JOINT CANADA-UNITED STATES
NATIONAL STANDARD

ANSI/CAN/UL 9595:2021

STANDARD FOR SAFETY

Factory Follow-Up on Personal Flotation Devices (PFDs)

Approved American National Standard

ANSI/UL 9595-2021

SCC FOREWORD

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UL Standard for Safety for Factory Follow-Up on Personal Flotation Devices (PFDs), ANSI/CAN/UL 9595

First Edition, Dated June 4, 2020

Summary of Topics

This revision of ANSI/CAN/UL 9595 dated September 9, 2021 has been issued to reflect the latest ANSI and SCC approval dates, and to incorporate Tensile Tester Jaw Specifications for Seam Seal Strength Test and editorial corrections in C3.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated June 4, 2021.

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ANSI/CAN/UL 9595:2021

Standard for Factory Follow-Up on Personal Flotation Devices (PFDs)

First Edition

June 4, 2020

This ANSI/CAN/UL Safety Standard consists of the First Edition including revisions through September 9, 2021.

The most recent designation of ANSI/UL 9595 as an American National Standard (ANSI) occurred on September 9, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC) on September 9, 2021.

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Preface

This is the First Edition of ANSI/CAN/UL 9595 Standard for Factory Follow-Up on Personal Flotation Devices (PFDs).

UL is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL 9595 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

To purchase UL Standards, visit the UL Standards Sales Site at http://www.shopulstandards.com/HowToOrder.aspx or call tollfree 1-888-853-3503.

This Edition of the Standard has been formally approved by the UL Standards Technical Panel (STP) on Personal Floatation Devices, STP 1123.

This list represents the STP 1123 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

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INTRODUCTION

1 Scope

This standard covers the basic elements of a production Inspection Program for various types of personal flotation devices.

2 Normative References

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9001, *Quality management systems – Requirements*

ISO 17025, *General requirements for the competence testing and calibration laboratories*

ISO/IEC 17020, *Conformity assessment – Requirements for the operation of various types of bodies performing inspection*

ISO/IEC 17065, *Conformity assessment – Requirements for bodies certifying products, processes and services*

3 Terms and Definitions

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

3.1 APPLICANT – The entity who retains the ultimate responsibility to ensure that the Certified product meets the requirements of the Follow-Up Document.

3.2 APPROVAL – Formal acknowledgement, by the Authority Having Jurisdiction (AHJ), that a product meets the relevant regulatory requirements.

3.3 CERTIFICATION – A process of product evaluation to:

a) Determine conformance of a product with a nationally recognized safety standard;

b) Provide for application of a Certification Mark to those products which conform to the standard; and

c) Provide for audit of an Applicant and/or Factory's quality management system, all under terms of an agreement(s) signed by the Applicant and the Certification and/or Inspection Body.

3.4 CERTIFICATION BODY – A body, acceptable to the AHJ, which determines, by means of product evaluation and review of the Applicant and/or Factory's quality assurance measures, that the product is eligible for the use of the Certification Mark.

3.5 CERTIFICATION MARK – A distinctive registered mark of a Certification Body that the Applicant, by the terms of the Certification Body, is authorized to apply to the product as a declaration that the product has been manufactured under the Follow-Up Program and complies with the requirements of the program.

3.6 CERTIFIED – Describes a product found to be in compliance with the appropriate standards and eligible for coverage under the Certification Program.

3.7 CRITICAL DIMENSIONS – Those dimensions identified in the Follow-Up Document that directly affect the performance characteristics of the product.

3.8 FACTORY – The physical location where production, complete or partial, of Certified product takes place.

3.9 FOLLOW-UP DOCUMENT – A document describing the Certified product and essential elements of the Follow-Up Program, prepared by the Certification Body and utilized by the Applicant and/or Factory and/or Inspection Body while the Certification is in effect.

3.10 FOLLOW-UP PROGRAM – The sampling, inspections, tests, or other measures taken by the Applicant and/or Factory and supplemented by the Certification and/or Inspection Body as a check on the means that the Applicant and/or Factory exercises to determine compliance of Certified products with the requirements. Such activities are generally conducted at a Factory or off-site location where related activities occur. Examination and testing may also be conducted by the Certification and/or Inspection Body on samples selected from the factory.

3.11 INITIAL PRODUCTION INSPECTION (IPI) – Inspection of the first production run of a representative product type to ensure that Applicant and/or Factory of a product are producing the product in accordance with the requirements in the Follow-Up Document.

3.12 INSPECTION BODY – A body that validates that the Applicant and/or Factory has performed all necessary examinations, tests and inspections to determine compliance of the Certified product with the requirements specified in the Follow-Up Document.

3.13 PERSONAL FLOTATION DEVICE (PFD) – Lifesaving or safety device intended to protect the user from drowning, including the following:

a) COMMERCIAL PFD – PFD intended to meet the carriage requirements for commercial vessels not subject to the International Convention for the Safety of Life at Sea (SOLAS);

b) RECREATIONAL PFD – PFD intended to meet the carriage requirements for recreational vessels;

c) SOLAS PFD – PFD intended to meet the carriage requirements for vessels subject to the International Convention for the Safety of Life at Sea (SOLAS).

d) THROWABLE PFD – PFD intended to be thrown; and

e) WEARABLE PFD – PFD intended to be worn on the body;

3.14 SPLIT INSPECTION – Inspection of a PFD partially manufactured at one or more Factories and shipped to another Factory to complete construction.

4 General Requirements

4.1 For each Certified Personal Flotation Device, the Certification Body shall establish a Follow-Up Program complying with the minimum requirements contained in this standard. Other methods or alternative means of control considered equivalent shall conform to the same minimum standard for a Certification Program and shall be authorized by the Certification and Inspection Body and documented in the Follow-Up Document.

4.2 An Applicant participating in the Certification and Inspection Program shall be required to sign a legally binding agreement with a Certification and/or Inspection Body. Such an agreement shall provide for those elements, duties, and responsibilities necessary for compliance with this standard.

4.3 The Certification and/or Inspection Body shall determine, by means of an Initial Production Inspection (IPI) and review of the Applicant's quality assurance measures, including competent staff and necessary equipment, that the Factory is eligible for coverage under a Certification Program.

4.4 An IPI shall be required for any production by a new Applicant or new Factory, or when the new PFD product does not use the same or similar aspects of production as existing production.

4.5 The IPI shall consist of witnessing the performance of all testing procedures required for Factory testing by the employees that will normally be performing said tests, and verification the Applicant and/or Factory has:

a) Equipment/area necessary to perform required Factory testing.

b) Calibration program and calibration records of equipment are traceable to appropriate National Standards and comply with section 6.3 of this standard.

c) Records to demonstrate that the employees are competent to perform required Factory testing.

d) Knowledge of minimum requirements for follow-up documents.

e) Record keeping and documentation of procedures.

f) A quality management system in place, noting the length of time the quality management system has been in place with documentation, which includes:

1) Incoming inspections and/or Supplier verification,

2) Segregation of non-conforming product/components, and

3) Procedures for disposition of non-conforming items.

4.6 The IPI may be waived/modified by the Certification Body if an IPI was previously conducted for that applicant and factory location that covered the same or similar aspects of production.

4.7 The Certification and/or Inspection Body shall witness, as applicable, all necessary examinations, tests, and inspections to determine compliance of randomly selected samples of the Certified product with the requirements specified in the Follow-Up Document. Samples shall be selected from production intended to bear the Certification Mark, finished products at the Applicant's factory bearing the Certification Mark, and may also include products that bear the Certification Mark that have been purchased on the open market. Records of factory tests and product examinations conducted between Factory Follow-Up audits shall also be audited for compliance.

4.8 The Certification and/or Inspection Body shall have the right to conduct unannounced inspections/audits at the factory, and to control Certification Marks, including the right to require that the Applicant remove a Mark from a product that does not comply with the requirements or place a product on hold pending rework or review by the AHJ.

4.9 The Applicant shall agree to have the product investigated by the Certification Body to determine compliance with changes in standards or shall agree to discontinue application of the Certification Mark when such changes become effective, or hold and revise the product to bring it into compliance with the new standard.

4.10 Each component shall be used in accordance with its certification rating and other limitations for use. Where components are not covered by a separate Follow-Up Program, the Applicant is responsible for ensuring that all relevant requirements are met.

5 Responsibilities of Certification and Inspection Bodies

5.1 General

5.1.1 Certification and Inspection Bodies shall be recognized by the AHJ as:

a) Being engaged, as a regular part of its business, in performing inspections and tests that are the same as or similar to the inspections and tests required for the product being considered for Certification or witnessed to perform representative tests successfully;

b) Having, or having access to, the equipment, facilities, personnel, and calibrated instruments that are necessary to inspect and test the products under the Certification Program;

c) Not being owned or controlled by:

1) An Applicant, vendor, or buyer of the products to be inspected or tested, or by an Applicant of similar products, or

2) A supplier of materials to the Applicant and/or Factory.

d) Being responsible for the impartiality of its Certification activities and shall not allow commercial, financial or other pressures to compromise impartiality. This shall not prohibit the Certification Body from consulting with an Applicant in setting up appropriate quality and record-keeping systems or compliance review of products throughout their design process;

e) Not advertising, promoting, or designing any Applicant's product or performing consulting work for any Applicant or Factory for products covered under the Follow-Up Program that could impair impartiality of the Follow-Up Program;

f) Not contracting or transferring to another person or organization responsibility for the supervision of inspections or tests required under the Certification Program, unless the originating Certification Body maintains oversight and accountability for a third party Inspection Body via a written contractual agreement;

g) Providing a mechanism for appealing decisions of the Certification and Inspection Body to a panel of independent experts composed of three members, one each from industry, testing laboratories, and regulatory agencies, chosen on a rotating basis with the final appeal to be presented to the AHJ;

h) Maintaining independent accreditation to ISO/IEC 17020 or ISO/IEC 17065, or other standards deemed equivalent by the AHJ.

5.1.2 The Certification and/or Inspection Body shall permit the use of a Certification Mark only on products that comply with all of the requirements of the Follow-Up Program and are also bearing the Approval Number of the AHJ. The Certification Mark shall be owned and controlled by the Certification Body, used exclusively to identify products as being Certified, and be Federally registered as a Certification Mark with the relevant agency (e.g. U. S. Patent and Trademark Office under the Trademark Act of 1946, commonly referred to as the Lanham Act (15 U.S.C. 1051 et. seq.) in the US, or the Canadian Intellectual Property Office under the Trade-marks Act (R.S.C. 1985, c. T-13) in Canada).

5.1.3 The Certification Body shall prepare a Follow-Up Document that conforms to this standard. The Follow-Up Document shall identify, describe, and set forth requirements for the continuation of the certification of the product and shall specify the authorized Certification Mark that shall be used only on the product and includes:

a) Photographs, drawings, text, or other means to the extent necessary to accurately describe all important features of the Certified product.

b) A list of critical dimensions subject to Sections 5.3.4.

c) In addition to those requirements in Section 6.5, when the Certification Body determines that additional tests shall be performed either at the Factory or Inspection Body's facility, detailed information describing the specific tests, including frequency, shall be documented by the Certification Body.

5.1.4 The Inspection Body shall complete a report at the time of each inspection and shall record an audit of the Applicant's and/or Factory's data sheets from both the ongoing inspection visit and samples of Applicant's and/or Factory's data sheets from production since the last inspection visit. The inspection report shall include at least the following information:

a) Date of inspection;

b) Inspector's name and Inspection Body's name;

c) Factory address;

d) Representative of the Applicant's name, phone number, and email address;

e) Follow-up document identification number;

f) Identification of the PFD product(s) inspected;

g) Nature of Inspection (i.e. regular inspection, audit inspection, etc.);

h) Quantity of Certification Marks used since last visit;

i) Description of non-compliances and corrective actions, if any, determined during the Inspection;

j) Identification of samples being sent to the Certification Body, if required; and

k) The inspection result and a statement of conformity where applicable.

