

be selected at random from the lot and tested. If one or more of the ten steps fails the test, each step in the lot must be tested.

(c) *Test #2: Ladders.* Assembled ladders must be separated into lots of 20 ladders or less. One ladder must be selected at random from the ladders in the lot. The ladder selected must be at least 3 m (10 ft.) long or, if each ladder in the lot is less than 3 m long, a ladder of the longest length in the lot must be selected. The ladder must be tested as prescribed in § 160.017-21(c)(2), except that only a 3 m section of the ladder need be subjected to the static load. If the ladder fails the test each other ladder in the lot must be tested.

(d) *Independent laboratory.* Each production test must be conducted or supervised by an independent laboratory. However, if a test is performed more than 4 different times per year, laboratory participation is required only 4 times per year. If the laboratory does not participate in all tests, the times of laboratory participation must be as selected by the laboratory. The times selected must provide for effective monitoring throughout the production schedule.

(e) *Visual examination.* The visual examination described in § 160.017-21(b) must be conducted as a part of each production test.

Subpart 160.021—Hand Red Flare Distress Signals

SOURCE: CGD 76-048a and 76-048b, 44 FR 73060, Dec. 17, 1979, unless otherwise noted.

§ 160.021-1 Incorporations by reference.

(a) The following is incorporated by reference into this subpart:

(1) "The Universal Color Language" and "The Color Names Dictionary" in *Color: Universal Language and Dictionary of Names*, National Bureau of Standards Special Publication 440, December 1976.

(b) NBS Special Publication 440 may be obtained by ordering from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (Order by SD Catalog No. C13.10:440).

(c) Approval to incorporate by reference the publication listed in this section was obtained from the Director of the Federal Register on November 1, 1979. The publication is on file at the Federal Register Library.

§ 160.021-2 Type.

(a) Hand red flare distress signals specified by this subpart shall be of one type which shall consist essentially of a wooden handle to which is attached a tubular casing having a sealing plug at the handle end, the casing being filled with a flare composition and having a button of ignition material at the top, with a removable cap having a friction striking material on its top which may be exposed for use by pulling a tear strip. The flare is ignited by scraping the friction striker on top of the cap against the igniter button on top of the flare. The general arrangement of the flare is shown by Figure No. 160.021-2(a). Alternate arrangements which conform to all the performance requirements of this specification (and other arrangements which conform with all performance requirements except candlepower and burning time, but provide not less than 3,000 candle-minutes with a minimum of 1/3 minute burning time) will be given special consideration.

