

Reference SOLAS/46CFR160.050

Guideline 160.150--Specification for Lifebuoys, SOLAS

§ 160.150-1 Incorporation by reference.

(a) INTERNATIONAL LIFE-SAVING APPLIANCE (LSA) CODE (Resolution MSC.48(66)), Chapter I (sections 1.1 and 1.2) and Chapter II (section 2.1 only).

(b) IMO TEST REQUIREMENTS (IMO Resolution A689(17)), Part I, paragraphs 1.1 through 1.9, (Includes Amendments through 1997) [See Attachment A]

(c) Specifications and Standards. These guidelines reference the following documents:

(1) Military specification:

MIL-R-16847--Ring buoy, lifesaving, unicellular plastic.

(2) Federal Specification:

V-T-295D-Thread, Nylon.

(3) Federal Standard:

No. 595--Colors.

(4) Inter-Society Color Council - National Bureau of Standards (ISCC-NBS):

Supplement to NBS Circular 553, Color Name Charts with Centroid Colors.

(5) Coast Guard Specification:

160.050—Specifications for a Buoy, Life Ring, Unicellular Plastic

164.015--Plastic foam, unicellular, buoyant, sheet and molded shape.

(d) Copies on file. Copies of the specifications referred to in this section shall be kept on file by the manufacturer, together with the certificate of approval. The Military Specification may be obtained from the Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pa., 19120. The Federal Specification and Federal Standard may be obtained from the Business Service Center, General Services Administration, Washington, DC 20407. The Coast Guard specification may be obtained from the Commandant, U.S. Coast Guard, G-MSE-4, Washington, DC 20593-0001.

§ 160.150-2 Types and sizes.

(a) Type. Lifebuoys shall be of the annular ring type as described in these guidelines.

(b) Sizes. Lifebuoys shall have an outer diameter of not more than 800 mm (31-1/2 inches) and an inner diameter of not less than 400 mm (15-3/4 inches).

§ 160.150-3 Materials.

(a) General. All exposed materials shall be rot-proof and be resistant to deterioration from: sunlight exposure, oil or oil products, salt water, and anticipated weather conditions encountered at sea. Lifebuoys shall be constructed of inherently buoyant material and shall not depend upon rushes, cork shavings or granulated cork, any other loose granulated material or any air compartment which depends on inflation for buoyancy. All components used in construction of lifebuoys must meet the applicable requirements of 46 CFR 164.019. All components shall not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds.

(b) Unicellular plastic. The unicellular plastic material used in fabrication of the buoy body shall meet the requirements of 46 CFR 164.015 for Type C material or shall be accepted by the Commandant for use as Lifeboat Buoyant Materials (polyurethane foam). The buoy's body shall be finished with two coats of vinyl base paint, or an alternate covering as accepted by the Commandant, for unicellular plastic that meets the requirements of 46 CFR 164.015. Lifeboat Buoyant Materials will require a more protective alternate covering. Alternate covers shall withstand one year of natural southern weathering without significant loss of strength. After the one year of weathering, the buoy shall pass the body-to-grab line strength test 5(g)(2) of these guidelines. The lifebuoys shall be of a highly visible orange color:

(1) International vivid-reddish-orange(v.rO) No. 34 of Inter-Society Color Council-National Bureau of Standards; or

(2) Color No. 12197 of Federal Standard 595

(c) Grab line. The grab line shall be not less than 9.5 mm (3/8-inch) in diameter. It shall be polyethylene, polypropylene, or other suitable buoyant type synthetic material. It shall have a minimum breaking strength of 6000 newtons (1, 350 pounds). The grab line shall withstand one year of natural southern weathering without significant loss of strength. After the one year of weathering, it shall pass the body-to-grab line strength test 160.150-5(g) (2). The Commandant may choose to waive this requirement if the grab line is black and is UV resistant.

(d) Beackets. When used, beackets for securing the grab line shall be 2-inch polyethylene, polypropylene, nylon, saran or other suitable synthetic material and shall have a minimum breaking strength of 2600 newtons (585 pounds). They shall be able to withstand one year of natural southern weathering without significant loss of strength. In addition, polyethylene, polypropylene, and nylon beackets shall be weather-resistant type

which is stabilized as to heat, oxidation, and ultraviolet light degradation. The beackets shall withstand one year of natural southern weathering without significant loss of strength. After the one year of weathering, they shall pass the body-to-grab line strength test §160.150-5(g)(2). The Commandant may choose to waive this requirement if the beackets are black and UV resistant.