5.1.5 If the production samples are not in compliance with the requirements, the Certification and/or Inspection Body shall require the Applicant, before shipping, to:

a) Remove all markings referencing certification, inspection or approval from the product; or

b) Rework all products to comply with the requirements of the standard; or

c) Abide by the decision of the Certification or Inspection Body and/or the AHJ with regards to temporary acceptance of the non-compliant product.

5.1.6 For a split inspection, the Certification Body shall include in the Follow-Up Document each Factory's specific responsibilities to maintain traceability of components and the level of compliance directly related to that Factory's operations. In addition, the Follow-Up Document shall specify the split inspection identification related to the PFD subassembly and/or components.

5.2 Assignment of a Process Rating

5.2.1 The Certification Body shall assign each Applicant/Factory combination a Process Rating, as shown in Table 5.1. The Certification Body shall assign a Process Rating when an Applicant/Factory combination first starts production of PFDs for which an approved Follow-Up Service program is required. Each new Applicant/Factory combination shall initially be assigned to Process Rating C or Process Rating B upon assessment by the Certification and/or Inspection Body. A sample program is attached; see Annex B – Elements of a Quality Management System.

5.2.2 Process Rating A shall be assigned to an Applicant/Factory combination that has demonstrated a superior quality management system.

5.2.3 Process Rating B shall be assigned to an Applicant/Factory combination with a good quality management system.

5.2.4 Process Rating C shall be assigned to an Applicant/Factory combination with minimally compliant quality management system or a quality management system that has not previously been rated.

Table 5.1
Assignment of a Process Rating

Required Quality Elements	Process Rating		
	Process Rating C	Process Rating B	Process Rating A
Quality Management System (QMS)	QMS that meets minimum requirements of this Standard.	QMS defined by Applicant/ Factory, which includes a Quality Manual that incorporates this Standard's requirements but is not approved by a 3rd party.	QMS recognized by the Certification as meeting ISO 9001, or a comparable quality standard, either by audits or acceptance of a 3rd party registration.
Control of Suppliers & Subcontractors	As needed for maintaining traceability records	Documented process for evaluation, selection and control	Documented process for evaluation, selection, and control that is accredited under the QMS.
Testing & Documentation	Able to perform & document Applicant and/or Factory's tests on end products.	Conducts & documents in-process QC inspection and tests and as a result is able to perform a reduced number of end product tests.	Conducts & documents in-process QC inspection and tests and as a result is able to perform minimal end product tests. Able to perform all tests as prescribed in this Standard.
Experience	None	1-year performing at Process Rating B while assigned Process Rating C	1-year performing at Process Rating A while assigned Process Rating B or C

5.2.5 The process rating shall be re-evaluated at least on an annual basis, when the Certification and/or Inspection Body determines that the Applicant and/or Factory has failed to meet the criteria of Table 5.1, or at the request of the Applicant and/or Factory.

5.2.6 If an Applicant and/or Factory is found to not be satisfactorily maintaining their QMS during an external audit, their process rating will be reassigned based on Table 5.1.

5.3 Elements of the Follow-Up Program

5.3.1 General

5.3.1.1 The Certification and/or Inspection Body's Countercheck Program, described in 5.3.7, at the Factory shall comply with the minimum requirements for the applicable Process Rating.

5.3.2 Inspection Frequency

5.3.2.1 Frequency of inspections shall be established in proportion to the production of PFDs bearing the Certification Mark and Process Rating. If an Applicant/Factory declares that a Factory is inactive and there has been no inspection in the current calendar year, the Certification and/or Inspection Body shall conduct one unannounced inspection per year to assure no production is occurring.

5.3.2.2 Product inspection audits shall be based on production in accordance with Table 5.2.

Table 5.2
Inspection Frequency

Wearable & Throwable Recreational PFDs – Inherent Buoyancy ONLY	
Process Rating C	1 inspection per 25,000 PFDs. Or, if 25,000 PFDs are not likely to be made, the minimum inspection visit frequency shall be 1 per quarter in which Certified Product is made.
Process Rating B	1 inspection per 50,000 PFDs.
	Or, if 50,000 PFDs are not likely to be made, the minimum inspection frequency shall be 1 per quarter in which Certified Product is made.
Process Rating A	Regardless of volume, Inspection audits shall be no less than semi-annually and may alternate between product inspection audits and quality system audits.

Wearable & Throwable Recreational PFDs – Inflatable or Combined Buoyancy Media	
Process Rating C	1 inspection per 5,000 PFDs
	Or, if 5,000 PFDs are not likely to be made, the minimum inspection visit frequency shall be 1 per quarter in which Certified Product is made.
Process Rating B	1 inspection per 10,000 PFDs.
	Or, if 10,000 PFDs are not likely to be made, the minimum inspection frequency shall be 1 per quarter in which Certified Product is made.
Process Rating A	Regardless of volume, Inspection audits shall be no less than semi-annually and may alternate between product inspection audits and quality system audits.

Wearable & Throwable Commercial PFDs	
Process Rating C	1 inspection per 1,000 PFDs.
	Or, if 1,000 PFDs are not likely to be made, the minimum inspection visit frequency shall be 1 per quarter in which Certified Product is made.
Process Rating B	1 inspection per 2,000 PFDs.
	Or, if 2,000 PFDs are not likely to be made, the minimum inspection frequency shall be 1 per quarter in which Certified Product is made.
Process Rating A	1 inspection per 5000.
	Or, if 5,000 PFDs are not likely to be made, the minimum inspection visit frequency shall be no less than semi-annually and may alternate between product inspections audits and quality system audits.

5.3.2.3 The Certification and/or Inspection Body shall increase the inspection frequency if, in its judgment, the increased frequency is necessary to audit the control over the product that will bear the Certification Mark. The basis for increased inspection frequency shall include the inability of the product to successfully complete the minimum Applicant and/or Factory's control program, inspector's countercheck program at factory, laboratory tests on the products and any other indication that the Certification Mark is being misused or misapplied.

5.3.2.4 Where an Applicant/Factory is assigned a Process Rating A, quality system audits may be self-reported, provided that the Certification and/or Inspection Body has visited the factory location within the last six months, and no critical QMS non-conformities have been reported.

5.3.3 Verification/ Traceability of Components

5.3.3.1 At each inspection, the inspector shall review the Applicant and/or Factory's records to determine compliance with requirements.

5.3.3.2 The inspector shall select samples of each part or subassembly to be examined.

5.3.4 Critical Dimensions Verification

5.3.4.1 Critical dimensions are those that directly affect the performance characteristics of the product, and should be documented in the Follow-Up Document.

5.3.4.2 The critical dimensions, such as foam and fabric cutting patterns, seal allowances, seam widths, etc., shall be verified against the approved illustrations at each inspection. The Certification and/or Inspection Body representative shall witness factory personnel verifying general design, location of webbings, closures, etc., to determine they are as shown on the illustrations.

5.3.5 Visual Inspection of Completed PFDs

5.3.5.1 At each inspection, the inspector shall examine randomly selected PFDs, and determine that the completed PFDs are of quality workmanship, by verifying that they:

a) Are in compliance with the Follow-Up Document;

b) Are free from defects that would impair the performance of the PFD; and

c) Are properly marked in accordance with the Certification Mark and any other markings or attached consumer information required by the AHJ.

5.3.6 Review of Records

5.3.6.1 The inspector shall review the Applicant and/ or Factory's test records to verify that tests have been conducted as required and that the necessary information is recorded, and that only product that is in compliance has been shipped.

5.3.6.2 The inspector shall verify the records required by Section 6.2.

5.3.7 Certification and/or Inspection Body Countercheck Tests

5.3.7.1 The Inspector shall witness a sampling of tests in sufficient quantity to establish confidence in the Applicant and/or Factory's ability to perform testing as specified in the Follow-Up Document. At a minimum, the buoyancy test and one strength test shall be witnessed annually. The type of strength test witnessed shall vary in order to assure all strength tests are witnessed. All tests shall be conducted in accordance with the test methods in the Sections indicated, unless otherwise specified in the Follow-Up Document.

5.3.7.2 Where a model is provided in "infant" size, samples shall be selected and sent to the Certification and/or Inspection Body's laboratory for testing as described in Section 5.3.8.

5.3.7.3 At the discretion of the Certification and/or Inspection Body, additional testing may be required to verify compliance with the applicable product standard(s), the Follow-Up Document, and this standard.

5.3.8 Flotation Stability Test

5.3.8.1 Once per year, the Inspector shall randomly select one complete device of each "infant" size, style, and model of PFD.

5.3.8.2 Unless otherwise specified, the Applicant and/or Factory shall forward the selected sample to the test laboratory for the Flotation Stability Test.

5.3.8.3 The Flotation Stability Test consists of the Donning, Water Entry, Turning and Flotation Stability Tests as defined in the applicable standard and shall be conducted on a complete assembled sample with three test subjects of appropriate size within the stated product range. The results shall comply with the applicable standard, subject to review by the AHJ.

6 Responsibilities of the Applicant and/or Factory

6.1 General

6.1.1 The Applicant and/or Factory shall provide a system to identify and isolate material as having been tested or not tested, found to comply or not to comply, scheduled for rework, or the like. Tags, or a similar means of identification, to indicate the required information, are acceptable for this purpose.

6.1.2 The Applicant and/or Factory shall be responsible for instituting corrective action when product or process non-conformances are found.

6.1.3 Certification Marks shall not be applied to PFDs that do not comply with the requirements.

6.1.4 At a minimum, the Applicant and/or Factory shall conduct the tests described in Section 6.5.

6.1.5 The Applicant and/or Factory shall determine the competency necessary for personnel performing work that affects compliance with product quality requirements, and verify those competency requirements have been satisfied.

6.1.6 The Applicant and/or Factory shall maintain a process for changes to products authorized by the Certification and/or Inspection Body, or significant manufacturing process changes that affect product conformance with requirements. Any product changes, manufacturing process changes, or test process changes shall be submitted to and authorized by the Certification Body before products may bear the Certification Mark.

6.2 Recordkeeping

6.2.1 The Applicant and/or Factory shall keep records of raw materials, parts, and subassemblies to verify correct material specifications and compliance with applicable specifications.

6.2.2 The Applicant and/or Factory shall maintain test records that include the following:

a) Identification of parts, subassemblies, or completed PFDs;

b) Tests conducted;

c) Dates of tests;

d) Number of samples tested;

e) Results of testing (pass/fail, and related data); and

f) Name of person who performed the activity.

6.2.3 The Applicant and/or Factory shall keep records verifying the competency of personnel performing work that affects compliance with product quality requirements.

6.2.4 The records shall be retained for at least 5 years and be available to the inspector upon request.

6.2.5 Where the PFD holds Approval from the AHJ, the Applicant is responsible for maintaining valid Approval. The Factory shall have a means for tracking the status of each Approval.

6.3 Calibration of Testing and Measuring Equipment

6.3.1 The Applicant and/or Factory shall maintain a program to assure that testing and measuring equipment used in production and/or inspection is clean, proper working order, and calibrated.

6.3.2 Inspection, measuring, and test equipment used by the Applicant and/or Factory to demonstrate compliance with requirements shall be calibrated and traceable to a national standard. The Applicant and/or Factory is responsible for selecting inspection, measuring, and test equipment that is suitable for the measurement to be taken, i.e. to ensure that equipment has the capability to meet tolerance and precision requirements listed in Annex C.

6.3.3 Equipment shall be calibrated at least annually with records of calibration maintained, either by:

a) An outside calibration service traceable to a national standard, or

b) Applicant/factory internal calibration program, provided it:

1) Uses externally calibrated measurement standard equipment traceable to a national standard that is only used for calibration purposes,

2) Uses documented calibration methods, and

3) Is conducted by trained competent personnel.

6.3.4 Measurement standard equipment shall be calibrated at the specified frequencies:

a) Weights and dimensional gauge block measurement standards shall be calibrated every three years or whenever the measurement standard has been subject to some form of abuse that may affect the measurement standard's fitness for use, and

b) All other measurement standards shall be calibrated at least annually.

