.* The test is only conducted when there is no significant air movement other than that caused by the fire. The N-heptane is ignited and allowed to burn for 30 seconds. A lifejacket which has been fully inflated with air is then passed through the flames in an upright, forward, vertical, free-hanging position with the bottom of the lifejacket 240 mm C 9½ in.) above the top edge of the test pan. The lifejacket is exposed to the flames for 2 seconds.

(3) *Requirement.* The lifejacket must not burn or melt for more than 6 seconds after being removed from the flames. The lifejacket must remain inflated throughout the test. If the lifejacket sustains any visible damage other than discoloration after being exposed to the flames, the lifejacket must—

(i) pass the test in paragraph (e)(2) of this section, except that only one subject is used and the test is done six times; and

(ii) pass the tensile test in paragraph (n)(1) of this section, except that a weight of 245 kg (540 lb.) is used in lieu of the 325 kg (720 lb.) weight.

(r) *Solvent exposure test.* Lifejackets with their automatic inflation mechanisms disabled must be used for this test. Two uninflated lifejackets that have been subjected to the tests in paragraph (h) of this section are totally submerged in diesel fuel, grade No. 2-D as defined in ASTM D 975 (incorporated by reference, see § 160.176-4), for 24 hours. The lifejackets are then removed and the excess fuel removed. One lifejacket must fully inflate using only its manual inflation mechanisms and the other using only its oral inflation mechanisms. The lifejackets must show no functional deterioration as a result of the test.

(s) *Puncture test.* A fully inflated lifejacket is placed on a flat, level surface. A test point 4 mm (5/32 in.) in diameter tapering to a rounded point, 1 mm (3/64 in.) in diameter, is pressed against an inflation chamber of the lifejacket perpendicular to the surface of the chamber at a rate of 300 mm/minute (12 in./minute). The test point is applied until the inflation chamber is punctured or the chamber walls are touching each other. The force required to puncture the inflation chamber or make the chamber walls touch each other is recorded. The force required must exceed 30 N (7 lb.).

(t) *Inflation chamber tests—*(1) *Over-pressure test.* One lifejacket is used in this test. Before pressurizing the lifejacket, each over-pressure valve, if any, must be blocked. One inflation chamber is then pressurized with air to 70 kPa (10 psig) and held for 5 minutes. After the 5 minute period, there must be no sign of permanent deformation, damage, or pressure loss of more than 3.5 kPa (0.5 psig). This test is then repeated as many times as necessary to test a different chamber until each chamber has been tested in this manner.

(2) *Air retention test.* One inflation chamber of a lifejacket is filled with air until air escapes from the over-

pressure valve or, if the lifejacket does not have an over-pressure valve, until its design pressure, as stated in the plans and specifications, is reached. After 12 hours the lifejacket must still be firm with an internal pressure of at least 14 kPa (2.0 psig). This test is then repeated as many times as necessary to test a different chamber until each chamber has been tested in this manner.

(u) *Seam strength test.* Samples of each type of structural sewn seam must be subjected to and pass the “Seam Strength (Sewability) Test” specified in Underwriters Laboratories Standard UL 1191 except that the breaking strength of each seam in the directions of both greater and lesser thread count must be at least 400 N (90 lb.).

(v) [Reserved]

(w) *Visual examination.* One complete lifejacket must be visually examined for compliance with the requirements of §§ 160.176–9 and 160.176–11 of this part

(x) [Reserved]

(y) *Inflation chamber properties.* The tests in this paragraph must be run after successful completion of all other approval tests. The results of these tests will be used to check the quality of incoming lifejacket components and the production process. Test samples must come from one or more lifejackets that were each used in all of the tests in paragraphs (e), (j), (p), (s), and (t) of this section.

(1) *Grab breaking strength.* The grab breaking strength of chamber materials must be determined according to Method No. 5100 of Federal Test Method Standard 191A or ASTM D 751 (incorporated by reference, see § 160.176–4).

(2) *Tear strength.* The tear strength of chamber materials must be determined according to Method No. 5132 or 5134 of Federal Test Method Standard 191A or ASTM D 751 (incorporated by reference, see § 160.176–4).

(3) *Permeability.* The permeability of chamber materials must be determined according to ASTM D 1434 (incorporated by reference, see § 160.176–4) using CO₂ as the test gas.