(e) Thread. When used to secure beackets and grab lines, each thread must meet the requirements of 46 CFR 164.023. Only one kind of thread may be used in each seam.

(f) Retro-reflective material. The lifebuoys shall be fitted with retro-reflective material (tape) with a minimum of 5 cm (2 inches) width around the lifebuoy at four locations spaced equally around the circumference of the lifebuoy. Retro-reflective material shall be Type II material that is approved under 46 CFR 164.018.

§ 160.150-4 Construction and workmanship.

(a) General. This specification covers lifebuoys which provide buoyancy to aid in keeping persons afloat in the water. Each buoy consists of a body constructed in the shape of an annular ring, with an approximately elliptical-shaped body cross section. The outside and inside diameters of the ring and the length and width of the cross section of the body shall be uniform throughout.

(b) Body. The body shall be made in either one or two pieces. If of two pieces, the pieces shall be equal in size and shall be adhesive bonded along a center line through an axis passing through the flat area dimension of the body. The adhesive shall be a liquid cold setting, polymerizable, nonsolvent, containing material of the phenolepichlorhydrin type or equivalent having good strength retention under outdoor weathering conditions.

(c) Grab line. The finished length of the grab line shall be at least four times the outside diameter of the buoy, and no longer than ten percent greater than that minimum length. The grabline shall be secured at four equidistant points around the buoy's circumference to form four equal loops. The ends of the grab line shall be securely and neatly spliced together, or shall be hand whipped with a needle and both ends securely and smoothly seized together. The grab line shall encircle the buoy and shall be held in place by the beackets. The spliced or seized ends of the grab line shall be placed in the center of the width of one of the beackets.

(d) Beackets. If beackets are used to secure the grab line to the lifebuoy, they shall comply with the requirements of this paragraph. Four beackets shall be fitted at four locations spaced equally around the circumference of the lifebuoy. The beackets shall be passed around the body of the buoy with the free ends to the outside, and shall be securely cemented to the buoy with a suitable waterproof adhesive which is compatible with the unicellular plastic used in the buoy body. The ends of the beackets shall be turned under at least 1 inch, one end to go around the grab line, and the other to be laid flat against the first end. The beackets shall then be stitched to the grab line with not less than five hand stitches made with two parts of thread or machined stitched with not less than three

stitches per inch. Alternate methods for rigging beackets and grab line will be given special consideration.

(e) Weight. A lifebuoy shall have a mass of not less than 2.5 kg (5-1/2 pounds). If the lifebuoy is intended to operate the quick release arrangement provided for the self-activated smoke signals and/or self-igniting lights, it shall have a mass sufficient to operate the quick release arrangement, but not less than 4 kg (8 pounds 13 ounces).

(f) Workmanship. Lifebuoys shall be of first class workmanship and free from any defects materially affecting their appearance or serviceability.

§ 160.150-5 Approval Tests.

(a) General. This section contains requirements for approval tests and examinations of lifebuoys. Each test or examination must be conducted or supervised by an independent laboratory. The tests must be done using lifebuoys that have been constructed in accordance with the plans and specifications in the application for approval. The tests in this section shall be conducted per the testing regimen found in Table 160.150-4(a).

Table 160.150-4(a)			
Ring Lifebuoy Testing Regimen			
Test Order	Buoy 1 Tests	Buoy 2 Tests	Buoy 3 Tests
1	§ 160.150-5(b)	§ 160.150-5(b)	§ 160.150-5(b)
2	§ 160.150-5(c)(1)	§ 160.150-5(c)(2)	§ 160.150-5(c)(2)
3	§ 160.150-5(f)	§ 160.150-5(e)	§ 160.150-5(g)
4	§ 160.150-5(d)	§ 160.150-5(h)	§ 160.150-5(h)
5	§ 160.150-5(h)		

(b) Temperature cycling tests.. Three lifebuoys shall complete 10 cycles of being subjected to alternately surrounding temperatures. One complete cycle shall include:

(1) Maintain the three lifebuoys at room temperature of 20 ± 3 °C ($68 + 6$ °F).for at least 4 hours.