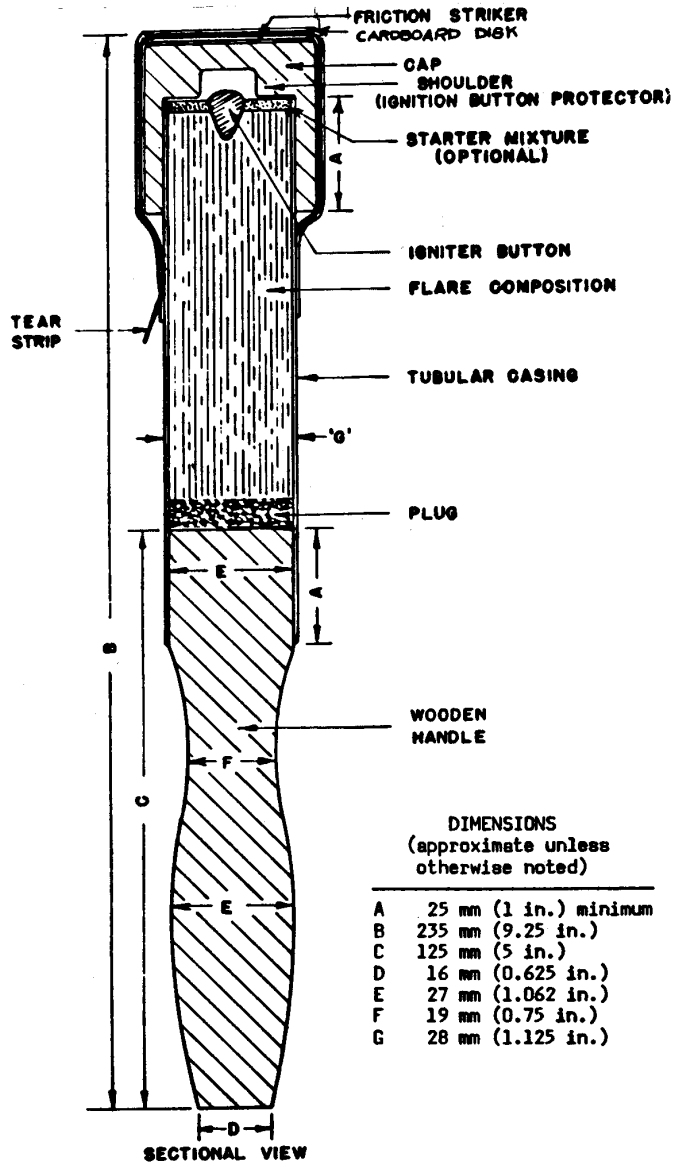


Figure 160.021-2(a). Hand Red Flare Distress Signal - General Arrangement.

(b) [Reserved]

§ 160.021-3 Materials, workmanship, construction and performance requirements.

(a) *Materials.* The materials shall conform strictly to the specifications and drawings submitted by the manufacturer and approved by the Commandant. The color of the tube shall be red. Flare compositions containing sulphur shall not contain more than 2.6 percent of potassium chlorate or an equivalent amount of any other chlorate. Flare compositions containing chlorates in any quantity shall not contain any ammonium salts.

(b) *Workmanship.* Hand red flare distress signals shall be of first class workmanship and shall be free from imperfections of manufacture affecting their appearance or that may affect their serviceability. Moistureproof coatings shall be applied uniformly and shall be free from pinholes or other visible defects which would impair their usefulness.

(c) *Construction.* The casing shall be fitted and secured to the handle with not less than a 25 mm (1 in.) overlap and shall be attached to the handle in such a manner that failure of the joint will not occur during tests, ignition, or operation. The plug shall be securely affixed in the casing to separate the flare composition from the wooden handle. The flare composition shall be thoroughly mixed and be uniformly compressed throughout to preclude variations of density which may adversely affect uniformity of its burning characteristics. The cap shall have a lap fit of not less than 25 mm (1 in.) over the end of the casing and flare composition to entirely and securely protect the exposed surface of the igniter button and end of flare composition and casing, and shall have an inner shoulder so constructed that it is mechanically impossible for the inner surface of the cap to come in contact with the igniter button. The cap shall be securely attached to the casing in such manner as to preclude its accidental detachment. The cap shall be provided on its top with a friction striking material which shall, by a pull of the tear strip, be entirely exposed for striking the friction igniter button.

The igniter button shall be non-water soluble or be protected from moisture by a coating of some waterproof substance, and shall be raised or exposed in such manner as to provide positive ignition by the friction striker. The igniter button shall be firmly secured in or on the top of the flare composition; the arrangement shall be such that the ignition will be transmitted to the flare composition. The assembled flare, consisting of tear strip, cap, casing, and handle, shall be sealed and treated to protect the flare from deterioration by moisture. The protective waterproof coating shall be applied so none adheres to the friction striking surface. Special consideration will be given to alternate waterproofing of the signal by means of a water-resistant coating on the signal plus packaging in a sealed plastic waterproof bag satisfactory to the Commandant.

(d) *Performance.* Signals shall meet all the inspection and test requirements contained in § 160.021-4.

§ 160.021-4 Approval and production tests.

(a) *Approval tests.* The manufacturer must produce a lot of at least 100 signals from which samples must be taken for testing for approval under § 160.021-7. The approval tests are the operational tests and technical tests in paragraphs (c) and (d) of this section. The approval tests must be conducted by an independent laboratory accepted by the Commandant under § 159.010 of this Chapter.