(4) *Seam strength.* The seam strength of the seams in each inflation chamber of at least one lifejacket must be determined according to ASTM D 751 (incor-

porated by reference, see § 160.176–4) except that 25 by 200 mm (1 by 8 in.) samples may be used where insufficient length of straight seam is available.

(z) *Additional tests.* The Commandant may prescribe additional tests, if necessary, to approve novel or unique designs.

[CGD 78–1746, 54 FR 50320, Dec. 5, 1989, as amended by CGD 78–174b, 56 FR 29441, June 27, 1991; USCG–2000–7790, 65 FR 58464, Sept. 29, 2000]

§ 160.176–15 Production tests and inspections.

(a) *General.* (1) Production tests and inspections must be conducted in accordance with this section and subpart 159.007 of this chapter.

(2) The Commandant may prescribe additional production tests and inspections if needed to maintain quality control and check for compliance with the requirements in this subpart.

(b) *Test and inspection responsibilities.* In addition to responsibilities set out in part 159 of this chapter, each manufacturer of an inflatable lifejacket and each independent laboratory inspector must comply with the following, as applicable:

(1) *Manufacturer.* Each manufacturer must—

(i) Perform all required tests and examinations on each lifejacket lot before the independent laboratory inspector tests and inspects the lot;

(ii) Perform required testing of each incoming lot of inflation chamber material before using that lot in production;

(iii) Have procedures for maintaining quality control of the materials used, manufacturing operations, and the finished product;

(iv) Have a continuing program of employee training and a program for maintaining production and test equipment;

(v) Have an inspector from the independent laboratory observe the production methods used in producing the first lifejacket lot produced and observe any revisions made thereafter in production methods;

(vi) Admit the inspector and any Coast Guard representative to any place in the factory where work is done on lifejackets or component materials,

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and where completed lifejackets are stored; and

(vii) Allow the inspector and any Coast Guard representative to take samples of completed lifejackets or of components materials for tests prescribed in this subpart.

(2) *Independent laboratory.* (i) An inspector may not perform or supervise any production test or inspection unless—

(A) The manufacturer has a current approval certificate; and

(B) The inspector has first observed the manufacturer's production methods and any revisions to those methods.

(ii) An inspector must perform or supervise all required tests and inspections of each lifejacket lot produced.

(iii) During each inspection, the inspector must check for noncompliance with the manufacturer's quality control procedures.

(iv) At least once each calendar quarter, the inspector must, as a check on manufacturer compliance with this section, examine the manufacturer's records required by §160.176-17 of this part and observe the manufacturer in performing each of the tests required by paragraph (h) of this section.

(c) *Lifejacket lots.* A lot number must be assigned to each group of lifejackets

produced. No lot may exceed 1000 lifejackets. A new lot must be started whenever any change in materials or a revision to a production method is made, and whenever any substantial discontinuity in the production process occurs. Changes in lots of component materials must be treated as changes in materials. Lots must be numbered serially. The lot number assigned, along with the approval number, must enable the lifejacket manufacturer, by referring to the records required by this subpart, to determine who produced the components used in the lifejacket.

(d) *Samples.* (1) Samples used in testing and inspections must be selected at random. Sampling must be done only when all lifejackets or materials in the lot are available for selection.

(2) Each sample lifejacket selected must be complete, unless otherwise specified in paragraph (h) of this section.

(3) The inspector may not select the same samples tested by the manufacturer.

(4) The number of samples selected per lot must be at least the applicable number listed in Table 160.176-15A or Table 160.176-15B.

TABLE 160.176-15A—MANUFACTURER'S SAMPLING PLAN

	Number of Samples Per Lot					
	Lot Size					
	1-100	101-200	201-300	301-500	501-750	751-1000
Tests:						
Inflation Chamber Materials.						
	SEE NOTE (1)					
Seam Strength	1	1	2	2	3	4
Over-pressure ^{2,3}	1	2	3	4	6	8
Air Retention.						
	EVERY DEVICE IN THE LOT					
Buoyancy & Inflation Media Retention	1	2	3	4	6	8
Tensile Strength ⁴	1	1	1	1	1	1
Detailed Product Examination	2	2	3	4	6	8
Retest Sample Size ²	—	—	13	13	20	20
Final Lot Inspection:.						
	EVERY DEVICE IN THE LOT					

¹ Samples must be selected from each lot of incoming material. The tests referenced in §§ 160.176-13(y)(1) through 160.176-13(y)(4) of this part prescribe the number of samples to select.