(2) Maintain at a high temperature of 65 ± 2 °C (150 ± 5 °F) for 8 continuous hours to be completed in one day. Immediately after removing from high temperature, examine each lifebuoy, which shall show no sign of loss of rigidity from exposure to high temperature.

(3) Maintain at room temperature of 20 ± 3 °C ($68 + 6$ °F) for at least 4 hours and not more than 16 hours; and then

(4) Maintain at a low temperature of 30 ± 2 °C (-22 ± 5 °F) for 8 continuous hours, to be completed in one day.

(5) Repeat (1) through (4) of this paragraph as required to complete ten cycles.

(6) After all ten exposure cycles, each lifebuoy shall be externally examined for signs of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities that could adversely affect its suitability for future use.

(c) Drop tests. Lifebuoys which have been subjected to the temperature cycling tests [paragraph (b) of this section] shall be used for the drop tests as follows:

(1) Concrete floor drop test. One lifebuoy, immediately upon removal from the freezer from the tenth cycle of the Temperature Cycling Test (subjected to the 30 ± 2 °C (-22 ± 5 °F) temperature test) in paragraph (b) of this section, shall be dropped three times from a height of 2 m (6 feet) onto a concrete floor. It shall not suffer damage, nor shall it exhibit breaks or cracks in the body.

(2) Water drop test. The other two lifebuoys subjected to the temperature cycling tests [paragraph (b) of this section] shall be dropped into the water from the height at which they are intended to be stowed on ships in their lightest seagoing condition, or 30 m (100 feet), whichever is greater. They shall not suffer damage that will render the rings unusable.

(d) Buoyancy test. A lifebuoy which has been subjected to the temperature cycling tests [paragraph (b) of this section] shall be used for this test.

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

(i) A weighted wire mesh basket that is large enough to hold the lifebuoy, is designed not to allow the lifebuoy to float free, is not less than 14.5 kg (32 pounds), and is heavy enough to overcome the buoyancy of the lifebuoy.

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

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

(2) Method. The lifebuoy is placed in the basket. The basket is then suspended from the scale and submerged in the test tank with the lifebuoy and basket completely below the water surface. An initial reading of the scale is taken after 30 minutes and again after 48 hours. The buoyancy of the lifebuoy is the submerged weight of the weighted basket alone minus the submerged weight of the basket with the lifebuoy inside.

(3) Requirement. The buoyancy of the lifebuoy must be 14.5 kg (32 pounds). Each lifebuoy must retain at least 95% of its initial buoyancy after being submerged for 48 hours.

(e) Flame exposure test. A lifebuoy that has been subjected to the temperature cycling tests [paragraph (b) of this section] shall be used for this test.

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

(i) A test pan at least 30 cm by 35 cm by 6 cm (12 inches by 14 inches by 2-1/2 inches) containing 1 cm (1/2 inch) of water under 3 cm (1 inch) of N-heptane.

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

(2) Method. The test is only conducted when there is no significant air movement other than that caused by the fire. The N-heptane is ignited and allowed to burn for 30 seconds. A lifebuoy is then passed through the flames in an upright, forward, vertical, free-hanging position with the bottom of the lifebuoy 25 cm (10 inches) above the top edge of the test pan. The lifebuoy is exposed to the flames for 2 seconds.

(3) Requirement. The lifebuoy must not burn or melt for more than 6 seconds after being removed from the flames.

(f) Solvent exposure test. Two lifebuoys that have been subjected to the temperature cycling tests [paragraph (b) of this section] shall be totally submerged horizontally under a 100 mm (4 inches) head of diesel fuel, grade No. 2-D as defined in ASTM D 975, at room temperature of 20 ± 3 °C ($68 + 6$ °F) for a period of 24 hours. The lifebuoys are then removed and the excess fuel removed.

(g) Weathering test. One lifebuoy shall be subjected to one year of natural sunlight weathering at a latitude less than thirty-six degrees. The lifebuoy shall be positioned so that one side of the buoy shall be exposed to the weather.