(b) *Production inspections and tests.* Production inspections and tests of each lot of signals produced must be conducted under the procedures in § 159.007 of this chapter. Signals from a rejected lot must not be represented as meeting this subpart or as being approved by the Coast Guard. If the manufacturer identifies the cause of the rejection of a lot of signals, the signals in the lot may be reworked by the manufacturer to correct the problem. Samples from the rejected lot must be retested in order to be accepted. Records shall be kept of the reasons for rejection, the reworking performed on the rejected lot, and the results of the second test.

(1) *Lot size.* For the purposes of sampling the production of signals, a lot must consist of not more than 30,000 signals. Lots must be numbered serially by the manufacturer. A new lot must be started with: (i) Any change in construction details, (ii) any change in sources of raw materials, or (iii) the start of production on a new production line or on a previously discontinued production line.

(2) *Inspections and tests by the manufacturer.* The manufacturer's quality control procedures must include inspection of materials entering into construction of the signals and inspection of the finished signals, to determine that signals are being produced in accordance with the approved plans. Samples from each lot must be tested in accordance with the operational tests in paragraph (c) of this section.

(3) *Inspections and tests by an independent laboratory.* An independent laboratory accepted by the Commandant under § 159.010 of this Chapter must perform or supervise the inspections and tests under paragraph (b)(2) of this section at least 4 times a year, unless the number of lots produced in year is less than four. The inspections and tests must occur at least once during each quarterly period, unless no lots are produced during that period. If less than four lots are produced, the laboratory must perform or supervise the inspection and testing of each lot. In addition, the laboratory must perform or supervise the technical tests in paragraph (d) of this section at least once for every ten lots of signals produced, except that the number of technical tests must be at least one but not more than four per year. If a lot of signals tested by the independent laboratory is rejected, the laboratory must perform or supervise the inspections and tests of the reworked lot and the next lot of signals produced. The tests of each reworked lot and the next lot produced must not be counted for the purpose of meeting the requirement for the annual number of inspections and tests performed or supervised by the independent laboratory.

(c) *Operational tests.* Each lot of signals must be sampled and tested as follows:

(1) *Sampling procedure and accept/reject criteria.* A sample of signals must be selected at random from the lot. The size of the sample must be the individual sample size in Table 160.021-4(c)(1) corresponding to the lot size. Each signal in the sample is tested as prescribed in the test procedure in paragraph (c)(2) of this section. Each signal that has a defect listed in the table of defects (Table 160.021-4(c)(2)) is assigned a score (failure percent) in accordance with that table. In the case of multiple defects, only the score having the highest numerical value is assigned to that signal. If the sum of all the failure percents (cumulative failure percent) for the number of units in the sample is less than or equal to the accept criterion, the lot is accepted. If the cumulative failure percent falls between the accept and reject criteria, another sample is selected from the production lot and the operational tests are repeated. The cumulative failure percent of each sample tested is added to that of the previous samples to obtain the cumulative failure percent for all the signals tested (cumulative sample size). Additional samples are tested and the tests repeated until either the accept or reject criterion for the cumulative sample size is met. If any signal in the sample explodes when fired or ignited in a way that could burn or otherwise injure the person firing it, the lot is rejected without further testing. (This procedure is diagrammed in figure 160.021-4(c)).

(2) *Test procedure.* Each sample signal (specimen) must be tested as follows:

(i) *Conditioning of test specimens—water resistance.* Immerse specimen horizontally with uppermost portion of the signal approximately 25 mm (1 in.) below the surface of the water for a period of 24 hours. If the signal is protected by alternate waterproofing consisting of a water-resistant coating on the signal plus packaging in a sealed plastic waterproof bag, the 24-hour water immersion conditioning will be conducted while the signal is in the sealed plastic waterproof bag and will be followed by an additional immersion of the bare signal (i.e., after removal from the bag) 25 mm (1 in.) below the surface of the water for a period of 10 minutes.

(ii) *Waterproofing of igniter button.* Remove the cap from the test specimen. Place head of specimen without cap about 25 mm (1 in.) under the surface of water for approximately 5 minutes. Remove specimen from the water and wipe dry.

(iii) *Ignition and burning characteristics.* Test specimens shall ignite and burn satisfactorily with uniform intensity when the directions on the signal are followed. Test specimens shall not ignite explosively in a manner that might be dangerous to the user or persons close by. The plug separating the flare composition from the handle shall in no case allow flame or hot gases to pass through it or between it and the casing in such manner as might burn the hand while holding the signal by the handle.

