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Title 33 – Navigation and Navigable Waters
Chapter I – Coast Guard, Department of Homeland Security
Subchapter E – Inland Navigation Rules

Part 84 Annex I: Positioning and Technical Details of Lights and Shapes

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PART 84—ANNEX I: POSITIONING AND TECHNICAL DETAILS OF LIGHTS AND SHAPES

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§ 84.01 Definitions.

- (a) The term *height above the hull* means height above the uppermost continuous deck. This height shall be measured from the position vertically beneath the location of the light.
- (b) *High-speed craft* means a craft capable of maximum speed in meters per second (m/s) equal to or exceeding: $3.7\sqrt[0.1667]{\nabla}$; where ∇ = displacement corresponding to the design waterline (cubic meters).

Note to paragraph (b): The same formula expressed in pounds and knots is maximum speed in

knots (kts) equal to exceeding 1.98 (lbs) $3.7\Delta^{0.1667}$; where Δ = displacement corresponding to design waterline in pounds.

- (c) The term *practical cut-off* means, for vessels 20 meters or more in length, 12.5 percent of the minimum luminous intensity (Table 84.14(b)) corresponding to the greatest range of visibility for which the requirements of Annex I (33 CFR part 84) are met.
- (d) The term *Rule* or *Rules* has the same meaning as in 33 CFR 83.03(r).

§ 84.02 Vertical positioning and spacing of lights.

- (a) On a power-driven vessel of 20 meters or more in length the masthead lights shall be placed as follows:
 - (i) The forward masthead light, or if only one masthead light is carried, then that light, at a height above the hull of not less than 5 meters, and, if the breadth of the vessel exceeds 5 meters, then at a height above the hull not less than such breadth, so however that the light need not be placed at a greater height above the hull than 8 meters.
 - (ii) When two masthead lights are carried the after one shall be at least 2 meters vertically higher than the forward one.
- (b) The vertical separation of the masthead lights of power-driven vessels shall be such that in all normal conditions of trim the after light will be seen over and separate from the forward light at a distance of 1000 meters from the stem when viewed from water level.
- (c) The masthead light of a power-driven vessel of 12 meters but less than 20 meters in length shall be placed at a height above the gunwale of not less than 2.5 meters.
- (d) The masthead light, or the all-round light described in Rule 23(d) (§ 83.23(d) of this chapter), of a power-driven vessel of less than 12 meters in length shall be carried at least one meter higher than the sidelights.
- (e) One of the two or three masthead lights prescribed for a power-driven vessel when engaged in towing or pushing another vessel shall be placed in the same position as either the forward masthead light or the after masthead light, provided that the lowest after masthead light shall be at least 2 meters vertically higher than the highest forward masthead light.
- (f)
 - (i) The masthead light or lights prescribed in Rule 23(a) (§ 83.23(a) of this chapter) shall be so placed as to be above and clear of all other lights and obstructions except as described in paragraph (f)(ii) of this section.
 - (ii) When it is impracticable to carry the all-round lights prescribed in Rule 27(b)(i) (§ 83.27(b)(i) of this chapter) below the masthead lights, they may be carried above the after masthead light(s) or vertically in between the forward masthead light(s) and after masthead light(s), provided that in the latter case the requirement of § 84.03(c) shall be complied with.
- (g) The sidelights of a power-driven vessel shall be placed at least one meter lower than the forward masthead light. They shall not be so low as to be interfered with by deck lights.
- (h) [Reserved]

- (i) When the Rules in this subchapter E prescribe two or three lights to be carried in a vertical line, they shall be spaced as follows:
 - (i) On a vessel of 20 meters in length or more such lights shall be spaced not less than 1 meter apart, and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 4 meters above the hull.
 - (ii) On a vessel of less than 20 meters in length such lights shall be spaced not less than 1 meter apart and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 2 meters above the gunwale.
 - (iii) When three lights are carried they shall be equally spaced.
- (j) The lower of the two all-round lights prescribed for a vessel when engaged in fishing shall be at a height above the sidelights not less than twice the distance between the two vertical lights.
- (k) The forward anchor light prescribed in Rule 30(a)(i) (§ 83.30(a)(i)), when two are carried, shall not be less than 4.5 meters above the after one. On a vessel of 50 meters or more in length this forward anchor light shall be placed at a height or not less than 6 meters above the hull.

[79 FR 37921, July 2, 2014, as amended by USCG-2012-0102, 79 FR 68622, Nov. 18, 2014; USCG-2015-0433, 80 FR 44280, July 27, 2015]

§ 84.03 Horizontal positioning and spacing of lights.