6.3.5 Equipment out of calibration shall be replaced or repaired. When equipment is found to exceed required calibration tolerances, the Applicant and/or Factory shall perform an analysis to determine if the out of calibration condition could have adversely affected inspection or test results. The investigation shall be initiated by the Applicant and/or Factory, and done to the satisfaction of the Certification Body.

6.4 Split Inspection Responsibilities

6.4.1 Each Factory shall maintain traceability of components directly related to that Factory's operations.

6.4.2 When shipped, each sub assembled PFD shall comply with the requirements applicable to the construction stage of the sub assembled PFD.

6.4.3 Each subassembly Factory shall apply a split inspection identification to the subassembly and/or components that are compliant to the Follow-Up Document.

6.4.4 A copy of all product examination, traceability, and test records related to that Factory's operations shall be maintained by each Factory.

6.4.5 A copy of these records from each subassembly Factory shall be forwarded to the Factory that completes the PFD construction and shall be maintained in the traceability records for the PFD at the final Factory.

6.4.6 Subassemblies and/or components received at the final Factory shall only be used when accompanied by the appropriate records and bearing the specified split inspection identification.

6.5 Tests to be conducted by the Applicant and/or Factory

6.5.1 General

6.5.1.1 The Applicant and/or Factory shall conduct the tests listed in Table 6.1, Table 6.3, or Table 6.5 as applicable to the type and buoyancy medium of the PFD. Where the PFD uses both inherent and inflatable buoyancy, the tests in Table 6.1 and Table 6.3 apply, but duplicate tests need not be repeated.

6.5.1.2 The sample selection and lot compliance shall be based upon Table 6.1, Table 6.3, or Table 6.5, as applicable, for each consolidated lot completed within that month. At least one sample from each individual lot shall be selected for the Detailed Product Examination.

6.5.1.3 A maximum of one month's production may contain multiple completed PFD lots of the same model PFD with the same component model/style/type and with no change in production methods. A new lot is not necessary for change in component lots. At no time shall a consolidated completed lot exceed 1000 PFDs.

6.5.1.4 The testing shall be completed at the end of the month or at the end of the completion of the consolidated lot, whichever occurs first. The testing shall be completed before the shipment of any of the consolidated lots.

6.5.1.5 The compliance records shall contain the individual lot numbers covered by the consolidated lot production.

6.5.1.6 Each PFD pamphlet or placard type shall be inspected at least annually to A1 – A2 test procedures in Annex A. When a new printing run is received, the pamphlet or placard shall be visually inspected for content.

6.5.2 Inherently buoyant PFD tests

Table 6.1
Applicant and/or Factory's sample tabulation for inherently buoyant PFD tests

Test	Number of Samples Per Lot			
	Lot Size 3 to 150	Lot Size 151 to 280	Lot Size 281 to 500	Lot Size 501 to 1000
A3 Detailed Product Examination	2	5	7	13
A4 Final Lot Inspection	Every PFD in lot			
A5 – A6 Foam Buoyancy and Buoyancy Distribution Test [a]	1	2	3	4
A7 – A8 Strength Tests [b]	1	1	1	1
A9 Vinyl Coating Thickness Test [c]	1	1	1	1

Table 6.1 Continued on Next Page

Table 6.1 Continued

Test	Number of Samples Per Lot			
	Lot Size 3 to 150	Lot Size 151 to 280	Lot Size 281 to 500	Lot Size 501 to 1000
A19 Rescue Harness PFD Attachment Release Test	1 per lot			
A20 Rescue Harness Strength Test	1 per lot			
A21 Rescue Harness PFD Pull-Toggle Security Of Attachment Test	1 per lot			
A22 Bulk Processed Kapok Buoyancy Test [d]	See A22			
A23 Kapok Purity [d]	See A23			
A24 Kapok Buoyancy Test [d]	1	2	3	4
A25 Kapok Displacement Test [d]	3	5	5	5
A26 Kapok Weight Test [d,e]	2	5	6	6
A27 Kapok Insert Envelope Seam Strength Test [d]	2	5	6	6

a) If a PFD sample does not conform with the Buoyancy Test, a sample size from the next succeeding lot shall consist of 10 PFDs selected at random. Samples for the Buoyancy Distribution Test shall be the same samples used in the Buoyancy Test. These tests may be performed at the same time. This test may be conducted in-process.
b) The indicated test shall be conducted upon any change in component Model/style, or when a revised production process is used. A change in component lot number is not considered a change in Model/style. However, the test shall be run at least once every quarter.
c) This evaluation shall be conducted on the samples prepared in accordance with the Vinyl Thickness Coating Test.
d) This test only applies to PFDs that use Kapok for buoyancy.
e) Each kapok insert is checked for weight during the stuffing operation. The number of samples per lot in this Table represent the additional number of complete sets of inserts randomly selected for a Weight Test.

The sample acceptance and rejection rate shall comply with Table 6.2. If a sample does not meet the acceptance criteria in Annex A and the Follow-Up Document for any test described in Table 6.1, a second sample testing shall occur. When second sample testing is necessary, the number of samples per lot as described in Table 6.1 shall be twice the size.

Table 6.2
Sample acceptance and rejection rate for inherently buoyant PFD tests

	Number of Nonconforming Samples Per Lot			
	Lot Size 1 to 150	Lot Size 151 to 280	Lot Size 281 to 500	Lot Size 501 to 1000
FIRST SAMPLE:				
Accept Lot	0	0	0	0
Select second sample	1	1	1	1
Reject Lot	2	2	2	2
SECOND SAMPLE:				
Accept Lot	0	0	0	0
Reject Lot	1	1	1	1

6.5.3 Inflatable PFD tests

Table 6.3
Applicant and/or Factory's sample tabulation for inflatable PFD tests

Test	Number of Samples Per Lot					
	Lot Size 1 to 100	Lot Size 101 to 200	Lot Size 201 to 300	Lot Size 301 to 500	Lot Size 501 – 750	Lot Size 751 – 1000
A3 Detailed Product Examination	2	2	3	4	6	8
A4 Final Lot Inspection	Every PFD in the lot					
A7 – A8 Strength Tests	c					
A10 Buoyancy and Inflation Medium Retention [a]	1	2	3	4	6	8
A11 Uninflated Buoyancy	b					
A12 Over Pressure [d,e]	1	2	2	3	3	4
A13 Air Retention [f]	Every PFD in the lot					
A14 Seal Seam Strength [g]	1	2	2	3	3	4
A15 Strength of Attachment	b					

a) Buoyancy and Inflation Medium Retention test samples may be used for the Over-Pressure test.
b) Test shall be conducted at least annually on one completely assembled sample for each model/style and size.
c) The indicated test shall be conducted upon any change in component Model/style, or when a revised production process is used. A change in component lot number is not considered a change in Model/style. However, the test shall be run at least once every quarter. Over-Pressure Test samples may be used for this test. If the Over-Pressure Test samples are used for the Strength Tests and a leakage occurs during the Strength Tests only, new samples from that lot may be selected without complying with the Retest Sample Size.
d) Samples selected for the indicated tests may not be used for more than one test, except as noted in a or c.
e) If a sample fails the Over-Pressure Test, the number of samples to be tested in the next lot produced shall be at least two percent of the total number of PFDs in the lot or ten PFDs, whichever is greater.
f) The inflation chamber of the PFD shall be evacuated of air by depressing the oral valve with the protrusion of the oral tube dust cap. Other means can be used to depress the oral valve provided it does not protrude into the oral tube a distance greater than that of the protrusion of the oral tube dust cap. The oral tube valve shall have free movement of the enclosed valve/spring after evacuation of the air.
g) This test may be conducted in-process on completed inflation chambers or completed PFDs.

The sample acceptance and rejection rate shall comply with Table 6.4. If a sample does not meet the acceptance criteria in Annex A and the Follow-Up Document for any test described in Table 6.3, a second sample testing shall occur. When second sample testing is necessary, the number of samples per lot as described in Table 6.3 shall be twice the size.

Table 6.4
Sample acceptance and rejection rate for inflatable PFD tests

	Number of Nonconforming Samples Per Lot					
	Lot Size 1 to 100	Lot Size 101 to 200	Lot Size 201 to 300	Lot Size 301 to 500	Lot Size 501 to 750	Lot Size 751 to 1000
FIRST SAMPLE:						
Accept Lot	0	0	0	0	0	0
Select second sample	–	–	1	1	1	1
Reject Lot	1	1	2	2	2	2
SECOND SAMPLE:						
Accept Lot	–	–	0	0	0	0
Reject Lot	–	–	1	1	1	1

6.5.4 Throwable PFD tests

Table 6.5
Applicant and/or Factory's sample tabulation for throwable PFD tests

Test	Number of Samples Per Lot			
	Lot Size 3 to 150	Lot Size 151 to 280	Lot Size 281 to 500	Lot Size 501 to 1000
A3 Detailed Product Examination [a]	2	5	7	13
A5 Buoyancy Test [b,c]	1	2	3	4
A9 Vinyl Coating Thickness Test [d]	1	1	1	1
A16 – A18 Grab Strength Tests [e]	1	1	1	1
A24 Kapok Buoyancy Test [a,b]	1	2	3	4
A26 Kapok Weight Test [a,f]	2	5	6	6
A27 Kapok Insert Envelope Seam Strength Test [a,b]	2	5	6	6

a) Samples selected for performing the Detailed Product Examination and Kapok Insert Envelope Seam Strength Test may be the same samples selected for other specified tests.
b) Each sample Throwable PFD shall either be a completed PFD or the number of inserts comprising a completed PFD.
c) If a Throwable PFD does not conform with the Buoyancy Test, random sampling from the next succeeding lot shall consist of 10 Throwable PFDs.
d) This evaluation shall be conducted on the samples prepared in accordance with the Vinyl Thickness Coating Test.
e) This test applies to Ring Buoy Body and Grab Line Strength Tests, Horseshoe Buoy Body/Grab Strap Strength Test, and Cushion Grab Strap Strength Test in Annex A. The indicated test shall be conducted upon any change in component Model/style, or when a revised production process is used. A change in component lot number is not considered a change in Model/style. However, the test shall be run at least once every quarter.
f) Each kapok insert used in cushions is checked for weight during the stuffing operation. The number of complete sets of inserts per lot in this Table represent the additional number of inserts randomly selected for a Weight Test, with results recorded.

The sample acceptance and rejection rate shall comply with Table 6.6. If one sample does not meet the acceptance criteria in Annex A and the Follow-Up Document for any test described in Table 6.5, a second sample testing shall occur. When second sample testing is necessary, the number of samples per lot as described in Table 6.5 shall be twice the size.

Table 6.6
Sample acceptance and rejection rate for throwable PFD tests

	Number of Nonconforming Samples			
	Lot Size 1 to 150	Lot Size 151 to 280	Lot Size 281 to 500	Lot Size 501 to 1000
FIRST SAMPLE:				
Accept Lot	0	0	0	0
Select second sample	–	1	1	1
Reject Lot	1	2	2	2
SECOND SAMPLE:				
Accept Lot	–	0	0	0
Reject Lot	–	1	1	1

ANNEX A
(Normative)

Test Methods

TEST METHODS FOR ALL PFDS

A1 Placard Inspection

A1.1 Method

Appearance and Content Test

Each sample placard shall be visually inspected.

Attachment Test

A complete PFD shall be suspended in an upright position above the floor by any convenient fixed means. The placard shall be attached to a PFD by its intended method. A total weight of 1.8 ±0.1 kg shall be attached approximately 25 mm from the bottom middle portion of the placard by a clamping mechanism. The complete assembly (consisting of the PFD, the placard, the attachment means, and the weight) shall be suspended for at least 1 minute, such that the complete assembly does not touch the floor.

A1.2 Basis of Acceptability

The written text and illustrations of the samples shall be identical to the placard in the Follow-Up Document.

The placard and its attachment means shall not break or separate from the PFD.