(iv) *Burning time.* The burning time of a specimen shall be obtained by stop watch measurements from the time a distinct sustained flame is emitted until it ceases. Test specimens shall burn in air not less than 2 minutes.

TABLE 160.021-4(C)(1)—ACCEPT AND REJECT CRITERIA FOR OPERATIONAL TEST LOTS.

Lot size	Individual sample size	Sample	Cumulative sample size	Accept ¹	Reject ¹
280 or less.	8	First	8	(?)	400
		Second	16	100	500
		Third	24	200	600
		Fourth ..	32	300	700
		Fifth	40	500	800
		Sixth	48	700	900
		Seventh	56	950	951
281 to 500.	13	First	13	0	400
		Second	26	100	600
		Third	39	300	800
		Fourth ..	52	500	1,000
		Fifth	65	700	1,100
		Sixth	78	1,000	1,200
		Seventh	91	1,350	1,351
501 to 1,200.	20	First	20	0	500
		Second	40	300	800
		Third	60	600	1,000
		Fourth ..	80	800	1,300
		Fifth	100	1,100	1,500
		Sixth	120	1,400	1,700
		Seventh	140	1,850	1,851
1,201 to 3,200.	32	First	32	100	700
		Second	64	400	1,000
		Third	96	800	1,300

TABLE 160.021-4(C)(1)—ACCEPT AND REJECT CRITERIA FOR OPERATIONAL TEST LOTS.—Continued

Lot size	Individual sample size	Sample	Cumulative sample size	Accept ¹	Reject ¹
More than 3,201.	50	Fourth ..	128	1,200	1,700
		Fifth	160	1,700	2,000
		Sixth	192	2,100	2,300
		Seventh	224	2,550	2,551
		First	50	200	900
		Second	100	700	1,400
		Third	150	1,300	1,900
		Fourth ..	200	1,900	2,500
		Fifth	250	2,500	2,900
		Sixth	300	3,100	3,300
		Seventh	350	3,750	3,751

¹ Cumulative failure percent.
² Lot may not be accepted. Next sample must be tested.

TABLE 160.021-4(C)(2)

Kind of defects	Percentage of failure
a. Failure to ignite	100
b. Ignites or burns dangerously	50
c. Nonuniform burning intensity	50
d. Chimneys so as to materially obscure the flame	25
e. Fire flashes down between casing and handle so as to endanger burning the hand	50
f. Burning time less than 70 pct of specified time ...	100
g. Burning time at least 70 pct but less than 80 pct of specified time	75
h. Burning time at least 80 pct but less than 90 pct of specified time	50
i. Burning time at least 90 pct but less than 100 pct of specified time	25

(d) *Technical tests.* Three signals must be subjected to each of the following tests. Two of the three signals must pass each test in order for the lot of signals to be accepted.

(1) *Underwater burning.* Condition each sample in accordance with paragraph (c)(2)(i) of this section. Ignite specimen and let it burn about 5 seconds in air. Submerge the burning signal in water in a vertical position with head down. Obtain under water burning time by stop watch measurement from time of submersion until distinct, sustained flame emission ceases. The test specimen shall burn under water not less than 5 seconds when subjected to this test.