(h) Strength test. The buoy body shall be suspended by a 50 mm (2-inch) wide strap. A similar strap shall be passed around the grab line on the opposite side of the buoy at the location where the line was spliced together, or as close to the splice as applicable. A 90 kg (200 pound) mass is suspended at the end of the strap. After 30 minutes, the lifebuoy body and grab line shall be examined, and there shall be no breaks, cracks or permanent deformation that could adversely affect its suitability for future use.

§ 160.150-6 Production tests and inspection.

(a) General. Production tests and inspections must be conducted in accordance with this section, 46 CFR 159.007, and any applicable independent laboratory procedures for production inspections and tests, as accepted by the Commandant.

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

(c) Oversight. In addition to responsibilities set out in 46 CFR Part 159 and the accepted laboratory procedures for production inspections and tests, each manufacturer of a lifebuoy and each laboratory inspector shall comply with the following, as applicable:

(1) Manufacturer. Each manufacturer must—

(i) Perform all tests and examinations necessary to show compliance with these guidelines on each lot before any inspector's tests and inspection of the lot;

(ii) Follow established procedures for maintaining quality control of the materials used, manufacturing operations, and the finished product; and

(iii) Allow an inspector to take samples of completed units or of component materials for tests required by these guidelines and for tests relating to the safety of the design.

(2) Laboratory. An inspector from the accepted laboratory shall oversee production in accordance with the laboratory's procedures for production inspections and tests accepted by the Commandant. During production oversight, the inspector shall not perform or supervise any production test or inspection unless—

(i) The manufacturer has a valid approval certificate; and

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

(iii) At least quarterly, the inspector shall check the manufacturer's compliance with the company's quality control procedures, examine the manufacturer's required records, and observe the manufacturer perform each of the required production tests.

(d) Test facilities. The manufacturer shall provide a suitable place and apparatus for conducting the tests and inspections necessary to determine compliance of lifebuoys with these guidelines. The manufacturer shall provide means to secure any test that is not continuously observed, such as the 48 hour buoyancy test. The manufacturer must have the calibration of all test equipment checked in accordance with the test equipment manufacturer's recommendation and interval but not less than at least once every year.

(e) Lots. A lot may not consist of more than 1000 lifebuoys. A lot number must be assigned to each group of lifebuoys produced. Lots must be numbered serially. A new lot must be started whenever any change in materials or a revision to a production method is made, and whenever any substantial discontinuity in the production process occurs. The lot number assigned, along with the approval number, must enable the lifebuoy manufacturer to determine the supplier's identifying information for the component lot.

(f) Samples.

(1) From each lot of lifebuoys, manufacturers shall randomly select a number of samples from completed units at least equal to the applicable number required by table 160.150-6(e) for testing. Additional samples must be selected for any tests, examinations, and inspections required by the laboratory's production inspections and tests procedures.

Table 160.150-6(e)--Sampling for Buoyancy Tests

Lot size	Number of life buoys in sample
100 and under	1
101 to 200	2
201 to 300	3
301 to 500	4
501 to 750	6
751 to 1000	8

(2) For a lot next succeeding one from which any sample lifebuoy failed the buoyancy or strength test, the sample shall consist of not less than ten specimen lifebuoys to be tested for buoyancy in accordance with paragraph (f) of this section.

(g) Tests— Each sample selected per paragraph (e) of this section shall be subjected to the following tests in the sequence given below:

(1) Concrete floor drop test per paragraph 5(c)(1) of these guidelines, except that the samples may be at room temperature when the test is conducted and do not need to undergo the Temperature Cycling Test.

(2) Buoyancy test per paragraph 5(d) of these guidelines.

(3) Strength test per paragraph 5(h) of these guidelines.

(h) Lot inspection. On each lot, the laboratory inspector shall perform a final lot inspection to be satisfied that the lifebuoys meet these guidelines. Each lot must demonstrate—

(1) First quality workmanship;

(2) That the general arrangement and attachment of all components are as specified in the approved plans and specifications; and

(3) Compliance with the marking requirements in these guidelines.

(i) Lot acceptance. When the independent laboratory has determined that the lifebuoys in the lot are of a type officially approved in the name of the company, and that such lifebuoys meet the requirements of these guidelines, the lifebuoys shall be plainly marked in waterproof ink with the independent laboratory's name or identifying mark.