A2 Pamphlet Inspection

A2.1 Method

Appearance and Content Test

Each sample pamphlet shall be visually inspected.

Interior Paper Weight Test

The cover page and staples shall be removed from one complete pamphlet sample. The dimensions shall be taken of each interior page. The total weight of all the interior pages shall be measured in grams. The weight per area of the interior pages shall be calculated using the formula below:

$$\text{Weight Per Area } (\text{grams/cm}^2) = \frac{\text{Total weight of interior pages (grams)}}{\text{Width of interior pages (cm)} \times \text{Length of interior pages (cm)} \times \text{Number of interior pages}}$$

Attachment Test

A complete PFD shall be suspended in an upright position above the floor by any convenient fixed means. The pamphlet shall be attached to a PFD by its intended method. A total weight of 1.8 ±0.1 kg shall be attached approximately 25 mm from the bottom middle portion of the pamphlet by a clamping mechanism.

The complete assembly (consisting of the PFD, the pamphlet, the attachment means, and the weight) shall be suspended for at least 1 minute, such that the complete assembly does not touch the floor.

A2.2 Basis of Acceptability

The written text and illustrations of the samples shall be identical to the pamphlet in the Follow-Up Document.

The Weight Per Area shall be at least 4.08 grams per 645 cm^2.

The pamphlet and its attachment means shall not break or separate from the PFD.

A3 Detailed Product Examination

A3.1 Method

Refer to Manufacturer's Sample Tabulation table for the number of complete PFDs to be selected from each production lot. The examination shall include construction details, dimensions (material, fabric, webbing, etc.), markings, and workmanship of each sample. The inspector/auditor shall not be responsible for meeting production schedules or be supervised by someone who is. This inspection shall be recorded in compliance with record keeping requirements.

A3.2 Basis for Acceptability

Results of the sample examination shall be recorded to verify:

a) Compliance with the specifications in the appropriate descriptive section(s) of Follow-up Document;

b) That measured dimensions comply with the dimensions and tolerances in the appropriate descriptive section(s) of the Follow-up Document;

c) That the torque of each screw type mechanical fastener falls within the tolerance specified in the appropriate descriptive section(s) of the Follow-up Document;

d) That first class workmanship is inherent in the product; and

e) That PFDs are free from defects which may materially affect their appearance or serviceability, except as described below.

Individual PFDs marked “seconds” or “irregulars” shall not be accepted. PFDs with surface imperfections (such as soiling) or with defects in optional or decorative components are generally not considered seconds or irregulars if they comply with all other requirements. However, they may not have any markings nor shall they be packaged indicating imperfections.

A4 Final Lot Inspection

A4.1 Method

On each PFD, the manufacturer shall perform a 100% final inspection. The final inspection shall be performed by a manufacturer's representative who is familiar with the requirements of the Follow-Up Service Procedure, the functioning of the PFD and its components and the production testing procedures.

A4.2 Basis for Acceptability

Each PFD shall demonstrate:

a) First quality workmanship;

b) That the general arrangement and attachment of all components, such as body straps, closures, inflation mechanisms, tie tapes, and drawstrings, are as specified in the applicable descriptive section(s) of the Follow-up Document;

c) That all markings are in compliance with the requirements of the applicable descriptive section(s) of Follow-up Document;

d) That the information pamphlet and owner's manual required by the Follow-up Document are securely attached to the PFD, with the pamphlet or placard selection information visible, and accessible prior to purchase.

Each nonconforming PFD shall be rejected.

TEST METHODS FOR INHERENTLY BUOYANT PFDS

A5 Foam Buoyancy Test

A5.1 Method

The buoyant material, as defined the Follow-Up Document, shall be placed in an individually weighted sample basket and completely submerged for a minimum of 2 hours without being unduly compressed. At the end of the 2 hours, all entrapped air shall be removed. The basket shall not be brought out of the water at any time prior to taking the buoyancy reading off the scale.

Then the basket shall be suspended by a spring or digital type scale so that the basket is submerged with a minimum of 50 mm between the inside top of the basket and the surface of the water, and

1. The submerged weight of each weighted basket containing the sample shall be recorded,

2. The submerged weight of the weighted basket with the sample removed shall then be recorded.

The buoyancy of each sample shall be computed by subtracting the submerged weight of the weighted basket, containing the sample, from the submerged weight of the weighted basket without the sample. The temperature of the water and the barometric pressure shall be recorded at the end of the Buoyancy Test. The measured buoyancy of any sample shall be corrected using one of the formulas below:

$$\text{Corrected Buoyancy} = \text{Buoyancy} \times \frac{\text{Barometric Pressure (mm Hg)}}{760.2\ \text{(mm Hg)}} \times \frac{293.15°\text{K}}{\text{Temp. in °C} + 273.15°\text{C}}$$

or

$$\text{Corrected Buoyancy} = \text{Buoyancy} \times \frac{\text{Barometric Pressure (kPa)}}{101.4\ \text{(kPa)}} \times \frac{293.15°\text{K}}{\text{Temp. in °C} + 273.15°\text{C}}$$

For Commercial and SOLAS PFDs, the PFD shall comply with one of the following:

1. Submergence under water for 48 hours prior to measuring the buoyancy; or

2. Submergence under water for 24 hours with a final buoyancy of no less than 95% of the initial stabilized buoyancy.

A5.2 Basis of Acceptability

The measured buoyancy shall be within the tolerances specified in the Follow-Up Document.

A6 Foam Buoyancy Distribution Test

A6.1 Method

The buoyancy of the buoyant material from the front of the PFD, as defined in the Follow-Up Document, shall be determined using the method described in the A5 Foam Buoyancy Test.

The buoyancy of the buoyant material from the front of the PFD is divided by the value for total PFD buoyancy to find the percent buoyancy distribution, using the formula below:

$$\text{Percent Buoyant Distribution} = \frac{\text{Buoyancy from front of PFD}}{\text{Total PFD buoyancy}} \times 100$$

A6.2 Basis of Acceptability

The percent buoyancy distribution shall be within the tolerances specified in the Follow-Up Document.

A7 Horizontal Load Test

A7.1 Method

The same sample may be used for the Vertical Load Test provided it passed.

For UL 1123, UL 1177, UL 1180 and UL 12402-4 Devices

Each PFD closure assembly shall be tested independently. This applies to:

- Continuous webbing strap(s) with one hardware closure.
- Single body strap assembly consisting of more than one hardware/webbing combination which provides a continuous strap around the PFD.
- Zippers

For UL 12402-5 Devices

Each PFD shall be tested:

- such that all closures and/or adjustment devices are tested simultaneously, with zipper fully engaged, if applicable.
- If the PFD includes a zipper and body straps, the test shall be repeated with each of the body straps fully loosened and only the zipper fully engaged

For this test, two cylinders shall be used. Each cylinder shall be of rigid material (i.e. steel or wood) and of adequate length to accommodate the full width of the portion of the PFD under test. The lines, straps, or other means used for applying the force shall pass through the cylinders in the device. Each cylinder shall be

- 127 ±13 mm diameter for all Adult size PFDs, or

- 50 ±6 mm diameter for an Infant, Child or Youth size PFDs,

The following conditions apply for specific PFDs

- For PFDs with friction type closures for size adjustment, the webbing shall be adjusted to the midway point of adjustment and then marked so that slippage of the webbing at the point of adjustment can be measured.

- When testing jacket-style PFDs, the sleeves are to be removed or strategically cut to allow the test apparatus to pass through.

- If inflatable, the PFD shall be tested both when uninflated and when inflated by its primary means of inflation. A different sample is acceptable to test each configuration.

With the PFD supported by the top cylinder and only the closure(s) to be tested closed and engaged, the test load shall be applied to the bottom cylinder so that the required load is applied to the PFD. For all load tests, any load from the test fixtures applied to the device shall be included in the test load (bottom cylinder, etc.). The test load shall be applied at a gradual and consistent rate so that the force is fully applied within 30 to 45 seconds and maintained for the specified time.

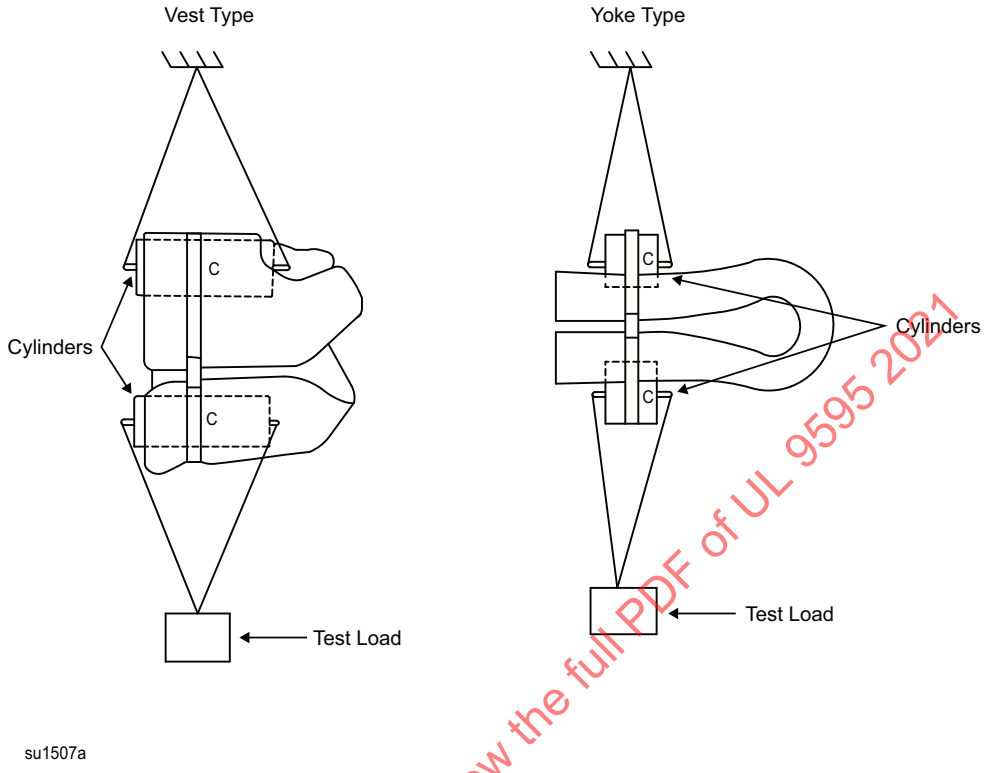
For PFDs with friction type closures or adjustment the slippage shall be measured. Following testing in the dry condition the test shall be repeated after immersing the PFD in fresh water for 2 minutes. Inflatable PFDs shall be in either an uninflated or inflated condition when measuring slippage.

For PFDs requiring testing in additional configurations (certain closures independent of others, dry/wet, inflated/uninflated), the test shall be repeated.

Note: Testing the shortest length zipper per model may be considered representative of test results for longer length zippers of the same model using the same zipper style if the zipper pin box is in the same general location on the PFD in relation to the body strap.

Figure A7.1

Horizontal Load Test Arrangement



For UL 1123, UL 1177, UL 1180 Devices

INHERENTLY BUOYANT PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Adult or Youth	1300	5
Child	1000	5
Infant	500	5
Commercial / SOLAS	3200	30

INFLATABLE PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Recreational	2000	5
Commercial / SOLAS	3200	30

For UL 12402-4 Devices

PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Adult or Youth	2000	5
Child	1020	5
Infant	510	5

For UL 12402-5 Devices

PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Adult or Youth	2000[1]	5
Child	1000	5
Infant	510	5
Note 1 – If the PFD has only one closure, then the Horizontal Load should be reduced to 1300N.		

A7.2 Basis of Acceptability

If Inflatable, the PFD shall be inflated and submersed in water to examine for any evidence of leakage after completion of the tests.

The PFD shall not exhibit evidence of functional deterioration, impaired operation, or leaks and friction type closures or adjustments assemblies shall not slip more than 25 mm at any point of adjustment.

EACH SAMPLE SUBJECTED TO A STRENGTH TEST SHALL BE RENDERED UNUSABLE AND DISCARDED FOLLOWING TESTING.