² Samples selected for this test may not be the same samples selected for other tests.

³ If any sample fails the over-pressure test, the number of samples to be tested in the next lot produced must be at least 2% of the total number of lifejackets in the lot or 10 lifejackets, whichever is greater.

⁴ This test is required only when a new lot of materials is used and when a revised production process is used. However, the test must be run at least once every calendar quarter regardless of whether a new lot of materials or a revised process is started in that quarter.

TABLE 160.176–15B—INSPECTOR'S SAMPLING PLAN

	Number of samples per lot					
	Lot size					
	1–100	101–200	201–300	301–500	501–750	751–1000
Tests:						
Over-pressure ¹	1	2	3	4	6	8
Air Retention	1	2	3	4	6	8
Buoyancy & Inflation Media Retention	1	2	3	4	6	8
Tensile Strength ²	1	1	1	1	1	1
Waterproof marking.						
	SEE NOTE (3) FOR SAMPLING					
Detailed Product Examination	2	2	2	3	3	3
Retest Sample Size ¹	10	10	13	13	20	20
Final Lot Inspection:	20	32	50	60	70	80

¹ Samples selected for this test may not be the same lifejackets selected for other tests.

² This test may be omitted if the manufacturer has previously conducted it on the lot and the inspector has conducted the test on a previous lot during the same calendar quarter.

³ One sample of each means of marking on each type of fabric or finish used in lifejacket construction must be tested. This test is only required when a new lot of materials is used. However, the test must be run at least once every calendar quarter regardless of whether a new lot of materials is started in that quarter.

(e) *Accept/reject criteria: manufacturer testing.* (1) A lifejacket lot passes production testing if each sample passes each test.

(2) In lots of 200 or fewer lifejackets, the lot must be rejected if any sample fails one or more tests.

(3) In lots of more than 200 lifejackets, the lot must be rejected if—

(i) One sample fails more than one test;

(ii) More than one sample fails any test or combination of tests; or

(iii) One sample fails one test and in redoing that test with the number of samples specified for retesting in Table 160.176–15A, one or more samples fail the test.

(4) A rejected lifejacket lot may be retested only if allowed under paragraph (k) of this section.

(5) In testing inflation chamber materials, a lot is accepted only if the average of the results of testing the minimum number of samples prescribed in the reference tests in §160.176–13(y) of this part is within the tolerances specified in §160.176–8(c)(1) of this part. A rejected lot may not be used in production.

(f) *Accept/reject criteria: independent laboratory testing.* (1) A lot passes production testing if each sample passes each test.

(2) A lot must be rejected if—

(i) One sample fails more than one test;

(ii) More than one sample fails any test or combination of tests; or

(iii) One sample fails one test and in redoing that test with the number of samples specified for retesting in Table 160.176–15B, one or more samples fail the test.

(3) A rejected lot may be retested only if allowed under paragraph (k) of this section.

(g) *Facilities and equipment*—(1) *General.* The manufacturer must provide the test equipment and facilities described in this section for performing production tests, examinations, and inspections.

(2) *Calibration.* The manufacturer must have the calibration of all test equipment checked at least every six months by a weights and measures agency or the equipment manufacturer, distributor, or dealer.

(3) *Equipment.* The following equipment is required:

(i) *A sample basket* for buoyancy tests. It must be made of wire mesh and be of sufficient size and durability to securely hold a completely inflated lifejacket under water without compressing it. The basket must be heavy enough or be sufficiently weighted to submerge when holding an inflated test sample.

(ii) *A tank filled with fresh water* for buoyancy tests. The height of the tank must be sufficient to allow a water depth of 5 cm (2 inches) minimum between the top of the basket and water surface when the basket is not touching the bottom. The length and width

of the tank must be sufficient to prevent each submerged basket from contacting another basket or the tank sides and bottom. Means for locking or sealing the tank must be provided to prevent disturbance of any samples or a change in water level during testing.

