procedures in the following tests and meet the requirements in these tests:

(1) *Jump test*, UL 1517, section S6 for Adult size. Youth and Small Child sizes are exempt from this test.

(2) *In-water removal*, UL 1517, section S9 for Adult and Youth sizes. The Small Child size is exempt from this test.

(3) *Buoyancy and inflation medium retention test*, UL 1517, Section S10, except the minimum buoyancies must be as specified in the Table 160.077–17(b)(11):

(4) *Flotation stability*.

(i) *Uninflated flotation stability*, UL 1517, section S7, except that for Type I devices the requirements of paragraph S7.1.A apply to all subjects regardless of their in-water weight. For Type V adult-size devices the requirements of paragraph S7.1.A apply to all adult subjects having an in-water weight of 13 lb or less, and the requirements of paragraph S7.1.B apply to all other adult subjects.

NOTE: —If the freeboard of a test subject is close to zero, caution must be taken to prevent the subject from inhaling water. The subject may use lightweight breathing aids to avoid inhaling water.

(ii) *Righting action test*, 46 CFR 160.176–13(d)(2) through (d)(5) for Type I hybrid PFDs. UL 1517, Section S8, for Type V hybrid PFDs.

(5) *Flotation stability—youths and small children*.

(i) *Uninflated flotation stability*, UL 1517, section S7, except that the requirements of paragraph S7.1.A apply to all subjects regardless of their in-water weight.

(ii) *Righting action test*, UL 1517, Section 15.3 through 15.13, for Youth and Small Child hybrid PFDs except comparisons are to be made to the appropriate size and type reference vest as defined in §160.077–2(j).

(d) *Flotation Stability Criteria*. At the end of the righting action test—

(1) At least 75% of the PFD's retroreflective material on the outside of the PFD, and the PFD light, must be above the water when the subject is floating in the stable flotation attitude; and

(2) The subject when floating in the stable flotation position and looking to the side, must be able to see—

(i) The water no more than 3 m (10 ft.) away; or

(ii) A mark on a vertical scale no higher than the lowest mark which can be viewed when floating in the same position in the reference vest defined in §160.077–3(j).

(3) Each adult test subject must have a freeboard of at least:

(i) 100 mm (4 inches) if the PFD being tested is to be approved as a Type I hybrid PFD; or

(ii) 120 mm (4.75 inches) if the PFD being tested is to be approved as a SOLAS lifejacket.

(e) *Visual Examination*. One complete PFD must be visually examined for compliance with the requirements of §160.077–15 and §160.077–17.

(f) *Inflation Chamber Properties*. If the tests in paragraphs (b) and (c) of this section are completed successfully, the tests in §160.077–19(d) must be run.

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

[CGD 78–174, 50 FR 33928, Aug. 22, 1985, as amended by CGD 78–174, 60 FR 2488, Jan. 9, 1995; 60 FR 7131, Feb. 7, 1995; CGD 95–072, 60 FR 50466, Sept. 29, 1995]

§160.077–23 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 of this subpart.

(b) *Test and Inspection Responsibilities*. In addition to responsibilities set out in part 159 of this chapter, each manufacturer of a hybrid PFD 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 PFD lot before the independent laboratory inspector tests and inspects the lot, except as provided in §160.077–23(d)(5);

(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 PFD 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 hybrid PFD's or component materials, and where completed PFD's are stored; and

(vii) Allow the inspector and any Coast Guard representative to take samples of completed PFD's or of component 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) Except as specified in paragraph (b)(2)(v) of this section, an inspector must perform or supervise testing and inspection of at least one PFD lot in each five lots produced.

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

(iv) Except as specified in paragraph (b)(2)(v) of this section, at least once each calendar quarter, the inspector must, as a check on the manufacturer's compliance with this section, examine the manufacturer's records required by §160.077–25 and observe the manufacturer perform each of the tests required by paragraph (h) of this section.

(v) If less than six lots are produced during any calendar year, only one lot inspection in accordance with paragraph (b)(2)(ii) of this section, and one records examination and test performance observation in accordance with paragraph (b)(2)(iv) of this section is required during that year. Each lot tested and inspected must be within seven lots of the previous lot inspected.

(c) *PFD Lots.* A lot number must be assigned to each group of PFD's produced. No lot may exceed 1000 PFD's. A new lot must be started whenever any change in materials or a production method is made, or 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 PFD manufacturer, by referring to the records required by this subpart, to determine who produced the components used in the PFD.

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

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

(3) Each adult test subject must have a freeboard of at least:

(i) 100 mm (4 inches) if the PFD being tested is to be approved as a Type I hybrid PFD; or

(ii) 120 mm (4.75 inches) if the PFD being tested is to be approved as a SOLAS lifejacket.

(4) The number of samples selected per lot must be at least the number listed in Table 160.077–23A or Table 160.077–23B, as applicable, except as allowed in paragraph (d)(5) of this section.

(5) If the total production for any five consecutive lots does not exceed 250 devices, the manufacturer's and inspector's tests can be run on the same sample(s) at the same time.

TABLE 160.077–23A—MANUFACTURER'S SAMPLING

	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 and 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 examination.						
Every device in the lot						

NOTES TO TABLE:
(1) Samples must be selected from each lot of incoming material. The tests referenced in §160.077–19(d)(2) through §160.077–19(d)(4) 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 this test, the number of samples to be tested in the next lot produced must be at least 2% of the total number of PFD's in the lot or 10 PFD's, 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 revised process is started in that quarter.