A8 Vertical Load Test

A8.1 Method

The same sample may be used for the Horizontal Load Test provided it passed.

For UL 1123, UL 1177, UL 1180 Devices

- Inflatable PFD samples shall be tested in the uninflated condition.

- Testing the narrowest shoulder width per model shall be considered representative of test results for greater shoulder widths of the same model using the same shoulder construction. If all shoulder widths are nominally the same, only one shoulder sample shall be required to be tested per model.

For ANSI/CAN/UL 12402 Devices

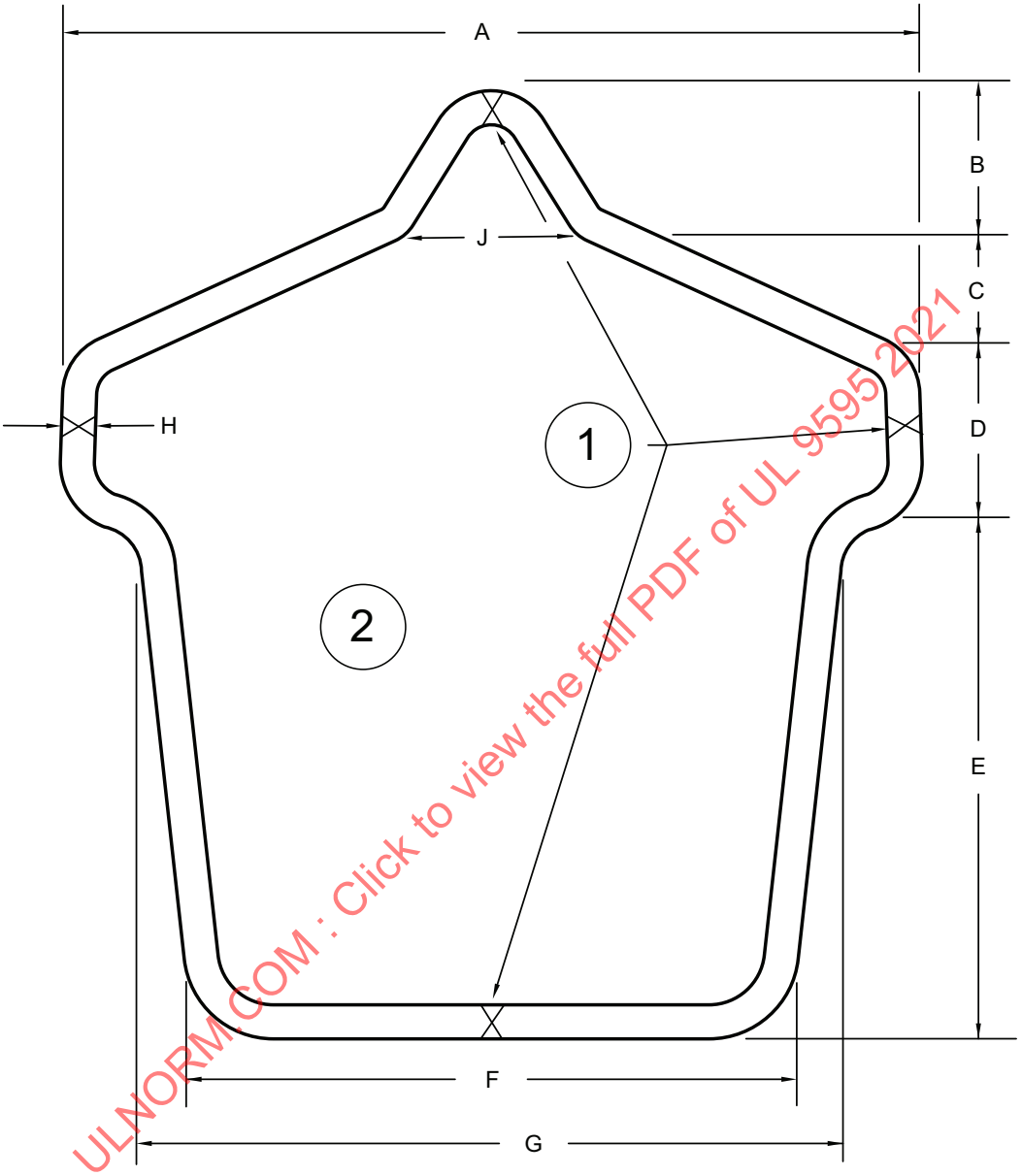
Inflatable PFD samples shall be tested both when uninflated and when inflated by its primary means of inflation.

For this test the PFD shall be secured to the test form illustrated on Figure A8.1 (Note – additional foam is allowed to be applied to the neck/shoulder of the test form) in the manner shown in Figure A8.2. When testing jacket-style PFDs, the sleeves are to be removed or strategically cut to allow the test apparatus to pass through. A 76 ±6 mm wide strap so that the test load is applied at a gradual and consistent rate so that the force is fully applied within 30 to 45 seconds and maintained for the required duration.

With the PFD supported by the 76 ±6 mm wide strap, a test load shall be applied to the bottom of the test form so that the required load shall be applied through the collar and through its attachment means to the test form. The total load shall include the test load, its attachment means, and the test form. The PFD shall be lifted with the 76 ±6 mm wide strap so that the test load is slowly applied and maintained for the required duration.

Figure A8.1

Test Form



Key

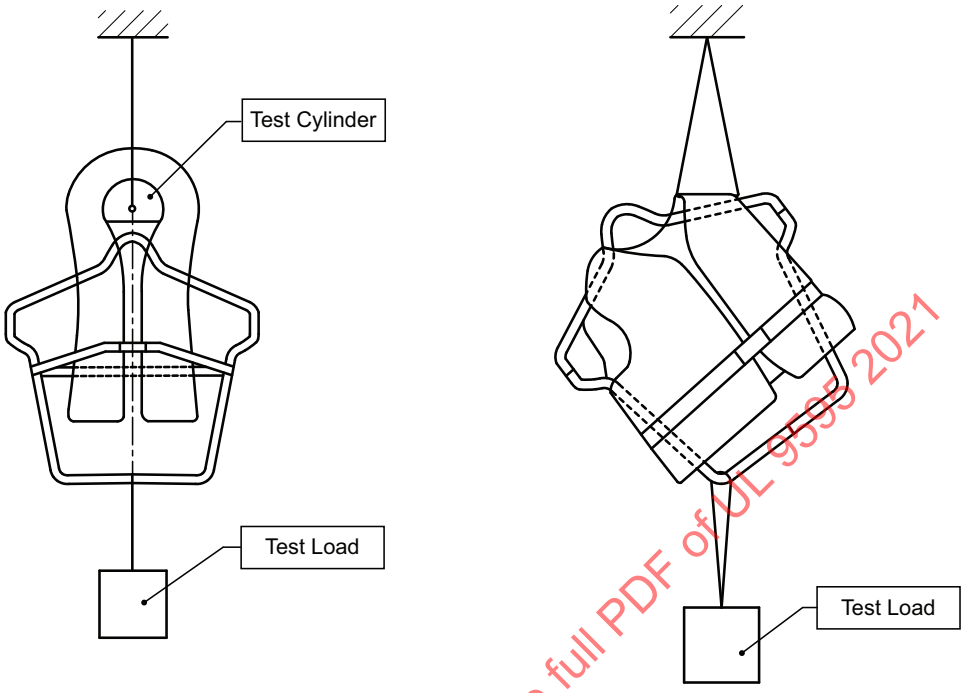
1 – Weld

2 – Insert of Buoyant Material

Test form size (mm)									
PFD Size	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**
Adult	610	114	76.2	127	381	432	508	25.4	178
Child	508	102	76.2	102	279	330	406	22.2	152
Infant	305	63.5	38.1	63.5	191	203	241	19.1	76.2

Figure A8.2

Vertical Load Test Arrangement



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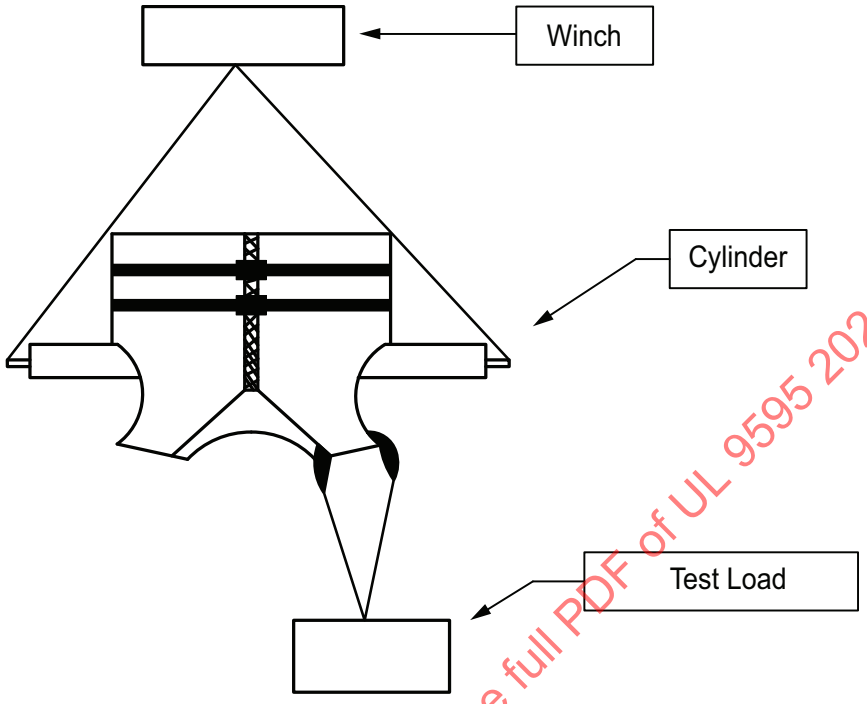
Alternate Method

An alternative method to using the test form is to place the PFD upside down and place a cylinder as described in the Horizontal Load Test through the arms of the PFD as show in Figure A8.3.

Each sample shall be suspended in an inverted position by means of a cylinder passed through the two arm holes, with the load applied to a single shoulder section. The strap for applying the appropriate test load shall be 76 ±6 mm wide and have a 6 mm ±2mm thick foam covering. The test load shall be applied at a gradual and consistent rate so that the force is fully applied within 30 to 45 seconds and maintained for the specified time.

Figure A8.3

Alternative Vertical Load Test Arrangement



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The PFD shall be examined for any evidence of damage after completion of the tests.

For UL 1123, UL 1177, UL 1180 Devices

INHERENTLY BUOYANT PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Adult	670	5
Youth or Child	515	5
Infant	270	5

INFLATABLE PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Recreational	890	5
Commercial / SOLAS	890	30

For UL 12402-4 Devices

INHERENTLY BUOYANT PFD REQUIRED TEST LOADS		
PFD TYPE	**TEST LOAD (N)**	**DURATION (MIN)**
Adult or Youth	750	5
Child	510	5
Infant	270	5

For UL 12402-5 Devices

INHERENTLY BUOYANT PFD REQUIRED TEST LOADS		
PFD TYPE	TEST LOAD (N)	DURATION (MIN)
Adult or Youth	750	5
Child	500	5
Infant	265	5
Note – If the device is intended for two or more user categories (infant, child, youth or adult), the load values shall be specified for the heavier category.		

A8.2 Basis of Acceptability

The PFD shall not exhibit evidence of functional deterioration or impaired operation and friction type closures or adjustments assemblies shall not slip more than 25 mm at any point of adjustment.

EACH SAMPLE SUBJECTED TO A STRENGTH TEST SHALL BE RENDERED UNUSABLE AND DISCARDED FOLLOWING TESTING.

A9 Vinyl Coating Thickness Test

A9.1 Method

The production PFD shall be cut in five randomly selected areas. At each cut, the thickness of the coating shall be measured with an optical comparator.

A9.2 Basis of Acceptability

The measured thickness of the vinyl coating shall be equal to or greater than specified in the Follow-Up Document.