(iii) *A scale* that has sufficient capacity to weigh a submerged basket for buoyancy tests. The scale must be sensitive to 14 g (0.5 oz.) and must not have an error exceeding ± 14 g (0.5 oz.).

(iv) *Tensile test equipment* that is suitable for applying pulling force in conducting body strap assembly strength subtests. The equipment assembly may be (A) a known weight and winch, (B) a scale, winch, and fixed anchor, or (C) a tensile test machine that is capable of holding a given tension. The assembly must provide accuracy to maintain a pulling force within ± 2 percent of specified force. Additionally, if the closed loop test method in § 160.176-13(h)(1) of this Part is used, two cylinders of the type described in that method must be provided.

(v) *A thermometer* that is sensitive to 0.5 °C (1 °F) and does not have an error exceeding ± 0.25 °C (0.5 °F).

(vi) *A barometer* that is capable of reading mm (inches) of mercury with a sensitivity of 1 mm (0.05 in.) Hg and an error not exceeding ± 5 mm (0.02 in.) Hg.

(vii) *A regulated air supply* that is capable of supplying the air necessary to conduct the tests specified in paragraphs (h)(4) and (h)(5) of this section.

(viii) *A pressure gauge* that is capable of measuring air pressure with a sensitivity of 1 kPa (0.1 psig) and an error not exceeding ± 0.5 kPa (0.05 psig).

(ix) *A torque wrench* if any screw fasteners are used. The wrench must be sensitive to, and have an error of less than, one half the specified tolerance for the torque values of the fasteners.

(4) *Facilities*: The manufacturer must provide a suitable place and the necessary apparatus for the inspector to use in conducting or supervising tests. For the final lot inspection, the manufacturer must provide a suitable working environment and a smooth-top table for the inspector's use.

(h) *Production tests and examinations—*
(1) *General*. (i) Samples used in testing must be selected according to paragraph (d) of this section.

(ii) On each sample selected—

(A) The manufacturer must conduct the tests in paragraphs (h)(2) through (h)(8) of this section; and

(B) The independent laboratory inspector must conduct or supervise the tests in paragraphs (h)(4) through (h)(9) of this section.

(iii) Each individual test result must, in addition to meeting the requirements in this paragraph, meet the requirements, if any, set out in the approved plans and specifications required by § 160.176-5(a)(2) of this part.

(2) *Inflation chamber materials*. Each sample must be tested according to §§ 160.176-13(y)(1) through 160.176-13(y)(3) of this part. The average and individual results of testing the minimum number of samples prescribed by § 160.176-13(y) of this part must comply with the requirements in § 160.176-8(c)(1) of this part.

(3) *Seam strength*. The seams in each inflation chamber of each sample must be tested according to § 160.176-13(y)(4) of this part. The results for each inflation chamber must be at least 90% of the results obtained in approval testing.

(4) *Over-pressure*. Each sample must be tested according to and meet § 160.176-13(t)(1) of this part.

(5) *Air retention*. Each sample must be tested according to and meet § 160.176-13(t)(2) of this part.

(6) *Buoyancy and inflation medium retention*. Each sample must be tested according to and meet § 160.176-13(j) of this part. Each buoyancy value must fall within the tolerances specified in the approved plans and specifications.

(7) *Tensile strength*. Each sample must be tested according to and meet § 160.176-13(n) of this part.

(8) *Detailed product examination*. Each sample lifejacket must be disassembled to the extent necessary to determine compliance with the following:

(i) All dimensions and seam allowances must be within tolerances prescribed in the approved plans and specifications required by § 160.176-5(a)(2) of this part.

(ii) The torque of each screw type mechanical fastener must be within its tolerance as prescribed in the approved plans and specifications.

(iii) The arrangement, markings, and workmanship must be as specified in the approved plans and specifications and this subpart.

(iv) The lifejacket must not otherwise be defective.

(9) *Waterproof marking test.* Each sample is completely submerged in fresh water for a minimum of 30 minutes, and then removed and immediately placed on a hard surface. The markings are vigorously rubbed with the fingers for 15 seconds. If the printing becomes illegible, the sample is rejected.

