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**GUIDELINES FOR THE DESIGN AND INSTALLATION OF A VISIBLE ELEMENT
TO THE GENERAL EMERGENCY ALARM ON PASSENGER SHIPS**

1 The Maritime Safety Committee, at its ninetieth session (16 to 25 May 2012), with a view to providing guidance on the addition of a visual element to the general emergency alarm system on passenger ships, as required by SOLAS regulation III/6.4.2, and following a recommendation made by the Sub-Committee on Ship Design and Equipment, at its fifty-fifth session, and the Sub-Committee on Fire Protection, at its fifty-fifth session, approved the annexed Guidelines for the design and installation of a visible element to the general emergency alarm on passenger ships.

2 Member Governments are invited to use the annexed Guidelines from 21 May 2012 when applying the relevant provisions of SOLAS regulation III/6.4.2 and to bring them to the attention of all parties concerned.

ANNEX

GUIDELINES FOR A VISUAL ELEMENT TO THE GENERAL EMERGENCY ALARM SYSTEM ON PASSENGER SHIPS

1 General

This document provides guidance on the addition of a visual element to the general emergency alarm system on passenger ships, as required by SOLAS regulation III/6.4.2, for the purpose of alerting persons who are deaf or hard of hearing while minimizing the possibility of triggering seizures in persons who have photosensitive epilepsy.

2 Definitions

2.1 *Effective intensity* is a measure of the brightness of a flashing light equivalent to the brightness of a steady-burning light as seen by a human observer. It is determined using specialized photometric equipment and reported in candela (cd).

2.2 *Field of view* is the line of sight over any 135° sector from any location.

2.3 *Flash rate* is the number of flashes per unit of time reported in Hertz (Hz).

2.4 *Illumination* is the amount of light incident on a surface measured in lumens per square metre.

2.5 *Photosensitive epilepsy* is a chronic neurological disorder characterized by recurrent seizures triggered by visual stimuli that form patterns in time or space, such as flashing lights, bold, regular patterns, or regular moving patterns.

2.6 *Polar diagram* is a graph employing polar coordinates to show the variation in effective intensity as a function of direction from the visual signal device.

2.7 *Public accommodation spaces* are those accommodation spaces for public use by passengers, such as public spaces, dining rooms, lounges, showrooms, public restrooms, corridors, lobbies, stairways, cinemas, gymnasiums, atriums, shops, and other similar spaces. It excludes cabins and associated balconies.

2.8 *Pulse duration* is the time interval between initial and final points of 10 per cent of maximum intensity of the flash.

2.9 *Synchronized* is appearing to occur at the same time as seen by a human observer.

2.10 *Visual signal* is the element of the general emergency alarm conveyed by regular repeated flashes of light.

3 Principal characteristics

3.1 The general emergency alarm system in all interior public accommodation spaces should have both a visual signal and an audible signal.

3.2 The visual signal should be integrated into the general emergency alarm system such that activation of the general emergency alarm results in the concurrent activation of both audible and visual signals without further action.

3.3 The device for producing the visual signal should have the same reliability and suitability for marine service as the other components of the general emergency alarm.

3.4 The visual signal should not interfere with the ability of the crew to safely navigate the ship at night.

3.5 The visual signal should be effective for alerting persons who are deaf or hard of hearing while minimizing the possibility of triggering seizures in passengers and crew who have photosensitive epilepsy. Visual signals with the following characteristics have been found to be acceptable* :

- .1 the lamp should be a xenon strobe type or equivalent;
- .2 the colour should be clear or nominal white;
- .3 the effective intensity should not exceed 1,000 cd;
- .4 the flash rate should not exceed two flashes per second (2 Hz) nor be less than one flash every second (1 Hz) throughout the design voltage range of the device; and
- .5 the maximum pulse duration should be 0.2 s with a maximum duty cycle of 40%.

3.6 To be effective, the visual signal device should comply with Table 1. This can be verified from a polar diagram of intensity and angles determined in accordance with an international or a national standard acceptable to the Administration.**

3.7 All visual signal devices within a field of view should be synchronized. This includes strobes operated by separate systems. The field of view includes viewing from an adjacent space. However, it is not necessary to synchronize visual signal devices and other strobes located in an adjacent main vertical zone (MVZ) due to a field of view extending through a doorway or other opening in the MVZ boundary, provided that the combined flash rate of all devices and strobes in such field of view does not exceed 4 Hz.