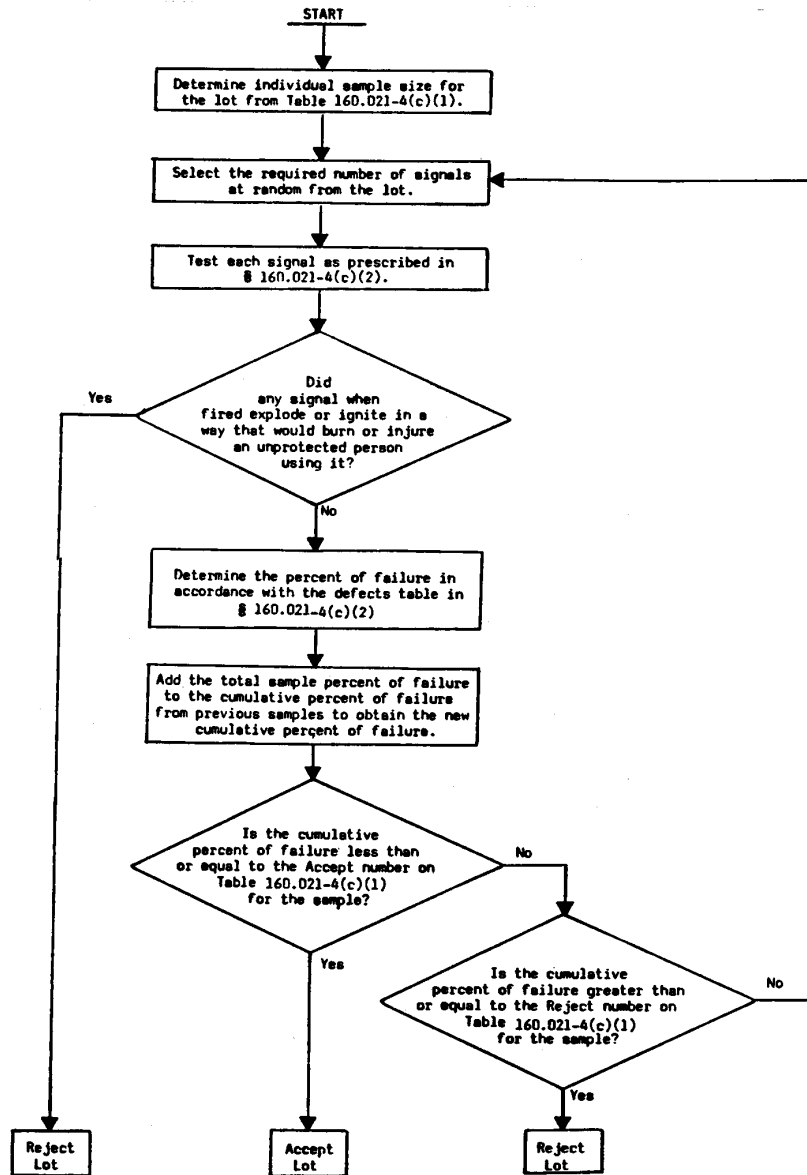


Figure 160.021-4(c). Operational test procedure.

(2) *Bending strength.* Place the specimens on supports 15 cm (6 in.) apart. Attach a weight of 35 kg (77 lb.) to a length of wire. Hang the weight from

the supported signal by looping the wire around the signal approximately

equidistant from the two points of support. Let the weight hang approximately 5 minutes. The test specimen shall not deflect more than 7 mm (1/4 in.), nor shall the joint between the casing and the handle fail, when subjected to this test.

(3) *Tensile strength.* Place the specimen in a chuck firmly holding it about 13 mm (1/2 in.) below the cap. Attach a weight of 35 kg (77 lb.) to a length of wire. Hang the weight from the supported signal by looping the wire through a hole bored perpendicular to and through the axis of the handle. Let the weight hang approximately 5 minutes. The test specimen shall not show noticeable distortion, nor shall the joint between the casing and handle fail, when subjected to this test.

(4) *Luminous intensity.* The luminous intensity of each specimen tested shall be measured by a visual photometer or equivalent photometric device, while the specimen is supported in a horizontal position and the photometer is at right angles to the axis of the specimen. Visual luminous intensity readings shall be observed and recorded at approximately 20 second intervals during the burning of the specimen. The minimum photometric distance shall be 3 m (10 ft.). Recording photometers shall have a chart speed of at least 25 mm (1 in.) per minute. The luminous intensity of specimen shall be computed as the arithmetical average of the readings recorded. The average luminous intensity of a test specimen shall be not less than 500 candela. The burning time of a specimen shall be obtained by stop watch measurements from the time distinct, sustained flame is emitted until it ceases. Test specimens shall burn in air not less than 2 minutes.