TABLE 160.077–23B—INSPECTOR'S SAMPLING

	Number of samples per lot					
	Lot size					
	1–100	101–200	201–300	301–500	501–750	751–1000
Tests:						
Over-pressure 1	1	1	2	2	3	4
Air retention	1	1	2	2	3	4
Buoyancy and inflation media retention	1	1	2	2	3	4
Tensile strength 2	1	1	1	1	1	1
Waterproof marking.						
See note 3 for sampling						
Detailed product examination	1	1	1	2	2	3
Retest sample size 1	10	10	13	13	20	20
Final Lot Inspection	10	15	20	25	27	30

NOTES TO TABLE:
(1) Samples selected for this test may not be the same PFD's selected for other tests.
(2) This test may be omitted if the manufacturer has previously conducted it and the inspector has conducted the test on a previous lot within the past year.
(3) One sample of each means of marking on each type of fabric or finish used in PFD construction must be tested whenever a new lot of materials is used or at least every six months regardless of whether a new lot of materials was used within the past six months.

(e) *Accept/Reject Criteria: Manufacturer Testing.* (1) A PFD lot passes production testing if each sample passes each test.

(2) In lots of 200 or less PFD's the lot must be rejected if any sample fails one or more tests.

(3) In lots of more than 200 PFD's, the lost must be rejected if—

(i) One sample fails more than one test;

(ii) More than one sample fails; or

(iii) One sample fails one test and in redoing that test with the number of samples specified for retesting in Table 160.077–23A, one or more samples fail the test.

(4) A rejected PFD 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 §160.077–19(d) is within the tolerances specified in §160.077–11(d)(1). Any lot that is rejected 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; or

(iii) One sample fails one test and in redoing that test with the number of samples specified for retesting in Table 160.077–23B, 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 annually 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 hold a complete inflated PFD. The basket must be heavy enough or be sufficiently weighted to become submerged when holding a 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 at least 5 cm (2 inches) from the water surface to the top of the basket 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 sample basket. 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 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 ±0.05 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.

(x) *Inflation chamber materials test equipment*. If the required tests in paragraph (h)(2) of this section are performed by the PFD manufacturer, test equipment suitable for conducting Grab Breaking Strength, Tear Strength, Permeability, and Seam Strength tests must be available at the PFD manufacturer's facility.

(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 the samples selected for testing—

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

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

(iii) Each individual test result must, in addition to meeting the requirements in this paragraph, comply with the requirements, if any, set out in the approved plans and specifications.

(2) *Inflation Chamber Materials.* Each sample must be tested according to §160.077–19(d)(1) through §160.077–19(d)(4). The average and individual results of testing the minimum number of samples prescribed in §160.077–19(d) must comply with the requirements in §160.077–11(d)(1).

(3) *Seam Strength.* The seams in each inflation chamber of each sample must be tested according to §§160.077–19(d)(1) and 160.077–19(d)(5). 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 UL 1517, section 28. Test samples may be prestressed by inflating them to a greater pressure than the required test pressure prior to initiating the test at the specified values.

(5) *Air Retention.* Each sample must be tested according to and meet UL 1517, section 36. Prior to initiating the test at the specified values, test samples may be prestressed by inflating to a pressure greater than the design pressure, but not exceeding 50 percent of the required pressure for the tests in paragraph (h)(4) of this section. Any alternate test method that decreases the length of the test must be accepted by the Commandant and must require a proportionately lower allowable pressure loss and the same percentage sensitivity and accuracy as the standard allowable loss measured with the standard instrumentation.

(6) *Buoyancy and Inflation Medium Retention.* Each sample must be tested according to and meet §160.077–19(b)(6), except that the UL 1517 section 19 test is not required unless specified on the approved plans and specifications. In addition to meeting the minimum values required by §160.077–19(b)(6), 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 UL 1517, section 22.

(8) *Detailed Product Examination.* Each sample 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.

(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 on the approved plans and specifications and this subpart.

(iv) The PFD must not otherwise be defective.

(9) *Waterproof Marking Test.* Each sample is completely submerged in fresh water for at least 30 min. 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 PFD 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 §160.077–31.

(2) *Accept/Reject Criteria.* Each nonconforming PFD must be rejected. If three or more nonconforming PFD's 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, the functioning of the PFD 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 inspection record required by §159.077–13 of this chapter and §160.077–25(b).

(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 individual PFD's 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 inspector shall notify the Commandant immediately.

(iv) The inspector must prepare and sign the record required by §159.077–13 of this chapter and §160.077–25(b). 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.

(k) *Disposition of PFD's Rejected in Testing or Inspections.* (1) A rejected PFD lot may be resubmitted for testing, examination, or inspection if the manufacturer first removes and destroys each PFD having the same type of defect or, if authorized by the Commandant or an authorized representative of the Commandant, reworks the lot to correct the defect.

(2) Any PFD 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 or an authorized representative of the Commandant.

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

[CGD 78–174, 50 FR 33928, Aug. 22, 1985, as amended by CGD 78–174A, 51 FR 4351, Feb. 4, 1986; CGD 78–174, 60 FR 2488, Jan. 9, 1995]

§160.077–25 Manufacturer records.

(a) Each manufacturer of hybrid PFD's must keep the records required by §159.007–13 of this chapter, except that they must be retained 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 PFD's 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 §159.077–13 of this chapter as long as the manufacturer's procedures and apparatus meet the requirements of this subpart.

(d) Each manufacturer of hybrid PFD's 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 §160.077–11(a)(4).

(2) A copy of this subpart.

(3) Each document incorporated by reference in §160.077–9.

(4) A copy of the approved plans and specifications.

(5) The approval certificate.

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

(e) The records required by paragraph (d)(1) of this section must be kept for at least 120 months after preparation.