3.8 For spaces equipped with the means of subdividing into smaller spaces (e.g. with movable bulkheads), the visual signal should be effective in each of the smaller spaces when so subdivided.

Ceiling-mounted device		Bulkhead-mounted device			
Off-angle axis (degrees)	Minimum percentage of rated effective intensity	Vertical distribution (degrees)	Minimum percentage of rated effective intensity	Horizontal distribution (degrees)	Minimum percentage of rated effective intensity
0	100%	0	100%	0	100%
45	75%	30	90%	45	75%
90	25%	90	12%	90	25%

* These characteristics are the same as found in chapter 18 of NFPA 72-2010, *National Fire Alarm and Signaling Code* of the United States. Devices with similar characteristics are found in many commercial and public buildings in the United States.

** An example of such a standard is ANSI/UL 1971, *Standard for Signaling Devices for the Hearing Impaired* of the United States.

3.9 The visual signal should be designed and installed in such a manner to be quickly noticed by an alert person anywhere within the space. Either of the approaches in 4.1 or 4.2 or an equivalent standard acceptable to the Administration is suitable.

4 System design and arrangement

4.1 Performance approach

A suitable performance requirement is complete coverage of a space with a minimum illumination of 0.4036 lumens/m² as calculated at any point in the covered area, based on the use of the polar diagrams of the devices used.

4.2 Prescriptive approach

4.2.1 Visual signal devices should be located to provide complete coverage of the protected space.

4.2.1.1 The area of coverage of a bulkhead-mounted visual signal device is a rectangle with the device mounted halfway along one edge of the rectangle as shown in Figure 1. The maximum horizontal dimension (X) of the area of coverage for varying effective intensities is found in Table 2.

4.2.1.2 The area of coverage of a ceiling-mounted visual signal device is a square with the device located in the centre of the square as shown in Figure 1. The maximum horizontal dimension (X) of the area of coverage for varying effective intensities and lens heights is found in Table 3.

4.2.1.3 When the visual signal device is not mounted per 4.2.1.1 or 4.2.1.2, the maximum horizontal dimension (X) should be determined by doubling the distance from the device to the farthest edge of the area of coverage. The pertinent edge for a bulkhead-mounted device is the side edge, not the edge opposite the device.

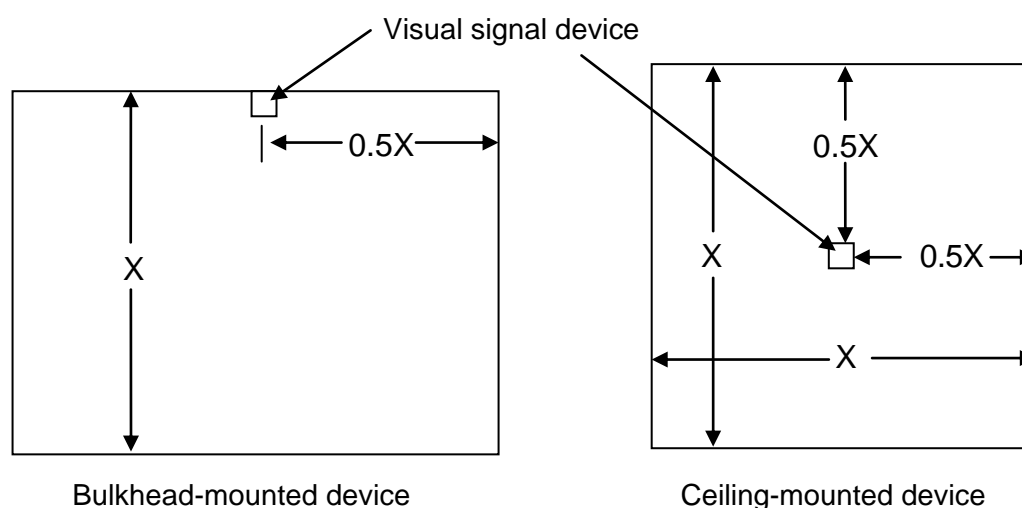


Figure 1 – Area of coverage

Table 2 – Maximum dimension versus effective intensity	
Maximum horizontal dimension (m)	Minimum effective intensity (cd)
6	15
8.5	30
9	33
10	41
11	50
12	59
13	69
14	80
15	92
16	104
17	118
18	132
19	147
20	162
21	179
22	197

