IALA RECOMMENDATION (NORMATIVE)

R0202 (E200-2)
MARINE SIGNAL LIGHTS - CALCULATION, DEFINITION AND NOTATION OF LUMINOUS RANGE

Edition 2.1

December 2017

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International Association of Marine Aids to Navigation and Lighthouse Authorities
Association Internationale de Signalisation Maritime

DOCUMENT REVISION

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

Date	Details	Approval
December 2008	1st issue	Council 44
December 2017	Entire document: Review and alignment with IALA strategy. Document style updated.	Council 65
September 2020	Edition 2.1 Editorial corrections.	

THE COUNCIL

RECALLING:

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

2 Article 8 of the IALA Constitution regarding the authority, duties and functions of the Council;

RECOGNIZING

1 the need to publish the performance of marine signal lights;

2 the need to specify, design and quantify the performance of marine signal lights worldwide;

NOTING this Recommendation 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;

INVITES Members and marine aids to navigation authorities worldwide to implement the provisions of the Recommendation;

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 this Recommendation;
- that all luminous range calculations are based on Allard's law: $I = E_r * D^2 * 0.05^{-D/V}$

  Where: I is the luminous intensity of the light [cd]
  E_r 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]
- that the Nominal Range of a maritime signal light is calculated for a meteorological visibility of 10 nautical miles (18,520 m) and 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
- 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.

- that the intensity used for range calculation takes into account the influence of the flash character and profile (R0204(E-200-4) Marine Signal Lights – Determination and Calculation of Effective Intensity);
- that the calculation takes into account a service condition factor.

REQUESTS the IALA AtoN Engineering and Sustainability Committee or such other committee as the Council may direct to keep the Recommendation under review and to propose amendments, as necessary.

ANNEX A LUMINOUS RANGE NOMOGRAPHS AND TABLES

A.1. LUMINOUS RANGE FOR NIGHT TIME

The chart is based on an illuminance is $E_r = 2 * 10^{-7} lx$.

