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## Annex I

### Positioning and Technical Details of Lights and Shapes

#### 1. Definition

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.

#### 2. 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 6 meters, and, if the breadth of the vessel exceeds 6 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 12 meters;

(ii) when two masthead lights are carried the after one shall be at least 4.5 meters vertically higher than the forward one.

(b) The vertical separation of 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 sea 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) A power-driven vessel of less than 12 meters in length may carry the uppermost light at a height of less than 2.5 meters above the gunwale. When, however, a masthead light is carried in addition to sidelights and a sternlight or the all-round light prescribed in rule 23(d)(i) is carried in addition to sidelights, then such masthead light or all-round light shall be carried at least 1 meter higher than the sidelights.

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(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, if carried on the aftermast, the lowest after masthead light shall be at least 4.5 meters vertically higher than the forward masthead light.

(f) (i) The masthead light or lights prescribed in Rule 23(a) shall be so placed as to be above and clear of all other lights and obstructions except as described in subparagraph (ii).

(ii) When it is impracticable to carry the all-round lights prescribed by Rule 27(b)(i) or Rule 28 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 Section 3(c) of this Annex shall be complied with.

(g) The sidelights of a power-driven vessel shall be placed at a height above the hull not greater than three quarters of that of the forward masthead light. They shall not be so low as to be interfered with by deck lights.

(h) The sidelights, if in a combined lantern and carried on a power-driven vessel of less than 20 meters in length, shall be placed not less than 1 meter below the masthead light.

(i) When the Rules 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 2 meters 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), 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 of not less than 6 meters above the hull.

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### **3. Horizontal positioning and spacing of lights**

(a) When two masthead lights are prescribed for a power-driven vessel, the horizontal distance between them shall not be less than one half of the length of the vessel but need not be more than 100 meters. The forward light shall be placed not more than one quarter 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) or Rule 28 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 shall be exhibited forward of amidships; except that a vessel of less than 20 meters in length need not exhibit this light forward of amidships but shall exhibit it as far forward as is practicable.

### **4. 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) 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) 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), 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 (i). 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).

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### 5. Screens for sidelights

The sidelights of vessels of 20 meters or more in length shall be fitted with inboard screens painted matt black, and meeting the requirements of Section 9 of this Annex. On vessels of less than 20 meters in length the sidelights, if necessary to meet the requirements of Section 9 of this Annex, shall be fitted with inboard matt black 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.

### 6. 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 meter and a height equal to its diameter;

(iii) a cylinder shall have a diameter of at least 0.6 meter and a height of twice its diameter;

(iv) a diamond shape shall consist of two cones as defined in (ii) above having a common base.

(b) The vertical distance between shapes shall be at least 1.5 meter.

(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.

### 7. Color specification of lights

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).

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The boundaries of the area for each color are given by indicating the corner coordinates, 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

### 8. 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  $2 \times 10^{-7}$  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:

<i>Range of visibility (luminous range) of light in nautical miles</i>	<i>Luminous intensity of light in candelas for K = 0.8</i>
<b>D</b>	<b>I</b>
1	0.9
2	4.3
3	12
4	27
5	52
6	94

*Note: The maximum luminous intensity of navigation lights should be limited to avoid undue glare. This shall not be achieved by a variable control of the luminous intensity.*

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### 9. 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  $1^{\circ}$  and  $3^{\circ}$  outside the prescribed sectors.
- (ii) For sternlights and masthead lights and at  $22.5^{\circ}$  abaft the beam for sidelights, the minimum required intensities shall be maintained over the arc of the horizon up to  $5^{\circ}$  within the limits of the sectors prescribed in Rule 21. From  $5^{\circ}$  within the prescribed sectors the intensity may decrease by 50% up to the prescribed limits; it shall decrease steadily to reach practical cut-off at not more than  $5^{\circ}$  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  $6^{\circ}$ , except anchor lights prescribed in Rule 30, which need not be placed at an impracticable height above the hull.

(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 so that they appear, as far as practicable, as one light at a distance of one mile.

### 10. Vertical sectors

- (a) The vertical sectors of electric lights as fitted, with the exception of lights on sailing vessels underway, shall ensure that:
- (i) at least the required minimum intensity is maintained at all angles from  $5^{\circ}$  above to  $5^{\circ}$  below the horizontal;
- (ii) at least 60% of the required minimum intensity is maintained from  $7.5^{\circ}$  above to  $7.5^{\circ}$  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  $5^{\circ}$  above to  $5^{\circ}$  below the horizontal;
- (ii) at least 50% of the required minimum intensity is maintained from  $25^{\circ}$  above to  $25^{\circ}$  below the horizontal.
- (c) In the case of lights other than electric these specifications shall be met as closely as possible.

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### 11. Intensity of non-electric lights

Non-electric lights shall so far as practicable comply with the minimum intensities, as specified in the Table given in Section 8 of this Annex.

### 12. Maneuvering light

Notwithstanding the provisions of paragraph 2(f) of this annex, the maneuvering light described in Rule 34(b) shall be placed in the same fore and aft vertical plane as the masthead light or lights and, where practicable, at a minimum height of 2 meters vertically above the forward masthead light, provided that it shall be carried not less than 2 meters 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 2 meters vertically apart from the masthead light.

### 13. 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 paragraph 2(a)(i) of this annex, provided that the base angle of the isosceles triangles 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 paragraph 2(a)(ii) of this annex 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;
- $\Psi$  is the trim in service conditions in degrees;
- C is the horizontal separation of masthead lights in meters.

\*Refer to the International Code of Safety for High-Speed Craft, 1994 and the International Code of Safety for High-Speed Craft, 2000.

### 14. Approval

The construction of lights and shapes and the installation of lights on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel is entitled to fly.

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## Annex II

### Additional Signals for Fishing Vessels Fishing in Close Proximity

#### 1. General

The lights mentioned herein shall, if exhibited in pursuance of Rule 26(d), be placed where they can best be seen. They shall be at least 0.9 meter apart but at a lower level than lights prescribed in Rule 26(b)(i) and (c)(i). The lights shall be visible all around the horizon at a distance of at least 1 mile but at a lesser distance than the lights prescribed by these Rules for fishing vessels.

#### 2. Signals for trawlers

(a) Vessels of 20 meters or more in length when engaged in trawling, whether using demersal or pelagic gear, shall exhibit:

- (i) when shooting their nets: two white lights in a vertical line;
- (ii) when hauling their nets: one white light over one red light in a vertical line;
- (iii) when the net has come fast upon an obstruction: two red lights in a vertical line.

(b) Each vessel of 20 meters or more in length engaged in pair trawling shall exhibit:

- (i) by night, a searchlight directed forward and in the direction of the other vessel of the pair;
- (ii) when shooting or hauling their nets or when their nets have come fast upon an obstruction, the lights prescribed in 2(a) above.

(c) A vessel of less than 20 meters in length engaged in trawling, whether using demersal or pelagic gear, or engaged in pair trawling, may exhibit the lights prescribed in paragraphs (a) or (b) of this section, as appropriate.

#### 3. Signals for purse seiners

Vessels engaged in fishing with purse seine gear may exhibit two yellow lights in a vertical line. These lights shall flash alternately every second and with equal light and occultation duration. These lights may be exhibited only when the vessel is hampered by its fishing gear.