(5) *Elevated temperature, humidity and storage.* Place specimen in a thermostatically controlled even-temperature oven held at 75 °C. with not less than 90 percent relative humidity for 72 hours. Remove specimen and store at room temperature (20° to 25 °C.) with approximately 65 percent relative humidity for 10 days. If for any reason it is not possible to operate the oven continuously for the 72-hour period, it may be operated at the required temperature and humidity for 8 hours

out of each 24 during the 72-hour conditioning period. (Total of 24 hours on and 48 hours off.) The signal shall not ignite or decompose during this conditioning. The signal shall ignite and operate satisfactorily following this conditioning.

(6) *Spontaneous ignition.* Place the specimen in a thermostatically controlled even-temperature oven held at 75 °C. with not more than 10% relative humidity for 48 consecutive hours. The signals shall not ignite or undergo marked decomposition.

(7) *Chromaticity.* The color of the burning signal must be vivid red as defined by sections 13 and 14 of the "Color Names Dictionary." Two identical test plates of white cardboard about 30 cm × 60 cm (12"×24") are used. Except for a negligible amount of stray daylight, the first test plate is illuminated by light from the specimen placed at a distance of about 1.5 m (5 ft.). The second test plate is illuminated only by light from an incandescent lamp operated at a color temperature close to 2,848 °K at a distance of about 30 cm (1 ft.). The first plate is viewed directly, the second through combinations of Lovibond red, yellow, and blue glasses selected so as to approximate a chromaticity match. By separating the test plates by a wide unilluminated area (subtending at the observer about 45°), it is possible to make accurate determinations of chromaticity in terms of the 1931 CIE Standard Observer and Coordinate System, in spite of fluctuations in luminous intensity of the specimen by factors as high as 2 or 3. The CIE coordinates are converted to the Munsell notation which is cross-referenced to the color name in Section 13 of the "Color Names Dictionary" (see the discussion in section 10 of "The Universal Color Language").

(8) *Heptane ignition.* (i) A metal pan must be used to hold a layer of water at least 12mm (1/2 in.) deep with a layer of technical grade heptane on top of the water. The pan must be at least 1 m (39 in.) square with sides extending between 175 mm (7 in.) and 200 mm (8 in.) above the surface of the water. The amount of heptane used to form the layer must be 2.0 liters per square

meter of pan area (6.25 fluid ounces per square foot).

(ii) The test must be conducted in a draft-free location. The ambient temperature, the temperature of the water, and the temperature of the heptane must all be between 20 °C (68 °F) and 25 °C (77 °F) at the time of the test.

(iii) The signal under test must be held with the flame end pointing upward at an angle of approximately 45°, 1.2 m (4 ft.) directly above the center of the pan. The signal must be ignited as soon as the heptane is observed to spread out over the water in continuous layer. The signal must be allowed to burn completely, and must remain in position until it has cooled.

(iv) The heptane must not be ignited by the flare or by material from the flare.

CAUTION: Heptane ignites rapidly and burns vigorously. The flare should be remotely ignited and all personnel should stay clear of the test pan while the flare is burning and while any part of it remains hot.

[CGD 76-048a and 76-048b, 44 FR 73060, Dec. 17, 1979, as amended by CGD 80-021, 45 FR 45280, July 3, 1980]

§ 160.021-5 Labeling and marking.

(a) *Labeling.* Each hand red flare distress signal shall bear a label securely affixed thereto, showing in clear, indelible black lettering on a red background, the following wording and information:

(Company brand or style designation)

Hand Red Flare Distress Signal

500 Candela—2 Minutes Burning Time

USE ONLY WHEN AIRCRAFT OR VESSEL IS SIGHTED

DIRECTIONS: Pull tape over top of cap. Remove cap and ignite flare by rubbing scratch surface on top of cap sharply across igniter button on head of signal.

CAUTION: Stand with back to wind and point away from body when igniting or flare is burning.

Service Life Expiration Date (Month and year to be inserted by manufacturer) (Month and year manufactured) (Lot No. ____). Manufactured by (Name and address of manufacturer). U.S. Coast Guard Approval No. ____

(b) *Marking of expiration date.* The expiration date must be not more than 42 months from the date of manufacture.