(i) [Reserved]

(j) *Final lot examination and inspection*—(1) *General.* On each lifejacket lot that passes production testing, the manufacturer must perform a final lot examination and an independent laboratory inspector must perform a final lot inspection. Samples must be selected according to paragraph (d) of this section. Each final lot examination and inspection must show—

(i) First quality workmanship;

(ii) That the general arrangement and attachment of all components such as body straps, closures, inflation mechanisms, tie tapes, drawstrings, etc. are as specified in the approved plans and specifications; and

(iii) Compliance with the marking requirements in § 160.176-23 of this Part.

(2) *Accept/reject criteria.* Each nonconforming lifejacket must be rejected. If three or more nonconforming lifejackets are rejected for the same kind of defect, lot examination or inspection must be discontinued and the lot rejected.

(3) *Manufacturer examination.* This examination must be done by a manufacturer's representative who is familiar with the approved plans and specifications required by § 160.176-5(a)(2) of this part, the functioning of the lifejacket and its components, and the production testing procedures. This person must not be responsible for meeting production schedules or be supervised by someone who is. This person must prepare and sign the record required by § 159.007-13(a) of this chapter and § 160.176-17(b) of this part.

(4) *Independent laboratory inspection.*

(i) The inspector must discontinue lot inspection and reject the lot if observation of the records for the lot or of in-

dividual lifejackets shows noncompliance with this section or the manufacturer's quality control procedures.

(ii) An inspector may not perform a final lot inspection unless the manufacturer has a current approval certificate.

(iii) If the inspector rejects a lot, the Commandant must be advised immediately.

(iv) The inspector must prepare and sign the inspection record required by § 159.007-13(a) of this chapter and § 160.176-17(b) of this part. If the lot passes, the record must also include the inspector's certification to that effect and a certification that no evidence of noncompliance with this section was observed.

(v) If the lot passes, each lifejacket in the lot must be plainly marked with the words, "Inspected and Passed, (Date), (Inspection Laboratory ID)." This marking must be done in the presence of the inspector. The marking must be permanent and waterproof. The stamp which contains the marking must be kept in the independent laboratory's custody at all times.

(k) *Disposition of rejected lifejacket lot or lifejacket.* (1) A rejected lifejacket lot may be resubmitted for testing, examination or inspection if the manufacturer first removes and destroys each defective lifejacket or, if authorized by the Commandant, reworks the lot to correct the defect.

(2) Any lifejacket rejected in a final lot examination or inspection may be resubmitted for examination or inspection if all defects have been corrected and reexamination or reinspection is authorized by the Commandant.

(3) A rejected lot or rejected lifejacket may not be sold or offered for sale under representation that it meets this subpart or that it is Coast Guard approved.

[CGD 78-1746, 54 FR 50320, Dec. 5, 1989, as amended by CGD 78-174b, 56 FR 29442, June 27, 1991]

§ 160.176-17 Manufacturer records.

(a) Each manufacturer of inflatable lifejackets must keep the records required by § 159.007-13 of this chapter except that they must be retained for at least 120 months after the month in

which the inspection or test was conducted.

(b) Each record required by § 159.007-13 of this chapter must also include the following information:

(1) For each test, the serial number of the test instrument used if there is more than one available.

(2) For each test and inspection, the identification of the samples used, the lot number, the approval number, and the number of lifejackets in the lot.

(3) For each lot rejected, the cause for rejection, any corrective action taken, and the final disposition of the lot.

(c) The description or photographs of procedures and apparatus used in testing is not required for the records prescribed in § 159.007-13 of this chapter as long as the manufacturer's procedures and apparatus meet the requirements of this subpart.

(d) Each manufacturer of inflatable lifejackets must also keep the following records:

(1) Records for all materials used in production including the following:

- (i) Name and address of the supplier.
- (ii) Date of purchase and receipt.
- (iii) Lot number.

(iv) Certification meeting § 160.176-8(a)(3) of this part.

(2) A copy of this subpart.

(3) Each document incorporated by reference in § 160.176-4 of this part.

(4) A copy of the approved plans and specifications required by § 160.176-5(a)(2) of this part.

(5) The approval certificate.

(6) Calibration of test equipment, including the identity of the agency performing the calibration, date of calibration, and results.

(7) A listing of current and formerly approved servicing facilities.