- (a) Except as specified in paragraph (e) of this section, when two masthead lights are prescribed for a power-driven vessel, the horizontal distance between them must not be less than one quarter of the length of the vessel but need not be more than 50 meters. The forward light must be placed not more than one half of the length of the vessel from the stem.
- (b) On a power-driven vessel of 20 meters or more in length the sidelights shall not be placed in front of the forward masthead lights. They shall be placed at or near the side of the vessel.
- (c) When the lights prescribed in Rule 27(b)(i) (§ 83.27(b)(i) of this chapter) are placed vertically between the forward masthead light(s) and the after masthead light(s), these all-round lights shall be placed at a horizontal distance of not less than 2 meters from the fore and aft centerline of the vessel in the athwartship direction.
- (d) When only one masthead light is prescribed for a power-driven vessel, this light must be exhibited forward of amidships. For a vessel of less than 20 meters in length, the vessel shall exhibit one masthead light as far forward as is practicable.
- (e) On power-driven vessels 50 meters but less than 60 meters in length operated on the Western Rivers, and those waters specified in § 89.25 of this chapter, the horizontal distance between masthead lights shall not be less than 10 meters.

§ 84.04 Details of location of direction-indicating lights for fishing vessels, dredgers and vessels engaged in underwater operations.

- (a) The light indicating the direction of the outlying gear from a vessel engaged in fishing as prescribed in Rule 26(c)(ii) (§ 83.26(c)(ii) of this chapter) shall be placed at a horizontal distance of not less than 2 meters and not more than 6 meters away from the two all-round red and white lights. This light shall be placed not higher than the all-round white light prescribed in Rule 26(c)(i)(§ 83.26(c)(i) of this chapter) and not lower than the sidelights.
- (b) The lights and shapes on a vessel engaged in dredging or underwater operations to indicate the obstructed side and/or the side on which it is safe to pass, as prescribed in Rule 27(d)(i) and (ii)(§ 83.27(d)(i) and (ii) of this chapter), shall be placed at the maximum practical horizontal distance, but in no case less than 2 meters, from the lights or shapes prescribed in Rule 27(b)(i) and (ii)(§ 83.27(b)(i) and (ii) of this chapter). In no case shall the upper of these lights or shapes be at a greater height than the lower of the three lights or shapes prescribed in Rule 27(b)(i) and (ii) (§ 83.27(b)(i) and (ii) of this chapter).

§ 84.05 Screens.

- (a) The sidelights of vessels of 20 meters or more in length shall be fitted with matt black inboard screens and meet the requirements of § 84.15. On vessels of less than 20 meters in length, the sidelights, if necessary to meet the requirements of § 84.15, shall be fitted with matt black inboard screens. With a combined lantern, using a single vertical filament and a very narrow division between the green and red sections, external screens need not be fitted.
- (b) On power-driven vessels less than 12 meters in length constructed after July 31, 1983, the masthead light, or the all-round light described in Rule 23(d)(§ 83.23(d) of this chapter) shall be screened to prevent direct illumination of the vessel forward of the operator's position.

§ 84.06 Shapes.

- (a) Shapes shall be black and of the following sizes:
 - (i) A ball shall have a diameter of not less than 0.6 meter.
 - (ii) A cone shall have a base diameter of not less than 0.6 meters and a height equal to its diameter.
 - (iii) A diamond shape shall consist of two cones (as defined in paragraph (a)(ii) of this section) having a common base.
- (b) The vertical distance between shapes shall be at least 1.5 meters.
- (c) In a vessel of less than 20 meters in length shapes of lesser dimensions but commensurate with the size of the vessel may be used and the distance apart may be correspondingly reduced.

§ 84.13 Color specification of lights.

- (a) The chromaticity of all navigation lights shall conform to the following standards, which lie within the boundaries of the area of the diagram specified for each color by the International Commission on Illumination (CIE), in the "Colors of Light Signals", which is incorporated by reference. It is Publication CIE No. 2.2. (TC-1.6), 1975, and is available from the Illumination Engineering Society, 345 East 47th Street, New York, NY 10017 and is available for inspection at the Coast Guard, Shore Infrastructure Logistics Center, Aids to Navigation and Marine Environmental Response Product Line (CG-SILC-ATON/MER), 2703 Martin Luther King, Jr. Ave, Mailstop 7714, Washington, DC 20593-7714. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this

material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html. This incorporation by reference was approved by the Director of the Federal Register.

(b) The boundaries of the area for each color are given by indicating the corner co-ordinates, which are as follows:

(i) **White:**

x 0.525 0.525 0.452 0.310 0.310 0.443

y 0.382 0.440 0.440 0.348 0.283 0.382

(ii) **Green:**

x 0.028 0.009 0.300 0.203

y 0.385 0.723 0.511 0.356

(iii) **Red:**

x 0.680 0.660 0.735 0.721

y 0.320 0.320 0.265 0.259

(iv) **Yellow:**

x 0.612 0.618 0.575 0.575

y 0.382 0.382 0.425 0.406

§ 84.14 Intensity of lights.