(c) *Other marking.* (1) There shall be die-stamped, in the side of the wooden handle in figures not less than 3 mm (C¹/₈ in.) high, numbers indicating the month and year of manufacture, thus: "6-54" indicating June, 1954.

(2) In addition to any other marking placed on the smallest packing carton or box containing hand red flare distress signals, such cartons or boxes shall be plainly and permanently marked to show the service life expiration date, date of manufacture, and lot number.

(3) The largest carton or box in which the manufacturer ships signals must be marked with the following or equivalent words: "Keep under cover in a dry place."

NOTE: Compliance with the labeling requirements of this section does not relieve the manufacturer of the responsibility of complying with the label requirements of 15 U.S.C. 1263, the Federal Hazardous Substances Act.

§ 160.021-6 Container.

(a) *General.* Containers for stowage of hand red flare distress signals in lifeboats and life rafts on merchant vessels are not required to have specific approval or to be of special design, but they shall meet the following test for watertightness when closed, and shall be capable of being opened and reclosed hand-tight to meet the same watertightness test. The materials shall be copper, brass, bronze, or equally corrosion-resistant to salt water and spray. The type container illustrated by Figure Number 160.021-6(a) is recommended for most purposes.

(b) *Watertightness test for containers.* Whenever a question arises as to the watertightness of a container, the following test may be made to determine whether it is satisfactory in this respect. Open the container, remove the contents, insert colored blotting paper as a lining, re-close container as tightly as possible by hand (no wrenches or special tools permitted), submerge container with top about 30 cm (1 ft.) below the surface of the water for two hours, remove container from water, wipe off excess moisture on outside,

then open the container and examine the blotting paper and entire interior for evidence of moisture penetration. If any moisture or water is evidenced, the container is not satisfactory.