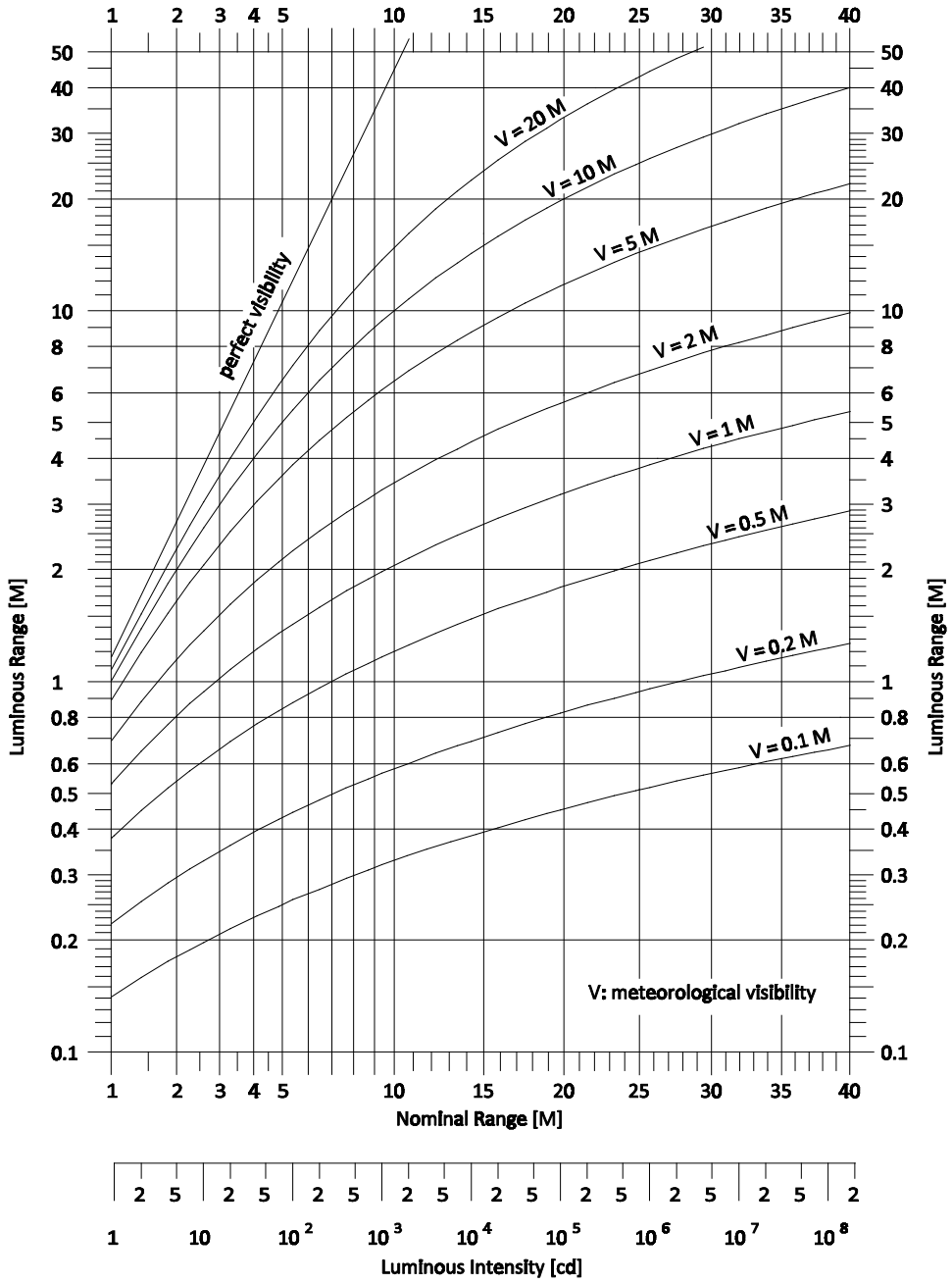

Figure 1 Luminous Range Diagram - Night Time

Table 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 (10^3 cd)	nautical miles (M)	Megacandelas (10^6 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		

A.2. LUMINOUS RANGE FOR DAYTIME

The chart is based on an illuminance is $E_r = 1 * 10^{-3} lx$.

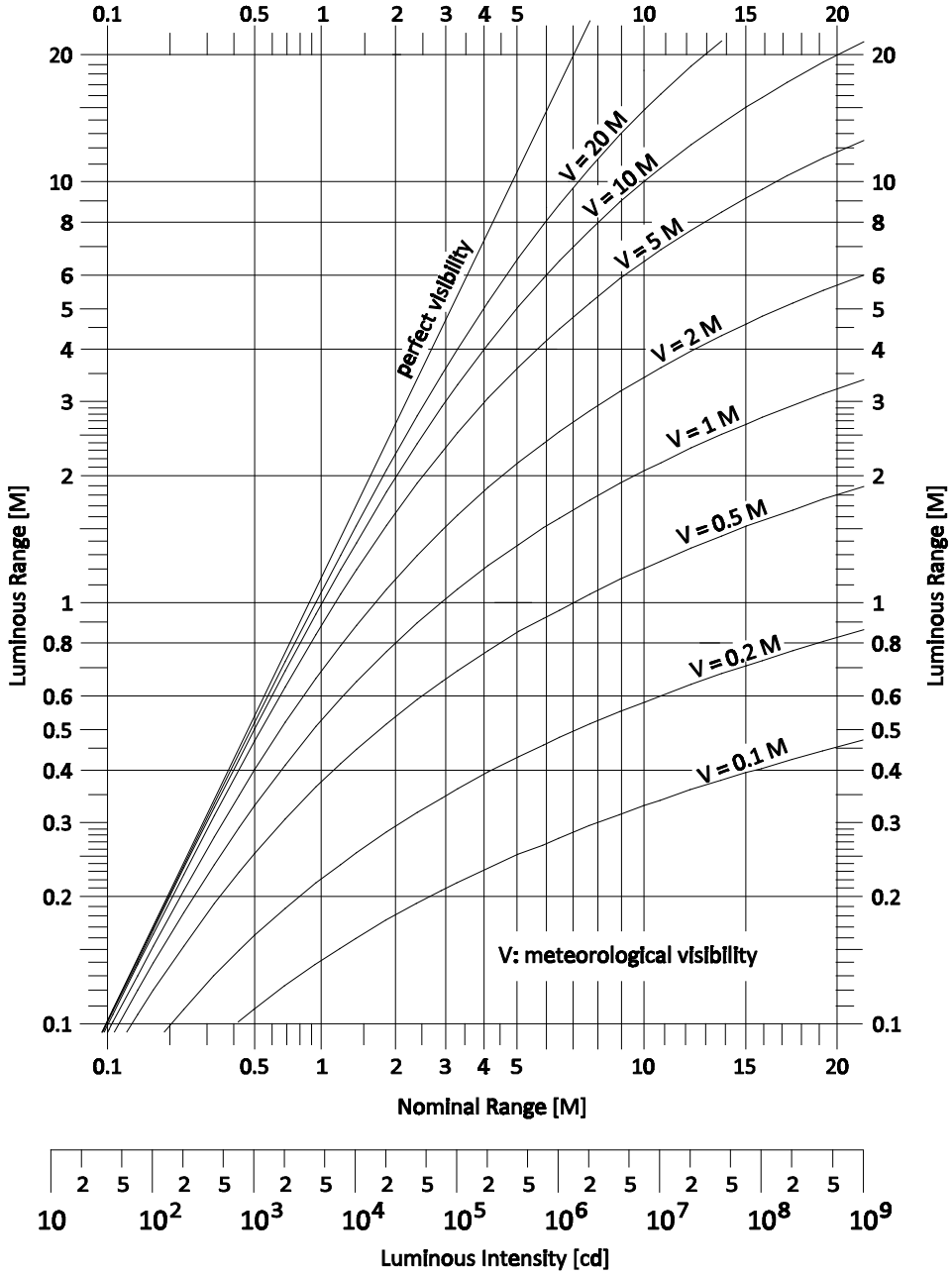

Figure 2 Luminous range diagram – day time

Table 2 Day time nominal range table (rounded off to the nearest nautical mile)

Luminous intensity	Nominal range (rounded)	Luminous intensity	Nominal range (rounded)
kilocandelas (10^3 cd)	nautical miles (M)	Megacandelas (10^6 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