TEST METHODS FOR INFLATABLE PFDS

A10 Buoyancy and Inflation Medium Retention Test

A10.1 Method

Either the Inflation Medium Cylinder Test Method or the Bulk Inflation Medium Test Method shall be used.

The measured buoyancy of any sample shall be corrected using one of the formulas below:

$$\text{Corrected Buoyancy} = \text{Buoyancy} \times \frac{\text{Barometric Pressure (mm Hg)}}{760.2\ \text{(mm Hg)}} \times \frac{293.15°\text{K}}{\text{Temp. in °C} + 273.15°\text{C}}$$

or

$$\text{Corrected Buoyancy} = \text{Buoyancy} \times \frac{\text{Barometric Pressure (kPa)}}{101.4\ \text{(kPa)}} \times \frac{293.15°\text{K}}{\text{Temp. in °C} + 273.15°\text{C}}$$

The Buoyancy Test shall be conducted in a tank of fresh water. A wire mesh, or equivalent, test basket of sufficient size to hold the sample, without compressing the PFD, shall be ballasted with sufficient weight to permit the complete submergence of the basket and PFD. The ballasted basket shall be suspended from a scale calibrated to an accuracy of ±28 g, and the weight of the empty submerged basket determined.

Inflation Medium Cylinder Test Method

Prior to testing, the inflation chambers of the PFD shall be evacuated of air. New, fully charged inflation medium cylinders, of the size specified for the PFD in the Follow-Up Document, shall be installed in the inflation systems.

The main chamber of the PFD shall be inflated by manually actuating the inflation system. The pressure within the chamber shall be reduced to 4 kPa, or to the minimum value of the design pressure range specified in the Follow-Up Document, whichever is less.

The sample shall be placed in the water and air entrapped in folds of fabric, or the like, shall be removed from the PFD immediately following submersion by agitating the PFD by hand for at least one minute while holding below the water surface. Without removing the PFD from the water, the PFD shall be placed under the basket so that its upper surface is a minimum of 50 mm below the water surface.

The weight of the basket, with the sample, shall be recorded at this time. To verify that temperature equilibrium / buoyancy stabilization has been achieved, the weight of the basket, with sample shall be recorded every 15 minutes after submersion until consecutive readings are within 57 g of each other, at which point stabilization is considered to have been achieved. The weight of the basket, with the sample, shall be recorded again 6 hours after the initial stabilized buoyancy reading. The temperature of the water and the barometric pressure shall be recorded at stabilization and at the end of the test.

The buoyancy of the PFD shall be computed by subtracting the submerged weight of the ballasted basket and PFD from the submerged weight of the ballasted basket alone.

For PFDs having more than one inflatable chamber, this test shall be repeated on each inflatable chamber.

Bulk Inflation Medium Test Method

Prior to testing, the inflation chambers of the PFD shall be evacuated of air. A used, uncharged inflation medium cylinder, of the size specified for the PFD in the Follow-Up document, shall be installed in the inflation system on the main chamber. For all other chambers on the PFD, new, fully charged inflation medium cylinders, of the size specified for the PFD in the Follow-Up document, shall be installed in the inflation systems.

The main chamber of the PFD shall be inflated with inflation medium from a bulk inflation medium supply through the oral inflation system. The pressure within the chamber shall be adjusted to the maximum value of the design pressure range specified in the descriptive section(s) of the Procedure for at least one minute to pre-stress the bladder. The pressure within the chamber shall be reduced to 4 kPa, or to the minimum value of the design pressure range specified in the Follow-Up Document, whichever is less.

The sample shall be placed in the water and air entrapped in folds of fabric, or the like, shall be removed from the PFD immediately following submersion by agitating the PFD by hand for at least one minute while holding below the water surface. Without removing the PFD from the water, the PFD shall be placed under the basket so that its upper surface is a minimum of 50 mm below the water surface.

The weight of the basket, with the sample, shall be recorded at this time. To verify that temperature equilibrium / buoyancy stabilization has been achieved, the weight of the basket, with sample shall be recorded every 15 minutes after submersion until consecutive readings are within 57 g of each other, at which point stabilization is considered to have been achieved. The weight of the basket, with the sample, shall be recorded again 6 hours after the initial stabilized buoyancy reading. The temperature of the water and the barometric pressure shall be recorded at stabilization and at the end of the test.

The buoyancy of the PFD shall be computed by subtracting the submerged weight of the ballasted basket and PFD from the submerged weight of the ballasted basket alone.

For PFDs having more than one inflatable chamber, this test shall be repeated on each inflatable chamber.

A10.2 Basis of Acceptability

Both the initial and the final corrected buoyancy of the PFD, shall be within the buoyancy range specified in the Follow-Up Document.

In addition, when submerged for 6 hours after stabilization, the corrected buoyancy of the inflated device shall be not less than 95 percent of the stabilized buoyancy.

A11 Uninflated Buoyancy Test

A11.1 Method

Prior to testing, the inflation chambers of the PFD shall be evacuated of air. Either a new, fully charged inflations medium cylinder or a used, uncharged inflation medium cylinder, of the size specified for the PFD should be installed in the inflation systems. If a used, uncharged inflation medium cylinder is installed in the inflation system, additional weight shall be added to the device to equal the weight of a new, fully charged inflation medium cylinder.

The test shall be conducted in a tank of fresh water maintained at a temperature of 20 ± 5°C.

A wire mesh, or equivalent test basket of sufficient size to hold the sample without compressing the PFD, shall be ballasted with sufficient weight to permit the complete submergence of the basket and PFD. The ballasted basket shall be suspended from a scale calibrated to an accuracy of ± 28 g, with the top of the basket at a minimum of 50 mm below the water surface.

The sample shall be placed in the basket. Air entrapped in folds of fabric, or the like, shall be removed from the PFD immediately following submersion by agitating the PFD by hand for a period of at least 3 minutes.

The PFD shall remain submerged in the basket for a minimum 15 minutes.

A11.2 Basis of Acceptability

To be considered acceptable, the PFD is required to maintain a positive buoyancy (i.e., not to sink) after 15 minutes of submergence.

A12 Over Pressure Test

A12.1 Method

The test shall be conducted in a tank of fresh water. A wire mesh, or equivalent, test basket of sufficient size to hold the sample without compressing it shall be ballasted with sufficient weight to permit the complete submergence of the basket and PFD.

If provided, an over-pressure relief valve shall be blocked or otherwise rendered inoperative. All chambers of the sample shall then be inflated to the over-pressure value specified in the Follow-Up Document.

The inflated PFD shall be submerged in the basket.

The weight of the submerged basket with inflated sample, with its top edge a minimum of 50 mm under water, shall be determined immediately upon stabilization of the scales (initial measurement) and after an additional 5 minutes (final measurement).

The buoyancy shall be considered the difference between the two weights (empty basket weight minus basket weight with sample). The percent change in buoyancy shall be calculated as follows:

$$\%\Delta \text{ in Buoyancy} = \frac{\text{Final Buoyancy} - \text{Initial Buoyancy}}{\text{Initial Buoyancy}} \times 100.$$

The sample shall be observed for leakage as evidenced by a continuous stream of bubbles. The sample shall also be examined after the test to determine if it is still serviceable.

A12.2 Basis of Acceptability

The PFD shall have no loss in buoyancy greater than 5 percent after being inflated for 5 minutes to the over-pressure specified in the Follow-Up Document. In addition, the PFD shall remain in a serviceable condition.

If leakage is observed during the test, the pressure in the PFD shall be reduced to the Air Retention Test pressure specified in the Follow-Up Document. The PFD shall then be subjected to either a 12 hour Air Retention Test or a 24 hour Buoyancy and Inflation Medium Retention Test. The results of this Air Retention Test will be considered acceptable if the pressure after 12 hours is within the inflation range specified in the descriptive section(s) of the Procedure. The results of this Buoyancy and Inflation Medium Retention Test will be considered acceptable if the buoyancy after 24 hours exceeds the minimum buoyancy specified in the Follow-Up Document

EACH PFD SUBJECTED TO THE OVER PRESSURE TEST SHALL BE RENDERED UNUSABLE AND DISCARDED FOLLOWING TESTING.

A13 Air Retention Test

A13.1 Method

Either the Change in Buoyancy Test Method or the Change in Pressure Test Method shall be used. Samples tested using the Change in Pressure Test Method may be retested using the Change in Buoyancy Test Method and accepted if the results of the Change in Buoyancy Test are acceptable. For PFDs having more than one inflatable chamber, the Air Retention Test shall be repeated on each inflatable chamber.

Change in Buoyancy Test Method

This test shall be conducted in a tank of fresh water. A wire mesh, or equivalent, test basket of sufficient size to hold the sample without compressing the PFD shall be ballasted with sufficient weight to permit the complete submergence of the basket and PFD.

The ballasted basket shall be suspended from a calibrated scale and the weight of the submerged basket determined.

The main inflatable chamber shall be inflated with air to the Air Retention Test Pressure as specified in the Follow-Up Document. Air entrapped in folds of fabric, or the like, shall be removed from the PFD immediately following submersion by agitating the PFD by hand for a minimum of one minute while holding below the water surface. Without removing the PFD from the water, the PFD shall be placed under the basket so that its upper surface is a minimum of 50 mm below the water surface. To verify that temperature equilibrium / buoyancy stabilization has been achieved, the weight of the basket, with sample shall be recorded every 15 minutes after submersion until consecutive readings are within 57 g of each other, at which point stabilization is considered to have been achieved. The weight of the basket with the sample shall be recorded again at least 12 hours after the initial stabilized buoyancy reading.

The temperature of the water and the barometric pressure shall be recorded at stabilization and at the end of the test.

The buoyancy of the PFD shall be computed by subtracting the submerged weight of the ballasted basket and PFD from the submerged weight of the ballasted basket alone.

Change in Pressure Test Method

The main inflatable chamber shall be inflated with air until:

(1) the Over Pressure Relief Valve (OPRV) opens, or

(2) the pressure equals 12 kPa or the maximum pressure of the design inflation range specified in the Follow-Up Document, whichever is greater, or

(3) the pressure equals 6.8 kPa above the maximum pressure of the design inflation range specified in the Follow-Up Document.

After a minimum 30 minute stabilization period the pressure shall be measured and, if necessary, adjusted to the Air Retention Test Pressure specified in the Follow-Up Document. This value shall be noted. If adjustment is necessary, an additional stabilization period may be conducted. The initial ambient temperature and barometric pressure shall be recorded after stabilization. At least twelve hours after the first stable reading, the final ambient temperature, barometric pressure shall be measured and recorded.

A13.2 Basis of Acceptability

Change in Buoyancy Test Method

If during the test, the water temperature is not maintained at 20 ± 3°C or the barometric pressure does not remain at 101 ± 1 kPa, then the initial and/or final buoyancy shall be corrected using the formulas described for the Buoyancy and Inflation Medium Retention Test, A11.

Each inflatable chamber of a PFD shall not experience a buoyancy loss of more than 1 percent over a period of 12 hours.

Change in Pressure Test Method

If, during the test, the ambient temperature changes by more than 3°C or the barometric pressure changes by more than 1 kPa, the results shall be corrected using one the formulas described for the Buoyancy and Inflation Medium Retention Test, A11, with the buoyancy replaced with pressure.

Each inflatable chamber of a PFD shall not experience a pressure loss of more than 2.7 kPa or 20 percent (whichever is less) of the stable pressure over a period of 12 hours. If the time exceeded 16 hours, the acceptable loss shall be equal to or less than the loss extrapolated at 16 hours. For 13.7 kPa the maximum acceptable loss is as follows:

LENGTH OF AIR RETENTION TEST	LOWEST ACCEPTABLE VALUE WHEN STARTING @ 13.7 kP
12 Hours	11 kPa
13 Hours	10.8 kPa
14 Hours	10.5 kPa
15 Hours	10.3 kPa
≥16 Hours	10.1 kPa

A14 Seal Seam Strength Test

A14.1 Method

Ten samples, each measuring 25 x 200 mm, shall be used. Each sample consists of two, 25 x 100 mm, pieces of fabric sealed together with a seal seam. A minimum of two samples shall be cut with the long dimension parallel to the warp yarns of the chamber material and at least two samples shall be cut with the long dimension perpendicular to the warp yarns of the chamber material.