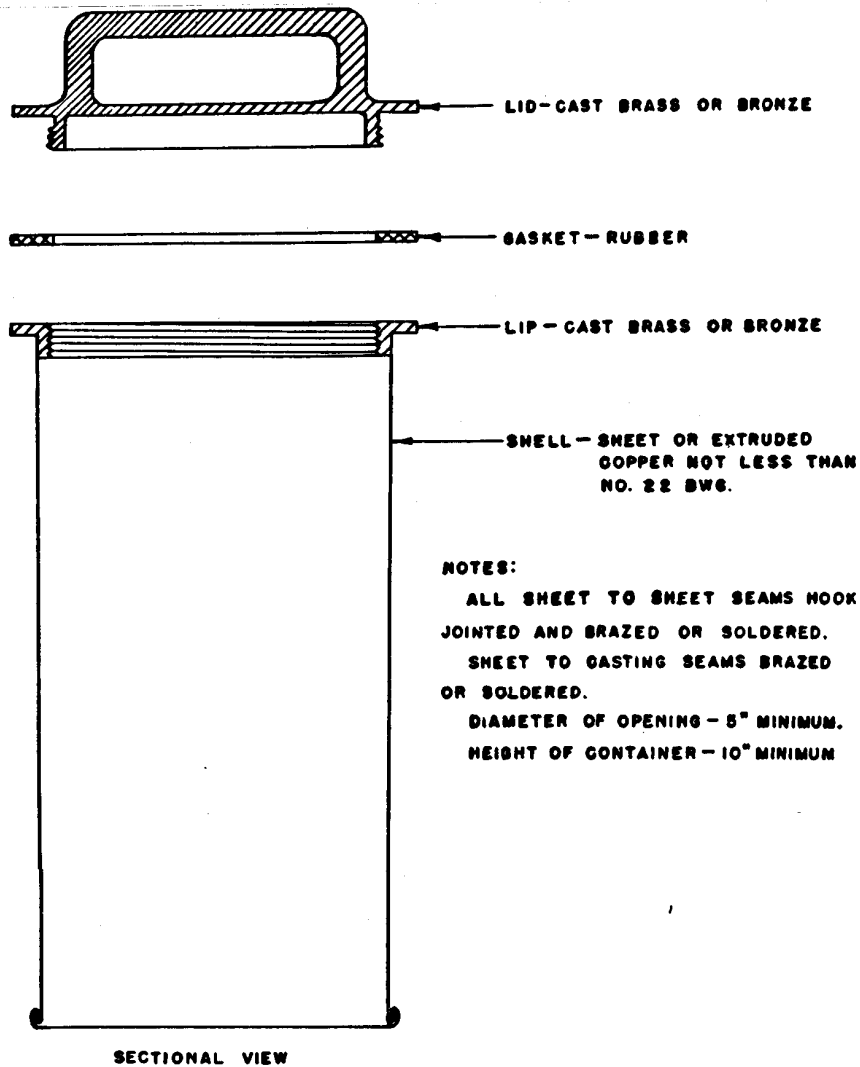


Figure 160.021-6(a). Watertight Container for Hand Red Flare Distress Signals.

(c) *Marking of container.* Containers shall be embossed or bear a brass or equivalent corrosion-resistant nameplate, or otherwise be suitably and permanently marked, to plainly show in letters not less than 13 mm (½ in.) high the following wording: "HAND RED FLARE DISTRESS SIGNALS". No additional marking which might cause confusion as to the contents shall be permitted. The vessel's name ordinarily is painted or branded on equipment such as this container, and nothing in this subpart shall be construed as prohibiting same.

§ 160.021-7 Procedure for approval.

(a) Signals are approved by the Coast Guard under the procedures in subpart 159.005 of this chapter.

(b) [Reserved]

Subpart 160.022—Floating Orange Smoke Distress Signals (5 Minutes)

SOURCE: CGD 76-048a and 76-048b, 44 FR 73067, Dec. 17, 1979, unless otherwise noted.

§ 160.022-1 Incorporations by reference.

(a) The following are incorporated by reference into this subpart:

(1) "The Color Names Dictionary" in *Color: Universal Language and Dictionary of Names*, National Bureau of Standards Special Publication 440, December 1976.

(2) "Development of a Laboratory Test for Evaluation of the Effectiveness of Smoke Signals," National Bureau of Standards Report 4792, July 1956.

(b) NBS Special Publication 440 may be obtained by ordering from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (Order by SD Catalog No. C13.10:440).

(c) NBS Report 4792 may be obtained from the Commandant (G-MSE), U.S. Coast Guard, Washington, DC 20593-0001.

(d) Approval to incorporate by reference the materials listed in this section was obtained from the Director of the Federal Register on November 1

and 29, 1979. The materials are on file in the Federal Register Library.

[CGD 76-048a and 76-048b, 44 FR 73067, Dec. 17, 1979, as amended by CGD 82-063b, 48 FR 4782, Feb. 3, 1983; CGD 88-070, 53 FR 34535, Sept. 7, 1988; CGD 95-072, 60 FR 50467, Sept. 29, 1995; CGD 96-041, 61 FR 50733, Sept. 27, 1996]

§ 160.022-2 Type.

(a) Floating orange smoke distress signals, specified by this subpart shall be of one type which shall consist essentially of an outer container, ballast, an air chamber, an inner container, the smoke producing composition, and an igniter mechanism. Alternate arrangements which conform to the performance requirements of this specification will be given special consideration.

(b) [Reserved]

§ 160.022-3 Materials, workmanship, construction, and performance requirements.

(a) *Materials.* The materials shall conform strictly to the specifications and drawings submitted by the manufacturer and approved by the Commandant. Metal for containers shall be not less than 0.5 mm (0.020 in.) in thickness. Other dimensions or materials may be considered upon special request when presented with supporting data. Igniter systems shall be corrosion-resistant metal. The combustible material shall be of such nature that it will not deteriorate during long storage, nor when subjected to frigid or tropical climates, or both.

(b) *Workmanship.* Floating orange smoke distress signals shall be of first class workmanship and shall be free from imperfections of manufacture affecting their appearance or that may affect their serviceability.

(c) *Construction.* The outer container shall be of a size suitable for its intended use. All sheet metal seams should be hook-jointed and soldered. The whole container shall be covered with two coats of waterproof paint or equivalent protection system. The igniter mechanism shall be simple to operate and provide ignition in most unfavorable weather. The mechanism shall be protected with a watertight cover having a finish which is corrosion-resistant to salt water and spray. The cover shall be easily and quickly