(e) The records required by paragraph (d)(1) of this section must be kept for at least 120 months after preparation. All other records required by paragraph (d) of this section must be kept for at least 60 months after the life-jacket approval expires or is terminated.

§ 160.176-19 Servicing.

(a) *General.* This section contains requirements for servicing facilities, manuals, training, guidelines, and

records. Other regulations in this chapter require inflatable lifejackets to be serviced at approved facilities at 12 month intervals.

(1) Each manufacturer of an approved inflatable lifejacket must provide one or more Coast Guard approved facilities for servicing those lifejackets. The manufacturer must notify the Commandant whenever an approved facility under its organization no longer provides servicing of a lifejacket make and model listed in the guidelines required by paragraph (d) of this section.

(2) Each manufacturer of an approved inflatable lifejacket must make replacement parts available to Coast Guard approved independent servicing facilities.

(b) *Servicing facilities.* Each Coast Guard approved servicing facility must meet the requirements of this paragraph and paragraph (d) of this section in order to receive and keep its approval for each make and model of life-jacket. Approval is obtained according to § 160.176-5(c) of this part.

(1) Each servicing facility must conduct lifejacket servicing according to its servicing guidelines and follow the procedures in the service manual required by this section.

(2) Each servicing facility must have a suitable site for servicing which must be clean, well lit, free from excessive dust, drafts, and strong sunlight, and have appropriate temperature and humidity control as specified in the service manual.

(3) Each servicing facility must have the appropriate service, repair, and test equipment and spare parts for performing required tests and repairs.

(4) Each servicing facility must have a current manufacturer's service manual for each make and model of life-jacket serviced.

(5) A servicing facility may have more than one servicing site provided that each site meets the requirements of paragraph (b)(2) of this section.

(6) Each servicing facility must be inspected at intervals not exceeding six months by an accepted independent laboratory, and a report of the inspections must be submitted to the Commandant at least annually. The report must contain enough information to show compliance with paragraphs (b)

(1) through (4) of this section and paragraph (d) of this section. Where a facility uses more than one site the report must show compliance at each site at least biennially.

(c) *Service manual.* (1) Each manufacturer of an approved inflatable lifejacket must prepare a service manual for the lifejacket. The service manual must be approved by the Commandant according to § 160.176-5(b) of this part.

(2) The manufacturer must make the service manual, service manual revisions, and service bulletins available to each approved servicing facility.

(3) Each service manual must contain the following:

(i) Detailed procedures for inspecting, servicing, and repackaging the lifejacket.

(ii) A list of approved replacement parts and materials to be used for servicing and repairs, if any.

(iii) A requirement to mark the date and servicing facility name on each lifejacket serviced.

(iv) Frequency of servicing.

(v) Any specific restrictions or special procedures prescribed by the Coast Guard or manufacturer.

(4) Each service manual revision and service bulletin which authorizes the modification of a lifejacket, or which affects a requirement under this subpart, must be approved by the Commandant. Other revisions and service bulletins are not required to be approved, but a copy of each must be sent to the Commandant when it is issued. At least once each year, the manufacturer must provide to the Commandant and to each servicing facility approved to service its lifejackets a bulletin listing each service manual revision and bulletin in effect.

(d) *Servicing facilities guidelines.* Each servicing facility must have written guidelines that include the following:

(1) Identification of each make and model of lifejacket which may be serviced by the facility as well as the manual and revision to be used for servicing.

(2) Identification of the person, by title or position, who is responsible for the servicing program.

(3) Training and qualifications of servicing technicians.

(4) Provisions for the facility to retain a copy of its current letter of approval from the Coast Guard at each site.

(5) Requirements to—

(i) Ensure each inflatable lifejacket serviced under its Coast Guard approval is serviced in accordance with the manufacturer's service manual;

(ii) Keep servicing technicians informed of each approved servicing manual revision and bulletin and ensure servicing technicians understand each change and new technique related to the lifejackets serviced by the facility;

(iii) Calibrate each pressure gauge, weighing scale, and mechanically-operated barometer at intervals of not more than one year;

(iv) Ensure each inflatable lifejacket serviced under the facility's Coast Guard approval is serviced by or under the supervision of a servicing technician who meets the requirements of item (3) of this paragraph;

(v) Specify each make and model of lifejacket it is approved to service when it represents itself as approved by the U.S. Coast Guard; and

(vi) Not service any lifejacket for a U.S. registered commercial vessel, unless it is approved by the U.S. Coast Guard to service the make and model of lifejacket.