In lieu of cutting seam samples from the completed bladders, prepared welded seams may be used with 5 samples constructed in the warp direction and 5 samples constructed in the fill direction.

No sample shall include selvage.

Initial jaw separation shall be 76 mm. The unsealed ends of the sample shall be clamped lengthwise and centered between the upper and lower clamps of the tensile test machine. The seal seam area of the sample shall be centered between the clamps and aligned perpendicular to the direction of pull, allowing sufficient slack so that the seal seam is not pre-stressed. The sealed ends of the fabric should be allowed to hang freely in lieu of being held perpendicularly to the direction of pull. The jaws shall then be separated at the rate of 300 ± 25 mm per minute. The maximum force required to cause rupture shall be recorded. Rubber padded jaws may be used to prevent slippage. Samples that slip in the clamps shall be discarded and the test repeated.

A14.2 Basis of Acceptability

The average seal seam strength shall be as specified in the Follow-Up Document. Averages for a fabric direction require a minimum of 5 samples in that direction. If insufficient samples are available for a given direction, the minimum average value of the 10 specimens shall be the average of the Warp plus Fill, or other Acceptable Values.

A15 Strength of Attachment Test

A15.1 Method

The PFD shall be mounted on the test form illustrated on Figure A8.3 in the uninflated condition. Each chamber shall be inflated to the maximum pressure of the design inflation range. A test load of 225N shall be attached to each inflation system, in turn by means of a clamp lacing or the like. For an inflation system having a joint or coupling other than at the connection to the chamber, the test shall be conducted with the weight attached at a point beyond the joint or coupling. Any tubes or hoses shall be evaluated by adjusting the point of attachment to the locations(s) most critical for the specific design being evaluated.

The test form shall be freely supported from the top, and then the test load shall be gradually applied at a consistent rate over 30 to 45 seconds until the inflation system completely supports the weight, and maintained in this position for a minimum of 5 minutes. After removal of the load, the chamber inflation pressure shall be measured and recorded.

The same PFD tested above shall be totally deflated and the tests repeated using a test load of 135 N.

For a PFD having other identifiable grab points, the inflated test shall be repeated using a test load of 135 N applied to the grab points.

A15.2 Basis of Acceptability

To be considered acceptable, the PFD is required to remain serviceable and not experience a pressure loss greater than 2.8 kPa or 20 percent of the initial pressure, whichever is less.

TEST METHODS FOR THROWABLE PFDS

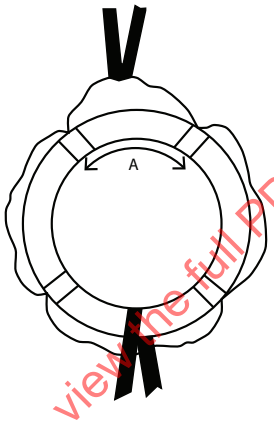
A16 Ring Buoy Body and Grab Line Strength Tests

A16.1 Method

The ring buoy shall be suspended by a 38 to 51 mm wide strap passed around the middle of the grab line and the splice or knot shall be located within the area marked "A" as shown in Figure A16.1. A 890 N force shall then be applied gradually at a consistent rate over 30 to 45 seconds by a second 39 to 51 mm wide strap passed around the body of the ring at the location 180 degrees from the point of suspension. The test load shall be maintained for a minimum of 30 minutes.

Figure A16.1

Ring Buoy



A16.2 Basis of Acceptability

A ring buoy of plastic foam body construction which shows excessive deflection immediately after removal of the test load, may be considered acceptable if it recovers a resemblance of its original shape within a period of 24 hours following removal of the force. Each ring buoy shall show no evidence of functional failure or impaired operation after each test. Slight movement of becket or tearing of coating or foam shall not constitute a failure.

EACH SAMPLE SUBJECTED TO A STRENGTH TEST SHALL BE RENDERED UNUSABLE AND DISCARDED FOLLOWING TESTING.

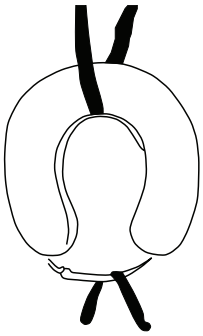
A17 Horseshoe Buoy Body/Grab Strap Strength Test

A17.1 Method

The horseshoe buoy shall be suspended by a 38 to 51 mm wide strap passed about the body at a location midway between the two ends as shown in Figure A17.1. An 890 N force shall then be applied gradually at a consistent rate over 30 to 45 seconds by a second 38 to 51 mm wide strap passed around the grab or closure strap. The test load shall be maintained for a minimum of 30 minutes.

Figure A17.1

Horseshoe Buoy



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A17.2 Basis of Acceptability

A horseshoe buoy constructed of foam plastic material, which shows excessive deflection immediately after removal of the test load, may be considered acceptable if it recovers a resemblance of its original shape within a period of 24 hours following removal of the test load. Each horseshoe buoy shall show no evidence of functional failure or impaired operation after each test.

EACH SAMPLE SUBJECTED TO A STRENGTH TEST SHALL BE RENDERED UNUSABLE AND DISCARDED FOLLOWING TESTING.

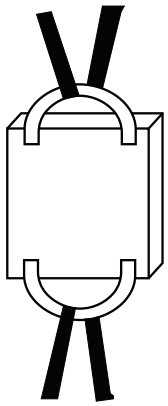
A18 Cushion Grab Strap Strength Test

A18.1 Method

The cushion shall be suspended by a 76 mm ±6 mm wide strap with 6.0 mm ±2 mm thick foam, then passed around the middle of the grab strap as shown in Figure A18.1. A 667 N force shall then be applied gradually at a consistent rate over 30 to 45 seconds by a second 76 mm ±6 mm wide strap covered on both sides with 6.0 mm ±2 mm thick foam, then passed around the middle of the other grab strap at the location 180 degrees from the point of suspension. The test load shall be maintained for a minimum of 10 minutes.

Figure A18.1

Cushion



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A18.2 Basis For Acceptability

For Cloth Covered Cushions – There shall be no evidence of tearing of the grab straps or cover and no opening of stitching where the straps are joined.

For Coated Cushions – There shall be no evidence of tearing of the grab strap or of any stitching joining the ends of the grab strap.

EACH SAMPLE SUBJECTED TO A STRENGTH TEST SHALL BE RENDERED UNUSABLE AND DISCARDED FOLLOWING TESTING

TEST METHODS FOR PFDS WITH RESCUE HARNESSES

A19 Rescue Harness PFD Attachment Release Test

A19.1 Method

One harness sample of each construction and material combination shall be used. Sample shall be routed onto the Rescuer's Harness PFD design with the 2 back belt loops closest together.

This test shall be deemed representative of all other Rescuer's Harness PFD designs with back belt loops farther apart.

Test load weights, test form (shown in Figure A8.1), deadweight rescue line attachment means (shown in Figure A19.1), and a peak reading force indicator.

Test form shall be fabricated of 25 mm diameter mild steel rod. All bend radii 38 mm inches.

Alternate Construction: Test form may be fabricated of 25 mm thick plywood. All edges shall be rounded to a radius of 13 mm ±1 mm.

Figure A19.1

Deadweight Rescue Line Attachment

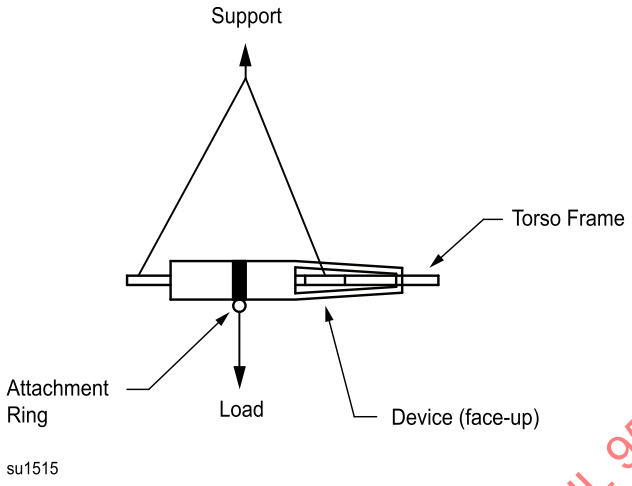
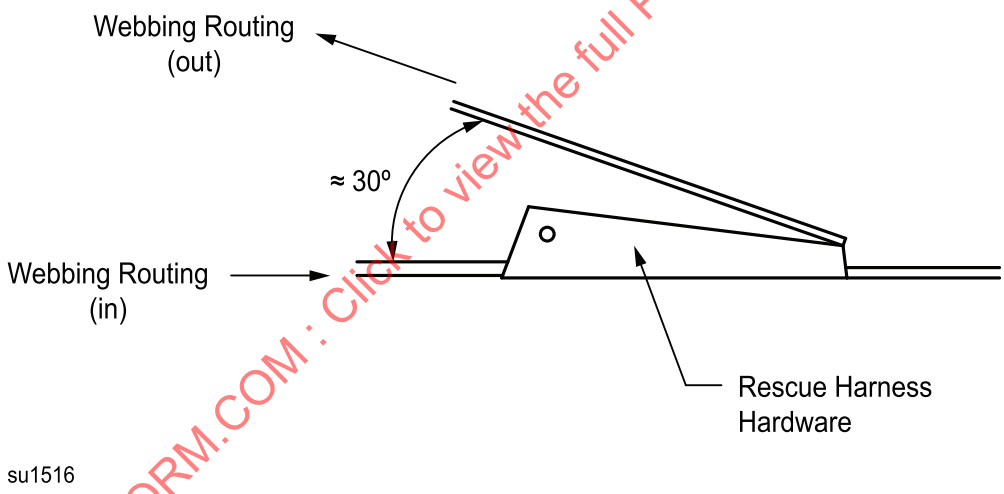


Figure A19.2

Buckle Release



This test shall be conducted after a minimum two-minute complete immersion of the PFD & rescuer's harness under water (i.e., wet).

A sample of the complete PFD shall be secured to a test form using all closure systems on the PFD. The test form shall be as described in Figure A8.1. Any means of adjustment on the harness shall be fully tightened. The test form shall be secured in a face up position to a hoist by routing webbing through the waist, neck and arm stubs of the test form. The rescue line attachment ring shall be placed at the back of the PFD and the rescuer's harness webbing passed through it. The webbing shall be properly threaded through the buckle and secured in accordance with the Manufacturer's instructions. The test load is then attached by appropriate means to the rescue line attachment ring, as shown in Figure A19.1. The total load applied to the PFD shall be 245 N and included the test load and the attachment means. The test load is applied gradually at a consistent rate over 30 to 45 seconds and maintained in this position until the buckle is released.

This release shall be achieved by attaching a peak reading force indicator to a length of small diameter line that in turn is attached at the end of the free end of the rescuer's harness webbing. The free end of the webbing shall be pulled back across the buckle at a rate of approximately 500 mm per minute and at an

angle of approximately 30 degrees relative to the base of the buckle, as shown in Figure A19.2, to open the buckle and allow the webbing and load to be released.

The buckle shall be opened to release the load. The reading of the peak reading force indicator shall be recorded. It shall be also noted if the ring snags or hangs up on the harness or PFD preventing its complete disengagement.

A19.2 Basis of Acceptability

The ring shall completely disengage from the harness and the force required to open the buckle shall not be greater than 110 N.

A20 Rescue Harness Strength Test

A20.1 Method

Samples of each construction and material combination shall be used. The samples may be new or the one used in Rescue Harness PFD Attachment Release Test & Pull-Toggle Security of Attachment Test. This test shall be conducted on a new “as received” “wet” rescuer’s harness sample (with wetting achieved by immersing the PFD and rescuer’s harness in water for a minimum of two minutes).