(a) The minimum luminous intensity of lights shall be calculated by using the formula:

$$I = 3.43 \times 10^6 \times T \times D^2 \times K^{-D}$$

Where:

I is luminous intensity in candelas under service conditions,

T is threshold factor 2×10^{-7} lux,

D is range of visibility (luminous range) of the light in nautical miles,

K is atmospheric transmissivity. For prescribed lights the value of K shall be 0.8, corresponding to a meteorological visibility of approximately 13 nautical miles.

(b) A selection of figures derived from the formula is given in the following table (Table 84.14(b)):

Table 84.14(b)

Range of visibility (luminous range) of light in nautical miles D	Minimum luminous intensity of light in candelas for $K = 0.8 I$
1	0.9
2	4.3
3	12
4	27
5	52
6	94

§ 84.15 Horizontal sectors.

(a)

- (i) In the forward direction, sidelights as fitted on the vessel shall show the minimum required intensities. The intensities shall decrease to reach practical cut-off between 1 and 3 degrees outside the prescribed sectors.
- (ii) For sternlights and masthead lights and at 22.5 degrees abaft the beam for sidelights, the minimum required intensities shall be maintained over the arc of the horizon up to 5 degrees within the limits of the sectors prescribed in Rule 21 (§ 83.21 of this chapter). From 5 degrees within the prescribed sectors the intensity may decrease by 50 percent up to the prescribed limits; it shall decrease steadily to reach practical cut-off at not more than 5 degrees outside the prescribed sectors.

(b)

- (i) All-round lights shall be so located as not to be obscured by masts, topmasts or structures within angular sectors of more than 6 degrees, except anchor lights prescribed in Rule 30 (§ 83.30 of this chapter), which need not be placed at an impracticable height above the hull, and the all-round white light described in Rule 23(e) (§ 83.23(e) of this chapter), which may not be obscured at all.
- (ii) If it is impracticable to comply with paragraph (b)(i) of this section by exhibiting only one all-round light, two all-round lights shall be used suitably positioned or screened to appear, as far as practicable, as one light at a minimum distance of one nautical mile.

Note 1 to paragraph (b)(ii): Two unscreened all-round lights that are 1.28 meters apart or less will appear as one light to the naked eye at a distance of one nautical mile.

[79 FR 37921, July 2, 2014, as amended by USCG-2016-0498, 82 FR 35080, July 28, 2017]

§ 84.16 Vertical sectors.

- (a) The vertical sectors of electric lights as fitted, with the exception of lights on sailing vessels underway and on unmanned barges, shall ensure that:
 - (i) At least the required minimum intensity is maintained at all angles from 5 degrees above to 5 degrees below the horizontal;

- (ii) At least 60 percent of the required minimum intensity is maintained from 7.5 degrees above to 7.5 degrees below the horizontal.
- (b) In the case of sailing vessels underway, the vertical sectors of electric lights, as fitted, shall ensure that:
 - (i) At least the required minimum intensity is maintained at all angles from 5 degrees above to 5 degrees below the horizontal;
 - (ii) At least 50 percent of the required minimum intensity is maintained from 25 degrees above to 25 degrees below the horizontal.
- (c) In the case of unmanned barges the minimum required intensity of electric lights as fitted shall be maintained on the horizontal.
- (d) In the case of lights other than electric lights these specifications shall be met as closely as possible.

§ 84.17 Intensity of non-electric lights.

Non-electric lights shall so far as practicable comply with the minimum intensities, as specified in the Table 84.14(b).

§ 84.18 Maneuvering light.

Notwithstanding the provisions of § 84.02(f), the maneuvering light described in Rule 34(b)(§ 83.34(b) of this chapter) shall be placed approximately in the same fore and aft vertical plane as the masthead light or lights and, where practicable, at a minimum height of one-half meter vertically above the forward masthead light, provided that it shall be carried not less than one-half meter vertically above or below the after masthead light. On a vessel where only one masthead light is carried the maneuvering light, if fitted, shall be carried where it can best be seen, not less than one-half meter vertically apart from the masthead light.

§ 84.19 High-speed craft.

- (a) The masthead light of high-speed craft may be placed at a height related to the breadth of the craft lower than that prescribed in § 84.02(a)(i), provided that the base angle of the isosceles triangle formed by the sidelights and masthead light, when seen in end elevation is not less than 27°.
- (b) On high-speed craft of 50 meters or more in length, the vertical separation between foremast and mainmast light of 4.5 meters required by § 84.02(k) may be modified provided that such distance shall not be less than the value determined by the following formula:

$$y = \frac{(a + 17\Psi)C}{1000} + 2 ;$$

Where:

y is the height of the mainmast light above the foremast light in meters;

a is the height of the foremast light above the water surface in service condition in meters;

Ψ is the trim in service condition in degrees;

C is the horizontal separation of masthead lights in meters.

Note to § 84.19: Refer to the International Code of Safety for High-Speed Craft, 1994 and the International Code of Safety for High-Speed Craft, 2000.

§ 84.20 Approval.

The construction of lights and shapes and the installation of lights on board the vessel must satisfy the Commandant, U.S. Coast Guard.