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| IALA RECOMMENDATION |

Document reference

Marine Signal Lights - Calculation, Definition and Notation of Luminous Range

Edition x.x

Document date

Revisions to this IALA document are to be noted in the table prior to the issue of a revised document.

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| Date | Page / Section Revised | Requirement for Revision |
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1 ACRONYMS 4

2 HEADING 1 5

2.1 Heading 2 5

2.1.1 HEADING 3 5

THE COUNCIL

**RECALLING** the function of IALA with respect to Safety of Navigation, the efficiency of maritime transport and the protection of the environment;

**RECOGNISING** the need to publish the performance of marine signal lights;

**RECOGNISING ALSO** the need to specify, design and quantify the performance of marine signal lights worldwide;

**NOTING** this document only applies to marine Aid-to-Navigation lights installed after the date of this publication;

**ADOPTS** the tables and charts in the annex of this recommendation; and,

**RECOMMENDS** that National Members, other appropriate Authorities and manufacturers providing marine aids to navigation services design, specify and publish the performance of marine Aid-to-Navigation signal lights in accordance with the Annex to this recommendation.

**RECOMMENDS AlSO** that the nominal range of lights intended for the guidance of shipping should be published in the “Lists of Lights”. The following information should be published:

* The nominal range of lights intended for the guidance of shipping by night;
* Where applicable, the nominal range of lights intended for the guidance of shipping by day;
* Nomograms permitting mariners to estimate the luminous range of lights intended for the guidance of shipping by day or by night as a function of their nominal range and the prevailing meteorological visibility.

1. Allard’s Law

All luminous range calculations are based on Allard’s law.

In the International System of units (SI) Allard’s law takes the following form:

Where:

*I* is the luminous intensity of the light [cd]

*Er* is the required illuminance at the eye of the observer [lx]

*D* is the luminous range in metres [m]

*V* is the meteorological visibility in metres [m]

A traditional form using nautical miles (M) is:

Where:

*I* is the luminous intensity of the light [cd]

*Er* is the required illuminance at the eye of the observer [lx]

*D* is the luminous range in nautical miles

*V* is the meteorological visibility in nautical miles

1. Nominal range

The nominal luminous range of a maritime signal light is the distance in nautical miles at which this light produces an illumination at the eye of the observer:

* of 2 × 10-7 lx for night time range
* of 1 × 10-3 lx for day time range

It is assumed that meteorological visibility V equals 10 nautical miles and that the atmosphere is homogenous.

1. LUMINOUS RANGE FOR NIGHT TIME

The chart is based on an illuminance is .



1. Luminous Range diagram - night time

COMMENT: Work to do for ENG5 remove background corrections

1. Night time nominal range table (rounded off to the nearest nautical mile)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Luminous  intensity | Nominal range (rounded) | Luminous intensity | Nominal range (rounded) | Luminous intensity | Nominal range (rounded) |
| candelas  (cd) | nautical miles (M) | kilocandelas  (103 cd) | nautical miles (M) | Megacandelas  (106 cd) | nautical miles (M) |
| 1 - 2 | 1 | 0.633 – 1.06 | 9 | 0.927 – 1.35 | 26 |
| 3 - 9 | 2 | 1.07 – 1.75 | 10 | 1.36 – 1.96 | 27 |
| 10 - 23 | 3 | 1.76 – 2.84 | 11 | 1.97 – 2.84 | 28 |
| 24 - 53 | 4 | 2.85 – 4.53 | 12 | 2.85 – 4.11 | 29 |
| 54 - 107 | 5 | 4.54 – 7.13 | 13 | 4.12 – 5.93 | 30 |
| 108 - 203 | 6 | 7.14 – 11.1 | 14 | 5.94 – 8.53 | 31 |
| 204 - 364 | 7 | 11.2 – 17.1 | 15 | 8.54 – 12.2 | 32 |
| 365 - 632 | 8 | 17.2 – 26.1 | 16 | 12.3 – 17.5 | 33 |
|  |  | 26.2 - 39.7 | 17 | 17.6 – 25.1 | 34 |
|  |  | 39.8 – 59.9 | 18 | 25.2 – 35.9 | 35 |
|  |  | 60.0 – 89.8 | 19 | 36.0 – 51.2 | 36 |
|  |  | 89.9 - 133 | 20 | 51.3 – 72.9 | 37 |
|  |  | 134 -198 | 21 | 73.0 - 103 | 38 |
|  |  | 199 - 293 | 22 | 104 -147 | 39 |
|  |  | 294 - 432 | 23 | 148 - 209 | 40 |
|  |  | 433 - 634 | 24 |  |  |
|  |  | 635 - 926 | 25 |  |  |

1. LUMINOUS RANGE FOR DAYTIME

The chart is based on an illuminance is .



1. Luminous range diagram – day time

COMMENT: Work to do for ENG5 remove auxiliary scale

1. Day time nominal range table (rounded off to the nearest nautical mile)

|  |  |  |  |
| --- | --- | --- | --- |
| Luminous  intensity | Nominal  range (rounded) | Luminous intensity | Nominal range (rounded) |
| kilocandelas  (103 cd) | nautical miles (M) | Megacandelas  (106 cd) | nautical miles (M) |
| 1 – 12.0 | 1 | 1.02 – 1.82 | 7 |
| 12.1 – 45.3 | 2 | 1.83 – 3.16 | 8 |
| 45.4 – 119 | 3 | 3.17 – 5.32 | 9 |
| 120 – 267 | 4 | 5.33 – 8.78 | 10 |
| 268 – 538 | 5 | 8.79 – 14.2 | 11 |
| 539 – 1010 | 6 | 14.3 – 22.6 | 12 |
|  |  | 22.7 – 35.6 | 13 |
|  |  | 35.7 – 55.5 | 14 |
|  |  | 55.6 – 85.6 | 15 |
|  |  | 85.7 – 130 | 16 |
|  |  | 131 – 198 | 17 |