Strength test equipment suitable for applying a test load, a test form (shown in Figure A8.1), and rescue line attachment (shown in Figure A19.1) are required.

Complete PFD Test Method

A sample of the complete PFD shall be secured to a test form shown in Figure A8.1 and all closure systems on the PFD shall be secured. All means of adjustment on the rescuer’s harness are fully tightened. The webbing is then marked so that slippage of the webbing through the harness hardware can be measured. The rescue line attachment ring, shown in Figure A19.1, shall be placed at the back of the PFD and the rescuer’s harness webbing passed through it. The webbing shall be properly threaded through the buckle and secured in accordance with the Manufacturer’s instructions. The test load shall be attached by appropriate means to the rescue line attachment ring. The total load applied to the PFD shall be 3200 N and include the pulling weight and the attachment means. The test load is applied gradually at a consistent rate over 30 to 45 seconds and maintained in this position for 2 minutes. At the end of the 2 minute period, the slippage of the webbing through the hardware shall be recorded as either ≤ 76 mm or > 76 mm.

Waist Belt Section Test Method

The harness shall be closed to form a loop leaving a minimum of 76 mm of excess strap. The webbing is then marked so that slippage of the webbing through the harness hardware can be measured. The ring shall be attached to a hoist. The loop is then attached to a test load. At the beginning of the test, the harness hardware shall be located midway between the test load attachment and the hoist. The total load applied to the PFD shall be 3200 N and includes the test load and the attachment means. The test load is applied gradually at a consistent rate over 30 to 45 seconds and maintained in this position for 2 minutes. At the end of the 2 minute period, the slippage of the webbing through the hardware shall be recorded as being either ≤ 76 mm or > 76 mm.

A20.2 Basis of Acceptability

Each sample shall support the required dead load weight for the full time duration without breaking, distorting or slipping more than 76 mm.

ALL SAMPLES USED FOR THIS TEST SHALL BE DESTROYED.

A21 Rescue Harness PFD Pull-Toggle Security of Attachment Test

A21.1 Method

This test shall be conducted on the pull toggle of the harnesses used in the Rescue Harness PFD Attachment Release Test.

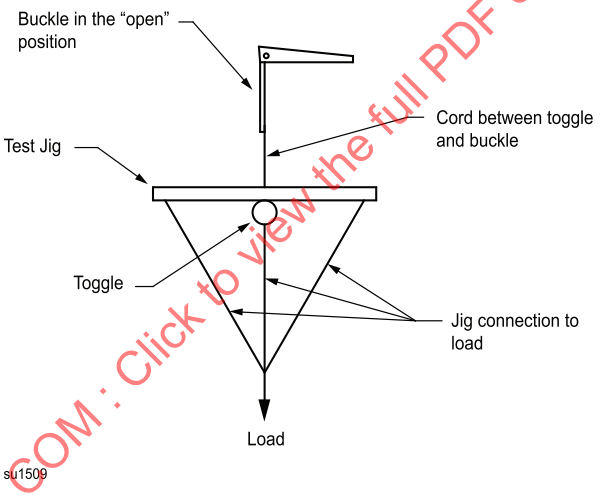
Test equipment suitable for applying a test load and a method to apply load to toggle are required.

For a rescuer's harness that employs a pull toggle that is attached to the harness buckle and is intended to be used to open the buckle, the pull toggle shall support a total load of 220 N, and shall include the test load and the attachment means. The assembly shall support the load for 1 minute.

The buckle or harness with buckle attached shall be supported in such a manner that will allow the load to be applied to the portion of the pull toggle that is intended to be grasped by the user, located furthest from the buckle, as shown in Figure A21.1. The force shall be applied in the intended direction of operation.

Figure A21.1

Toggle Test Assembly



A21.2 Basis of Acceptability

Each sample shall support the required test load for the full duration without breaking.

TEST METHODS FOR INHERENTLY BUOYANT AND THROWABLE KAPOK PFDS

A22 Bulk Processed Kapok Buoyancy Test

A22.1 Method

The Manufacturer shall randomly select no less than one 454 grams sample from each 900 kg of kapok which is intended for use in PFDs. The sample shall be processed by the same method/machine as will be used for all production units.

When kapok is reprocessed or salvaged from rejected production, (i.e., "leakers" or volume displacement noncompliance), a Bulk Processed Buoyancy Test shall be performed on the salvaged kapok or on the blend of salvaged and new kapok after the normal reprocessing or handling necessary for reuse is completed. The rate for sampling shall be the same as stated above

Each sample shall be placed in the specified rigid wire basket with sufficient weight added, so that when suspended in a water tank the basket is completely submerged to a minimum depth of 305 mm below the surface of the water when measured from the top of the basket.

The sample shall remain totally submerged for a minimum of 24 hours, except that every fifth test shall remain totally submerged for a minimum of 48 hours, after which the basket shall be suspended by a spring or digital type scale and:

1. The submerged weight of the weighted basket containing the sample shall be recorded, and

2. The submerged weight of the weighted basket with sample removed shall be recorded.

The buoyancy of each sample shall be computed by subtracting the submerged weight of the weighted basket containing the sample from the submerged weight of the weighted basket without the sample, then dividing the sample buoyancy by the sample volume.

$$\text{Buoyancy} = \frac{\text{Weight Basket with Sample (kg)} - \text{Weight Basket without Sample (kg)}}{\text{Sample Volume } (m^3)}$$

A22.2 Basis of Acceptability

The minimum acceptable buoyancy of each sample is 769 kg per m^3. The actual value shall be recorded. Bulk processed kapok not in compliance with these requirements shall be rejected.

A23 Kapok Purity

A23.1 Method

If during the Production Examination, it appears that the processed kapok contains more than 5 percent, by weight, of sticks, seed, or other foreign matter as specified in the description, the following test shall be conducted.

A random sample consisting of 330 grams of kapok shall be selected.

The kapok fibers shall be separated from the foreign matter in the sample by hand. The foreign matter shall then be weighed.

A23.2 Basis of Acceptability

If the 330 grams sample contains more than 15 grams of foreign matter, the processed kapok from which the sample was taken shall be rejected. The actual value shall be recorded.

A24 Kapok Buoyancy Test

A24.1 Method

Each insert envelope shall be slit with a minimum of 50 mm long cuts on each corner of each side to release all entrapped air from inside the inserts. Refer to Figure A24.1 for illustration of slitting locations. Each set of kapok inserts is then placed in an individual weighted basket and submerged to a minimum of 50 mm between the top of the basket and the surface of the water. Each set of kapok inserts shall remain totally submerged for a minimum of 24 hours. The kapok material shall not be unduly compressed during the test period, and shall be unrestricted to permit free escape of all entrapped air.

At the end of the minimum 24 hour submersion, each basket shall be suspended by a scale and;

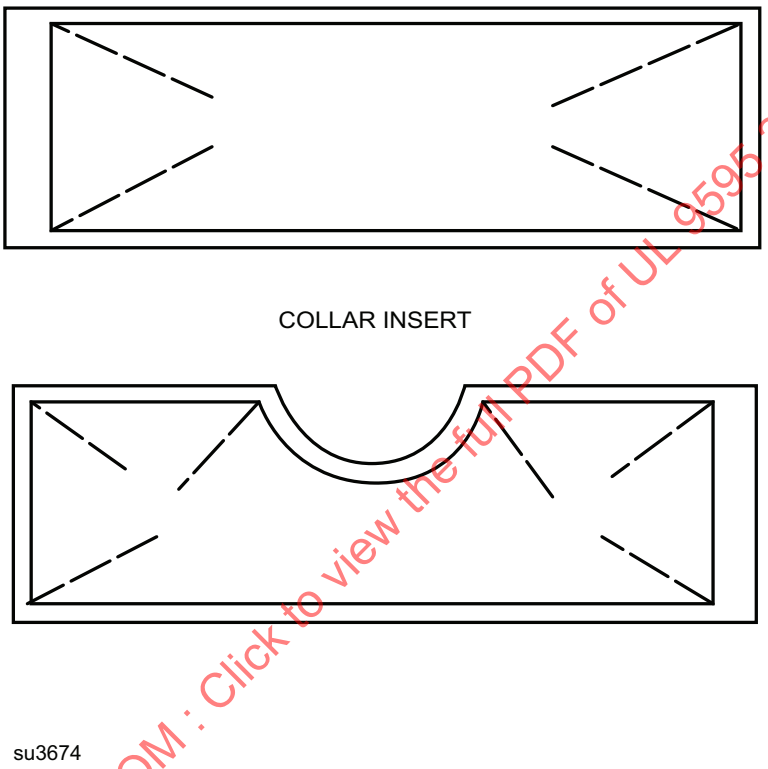
1. The submerged weight of each weighted basket containing the sample shall be recorded.

2. The submerged weight of weighed basket with the sample removed shall be recorded.

The buoyancy of each sample shall be computed by subtracting the submerged weight of the weighted basket, containing the sample, from the submerged weight of the weighted basket without sample.

Figure A24.1

Kapok Envelope Slit Locations



A24.2 Basis of Acceptability

The buoyancy of each sample set shall be recorded and shall be within the tolerance range specified in the Follow-Up Document.

A25 Kapok Displacement Test

A25.1 Method

The displacement of the finished, heat-sealed kapok insert envelopes, without slits, shall be placed into a weighted basket and submerged a minimum of 50 mm between the top of the basket and the surface of the water. On an additional kapok insert from the same lot, the temperature of the kapok shall be measured by inserting a thermometer in the kapok within the insert. The barometric pressure shall also be determined at the time of the test.

A25.2 Basis of Acceptability

The volume displacement for each sealed insert envelope for each test sample, along with the lot number shall be recorded on the Manufacturer's test data sheet and shall be within the allowable ranges for

volume displacement for the various kapok temperature and barometric pressure ranges specified in Table A1, Table A2, Table A3, Table A4, and Table A5 for vest Models AK-1, CKM-1, CKS-1 and CKS-2.

Table A1, Table A2, Table A3, Table A4, and Table A5 have three sets of five columns each, to be used as follows:

1. The center three columns of each set provide the mean value and upper and lower limits of volume displacement to be used by the Manufacturer at time of sealing inserts.

2. The outer two columns of each set provide the upper and lower limits of volume displacement at any time after the time of sealing the insert, and are for the UL Field Representative's use only.

All accepted lots of inserts shall be held for no less than four hours prior to stuffing to identify "leakers", which are inserts that swell or expand when defects admit air. All "leakers" shall be culled and destroyed.

Table A1

Model AK-1

Volume Displacement Limits (lb/oz)

FRONT INSERTS

28.3 - 29.3					29.4 - 30.4					30.5 - 31.5					PSI in / °F
5 11	5 15	6 3	6 7	6 12	5 7	5 11	5 15	6 3	6 8	5 4	5 8	5 12	6 0	6 4	40 - 45
5 12	6 0	6 4	6 8	6 13	5 8	5 12	6 0	6 4	6 9	5 5	5 9	5 13	6 1	6 5	45.1 - 50
5 13	6 1	6 5	6 9	6 14	5 9	5 13	6 1	6 5	6 10	5 6	5 10	5 14	6 2	6 6	50.1 - 55
5 14	6 2	6 6	6 10	6 15	5 10	5 14	6 2	6 6	6 11	5 7	5 11	5 15	6 3	6 7	55.1 - 60
5 15	6 3	6 7	6 11	7 0	5 11	5 15	6 3	6 7	6 12	5 0	5 12	6 0	6 4	6 8	60.1 - 65
5 15	6 4	6 8	6 12	7 1	5 12	6 0	6 4	6 8	6 13	5 9	5 12	6 0	6 4	6 9	65.1 - 70
6 0	6 5	6 9	6 13	7 2	5 13	6 1	6 5	6 9	6 14	5 10	5 13	6 1	6 5	6 10	70.1 - 75
6 1	6 6	6 10	6 14	7 3	5 14	6 2	6 6	6 10	6 14	5 10	5 14	6 2	6 6	6 11	75.1 - 80

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