		Lens height (m)															
		2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10
Maximum horizontal dimension (m)	5	15	15	15	15	15	15	17	20	22	25	29	32	36	40	44	48
	6	16	15	16	15	16	19	21	22	24	27	30	33	37	41	45	50
	7	21	21	20	21	20	21	23	27	28	30	31	35	39	42	47	51
	8	27	28	27	27	27	26	26	29	32	35	37	38	40	44	48	53
	9	35	35	34	33	35	34	33	33	34	38	42	45	47	49	51	55
	10	45	43	43	42	41	42	41	41	41	40	44	49	53	56	58	60
	11	55	51	53	51	50	51	50	49	49	49	47	51	56	61	66	68
	12	67	61	62	62	60	59	61	60	59	58	58	56	59	64	69	74
	13	80	73	72	73	72	70	70	71	70	69	68	68	66	67	72	77
	14	94	86	83	85	84	83	81	83	82	80	79	79	79	77	76	81
	15	109	100	95	97	96	96	94	93	95	93	92	91	91	91	88	86
	16	126	115	108	109	111	108	109	107	107	108	106	104	104	103	103	100
	17	142	132	124	123	125	122	123	122	120	122	121	119	118	117	117	116
	18	159	150	142	137	139	140	136	139	136	134	137	134	133	132	131	131
	19	177	169	159	154	154	157	152	153	153	151	151	152	149	147	147	146
	20	196	189	177	173	170	172	171	166	171	169	167	169	167	165	163	163
21	216	211	198	194	186	189	192	184	185	189	186	183	186	183	181	180	
22	237	233	219	212	208	206	209	205	200	205	206	203	203	203	200	198	
23	259	257	242	231	230	225	228	228	220	221	226	224	221	223	221	218	
24	281	282	266	252	253	246	247	250	243	237	242	246	243	240	243	240	
26	330	331	318	302	294	296	287	291	292	283	278	283	289	286	283	285	

^{***} The effective intensities are based on providing at least 0.405 lumens/m² at the middle of the bottom edge of the coverage area, 0.246 lumens/m² at the bottom of the corners, and 0.243 lumens/m² at a height of 1.5 m in the corners by a visual alarm device with the minimum distribution of effective intensities of ANSI/UL 1971, *Standard for Signaling Devices for the Hearing Impaired* of the United States.

4.2.2 Bulkhead-mounted visual signal devices should be mounted on the bulkhead such that the entire lens is not less than 2,030 mm and not greater than 2,440 mm above the deck surface. For spaces with multiple levels, the mounting height should be determined above the nearest deck surface.

4.2.2.1 If the bulkhead-mounted visual signal devices cannot be mounted at least 2,030 mm above the deck due to low ceiling height, the devices should be mounted within 150 mm of the ceiling. The maximum horizontal dimension (X) should be reduced by twice the difference between the actual mounting height and 2,030 mm.

4.2.3 Ceiling-mounted visual signal devices may be mounted on or suspended from the ceiling. If ceiling heights exceed 10 m, ceiling-mounted visual signal devices should be suspended at or below 10 m.

4.2.4 For corridors less than 6 m in width, the following specification may be used instead of 4.2.1.

4.2.4.1 The minimum effective intensity of the visual signal device should be 15 cd.

4.2.4.2 Visual signal devices should be located not more than 4 m from the end of the corridor with a separation not greater than 30.5 m between devices.

4.2.4.3 If there is an interruption of the concentrated viewing path, such as a fire door, an elevation change, or any other obstruction, the area should be treated as a separate corridor.

5 Testing requirements

5.1 After initial installation or modification, the system should be checked to verify proper operation including the following items:

- .1 that all visual signal devices operate upon activation of the general emergency alarm system; and
- .2 that all visual signal devices are synchronized as specified in 3.7.

5.2 The periodic testing of visual signal devices as part of the general emergency alarm system should be included in the maintenance plan required by SOLAS regulation II-2/14.2.2.