(e) *Servicing records.* Each servicing facility must maintain records of all completed servicing. These records must be retained for at least 5 years after they are made, be made available to any Coast Guard representative and independent laboratory inspector upon request, and include at least the following:

(1) Date of servicing, number of lifejackets serviced, lot identification, approval number, and test results data for the lifejackets serviced.

(2) Identification of the person conducting the servicing.

(3) Identity of the vessel receiving the serviced lifejackets.

(4) Date of return to the vessel.

§ 160.176-21 User manuals.

(a) The manufacturer must develop a user's manual for each model of inflatable lifejacket. The content of the manual must be provided for approval

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according to §§160.176-5(a)(3)(v) and 160.176-5(b) of this part.

(b) A user's manual must be provided with each lifejacket except that only five manuals need be provided to a single user vessel if more than five lifejackets are carried on board.

(c) Each user's manual must contain in detail the following:

(1) Instructions on use of the lifejacket and replacement of expendable parts.

(2) Procedures for examining serviceability of lifejackets and the frequency of examination.

(3) Pages for logging on board examinations.

(4) Frequency of required servicing at approved servicing facilities.

(5) Instructions, if any, on proper stowage.

(6) Procedures for getting the lifejackets repaired by a servicing facility or the manufacturer.

(7) Procedures for making emergency repairs on board.

(8) Any specific restrictions or special instructions.

§ 160.176-23 Marking.

(a) *General.* Each inflatable lifejacket must be marked with the information required by this section. Each marking must be waterproof, clear, and permanent. Except as provided elsewhere in this subpart, each marking must be readable from a distance of three feet.

(b) *Prominence.* Each marking required in paragraph (d) of this section, except vital care and use instructions, if any, must be less prominent and in smaller print than markings required in paragraph (c) of this section. Each optional marking must be significantly less prominent and smaller than required markings. The marking "ADULT" must be in at least 18 mm ($\frac{3}{4}$ inch) high bold capital lettering. If a lifejacket is stored in a package, the package must also have the marking "ADULT" or this marking must be easily visible through the package.

(c) *Text.* Each inflatable lifejacket must be marked with the following text in the exact order shown:

ADULT—For a person weighing more than 90 pounds.

Type V PFD—Approved for use on (*see paragraph (e) of this section for exact text to be*

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used here) in lieu of (*see paragraph (f) of this section for exact text to be used here*).

This lifejacket must be serviced, stowed, and used in accordance with (*insert description of service manual and user's manual*).

When fully inflated this lifejacket provides a minimum buoyant force of (*insert the design buoyancy in lb.*).

(d) *Other Information.* Each lifejacket must also be marked with the following information below the text required by paragraph (c) of this section:

(1) U.S. Coast Guard Approval No. (*insert assigned approval number*).

(2) Manufacturer's or private labeler's name and address.

(3) Lot Number.

(4) Date, or year and calendar quarter, of manufacture.

(5) Necessary vital care or use instructions, if any, such as the following:

(i) Warning against dry cleaning.

(ii) Size and type of inflation medium cartridges required.

(iii) Specific donning instructions.

(e) *Approved applications.* The text to be inserted in paragraph (c) of this section as the approved use will be one or more of the following as identified by the Commandant on the approval certificate issued according to §159.005-13(a)(2) of this chapter:

(1) The name of the vessel.

(2) The type of vessel.

(3) Specific purpose or limitation approved by the Coast Guard.

(f) *Type equivalence.* The exact text to be inserted in paragraph (c) of this section as the approved performance type will be one of the following as identified by the Commandant on the approval certificate:

(1) Type I PFD.

(2) Type V PFD—(*insert exact text of additional description noted on the approval certificate*).

[CGD 78-1746, 54 FR 50320, Dec. 5, 1989, as amended by CGD 78-174b, 56 FR 29442, June 27, 1991]

PART 161—ELECTRICAL EQUIPMENT

Subpart 161.001 [Reserved]

Subpart 161.002—Fire-Protective Systems

Sec.

161.002-1 Incorporation by reference.

161.002-2 Types of fire-protective systems.