(j) Lot rejection. Each nonconforming unit must be rejected. If three or more nonconforming units are rejected for the same kind of defect, lot inspection must be discontinued and the lot rejected. The inspector must discontinue lot inspection and reject the lot if examination of individual units or the records for the lot shows noncompliance with either these guidelines, or the laboratory's or the manufacturer's quality control procedures. A rejected unit or lot may be resubmitted for testing and inspection if the manufacturer first removes and destroys each defective unit or, if authorized by the laboratory, reworks the unit or lot to correct the defect. A rejected lot or rejected unit may not be sold or offered for sale under the representation that it meets these guidelines or that it is Coast Guard-approved.

§ 160.150-7 Marking and Pamphlet.

(a) Each lifebuoy must have the following information in permanent waterproof lettering, where items in "()" are specific to the lifebuoy:

SOLAS LIFEBUOY.

Inspected and tested in accordance with U.S. Coast Guard regulations.

(Name of buoyant material) buoyant material provides a minimum buoyant force of 14.5 kg

(32 pounds).

Approved for use on all vessels as a throwable device.

U.S. Coast Guard Approval No:

160.150/(assigned manufacturer's No.)/(Revision No.);

160.050/(assigned manufacturer's No.)/(Revision No.);

Model No.: (model number)

(Name and address of manufacturer or distributor).

Size: (size).

(Laboratory).

Lot No.: (lot number).

(b) A method of marking that is different from the requirements of paragraph (a) of this section may be given consideration by the Coast Guard.

(c) The manufacturer must meet 33 CFR 181.701 through 33 CFR 181.705 which requires an instruction pamphlet for each device that is sold or offered for sale for use on recreational boats, and must make the pamphlet accessible prior to purchase.

§ 160.150-8 Procedure for approval.

(a) General. Designs of lifebuoys are approved only by the Commandant, U.S. Coast Guard. Manufacturers seeking approval of a lifebuoy design shall follow the procedures of these guidelines and 46 CFR 159.005.

(b) Each application for approval of a lifebuoy must contain the information specified in 46 CFR 159.005-5. The application and, except as provided in paragraphs (c) and (d)(2) of these guidelines, a prototype lifebuoy must be submitted to the Commandant for pre-approval review. If a similar design has already been approved, the Commandant may waive the pre-approval review under 46 CFR 159.005-5 and 46 CFR 159.005-7.

(c) If the lifebuoy is of a standard design described in 46 CFR 160.050, the application:

(1) Must include the following: A statement of any exceptions to the standard plans and specifications, including drawings, product description, construction specifications, and/or bill of materials.

(2) Need not include: The information specified in § 159.005-5(a)(2).

(d) If the lifebuoy is not of the standard design described in 46 CFR 160.050, the application must include the following:

(1) Plans and specifications containing the information required by 46 CFR 159.005-12, including drawings, product description, construction specifications, and bill of materials.

(2) The information specified in 46 CFR 159.005-5(a)(2) (i) through (iii), except that, if pre-approval review has been waived, the manufacturer is not required to send a prototype lifebuoy sample to the Commandant.

- (3) Buoyancy and other relevant tolerances to be complied with during production.
 - (4) The text of any optional markings to be included on the lifebuoy, in addition to the markings required by these guidelines.
 - (5) For any conditionally approved lifebuoy, the intended approval condition(s).
- (e) The description of quality control procedures required by 46 CFR 159.005-9 may be omitted if the manufacturer's planned quality control procedures meet the requirements of those accepted by the Commandant for the independent laboratory performing production inspections and tests.
- (f) Waiver of tests. A manufacturer may request that the Commandant waive any test prescribed for approval under these guidelines. To request a waiver, the manufacturer must submit to the Commandant and the laboratory described in 46 CFR 159.010, one of the following:
- (1) Satisfactory test results on a lifebuoy of sufficiently similar design as determined by the Commandant.
 - (2) Engineering analysis demonstrating that the test for which a waiver is requested is not appropriate for the particular design submitted for approval or that, because of its design or construction, it is not possible for the lifebuoy to fail that test.