

IALA Recommendation

E-200-0

On

Marine Signal Lights

Part 0 – Overview

Edition 1

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Document Revisions

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

| Date | Page / Section Revised | Requirement for Revision |
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Recommendation on Marine Signal Lights, Part 0 - Overview **(Recommendation E-200-0)**

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 provide guidance for

- acceptable marine signal light colours,
- the calculation and reporting of a light's luminous range,
- the measurement of optical performance,
- the determination and calculation of effective intensity, and
- the calculation of the performance of light apparatus;

RECOGNISING ALSO the importance of uniformity in the measurement, calculation, reporting, and characteristics of marine signal lights;

RECOGNISING FURTHER the need to update older IALA recommendations to accommodate new light technologies;

NOTING that this recommendation replaces:

- IALA Recommendation for the Notation of Luminous Intensity and Range of Lights (R-y, November 1966);
- IALA Recommendation for a Definition of the Nominal Daytime Range of Maritime Signal Lights Intended for the Guidance of Shipping by Day (R-x, April 1974);
- IALA Recommendation For the Colour of Light Signals on Aids to Navigation (R-v, December 1977);
- IALA Recommendation on the Determination of the Luminous Intensity of a Marine Aid to Navigation Light (R-w, December 1977);
- IALA Recommendation For the Calculation of the Effective Intensity of a Rhythmic Light (R-z, November 1980);
- IALA Recommendation on the Photometry of Marine Aids-to-Navigation Signal Lights (E-122, June 2001).

ADOPTS the recommendations for marine aids to Navigation Signal Lights set out in the annex of this recommendation; and

RECOMMENDS that National Members, equipment manufacturers, independent laboratories and other appropriate Authorities adopt the standards set out in the annex of this recommendation.

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Annex

The E-200 series of Recommendations on Marine Signal Lights Part 0 - Overview

1 INTRODUCTION

1.1 Background

Mariners of all times have needed Visual Aids to Navigation. The first application of a system of signal lights for navigational purposes is believed to have been made for maritime purposes. AtoN technology developed over time and major developments in light sources and optics had been achieved before the beginning of the 20th Century. A lot of investigation in physics, meteorology and physiology were carried out for marine lights and later the results were used e.g. for railroad and aeronautical lights.

Throughout its 50 years history IALA has provided guidance on both engineering aspects and management aspects of Aids to Navigation to its members. Consequently IALA has published numerous recommendations and guidelines on the technical aspects of visual aids. The number of relevant documents has made it increasingly complicated for members to get a thorough understanding of the basic theory and recommended methods and mathematical models used. Furthermore the developments in light source technologies (e.g. Light Emitting Diodes) has revealed some shortcomings of the model recommended for calculating effective intensity, definition of colour region and in the same way the method of colour measurement and luminous intensity measurement.

This development has led to the need to review and amalgamate a number of IALA documents into one set of interrelated documents, making it easier for members to acquire relevant information on various aspects of visual aids to navigation.

1.2 Superseded documents

This series of recommendations supersede the following IALA recommendations:

- IALA Recommendation for the colours of light signals on aids to navigation (Dec. 1977);
- IALA Recommendation on the determination of the luminous intensity of a marine aid to navigation light (Dec. 1977);
- IALA Recommendation on the calculation of the effective intensity of a rhythmic light (Nov. 1980);
- Draft IALA Recommendation E-122 on the photometry of marine aids to navigation signal lights (Oct 2004);
- Recommendation for the notation of luminous intensity and range of lights (1966);
- Recommendation for a definition of the nominal daytime range of maritime signal lights intended for the guidance of shipping by day (1974).

The content of the abovementioned recommendations has been updated and amalgamated into this new series of recommendation.

2 SCOPE OF THE E-200 SERIES OR RECOMMENDATIONS

The E-200 series of recommendations gives guidance on the recommended basic characteristics of marine signal lights i.e. luminous intensity (brightness), spectral properties (colour), how to measure or estimate their angular, temporal and colour characteristics and how to estimate how well the signal is perceived by the mariner from a distance.

This series of recommendations does not give guidance on the technical design of marine signal lights, their operation or management.

3 PURPOSE OF THIS DOCUMENT

The purpose of this first part of the E-200 series of recommendations is to give some background information and an overview of the recommendations in the series as well as to give guidance to readers on where to find specific topics.

4 OVERVIEW OF THE E-200 SERIES OF RECOMMENDATIONS

4.1 General

The series consists of:

Part 0 – Overview

Part 1 – Colour

Part 2 – Calculation, Definition and Notation of Luminous Range

Part 3 – Measurement

Part 4 – Determination and Calculation of Effective Intensity

Part 5 – Estimation of the Performance of Optical Apparatus

4.2 A short description of the individual parts of the E-200 series

Part 0 – Overview (this document) gives some background information and an overview of the recommendations in the series as well as to give guidance to readers on where to find specific topics.

Part 1 – Colour describes the recommended spectral characteristics i.e. recommended colour chromaticity regions of marine signal lights. Information on how and why these regions have been adjusted is given and about risk of colour confusion. A new recommended chromaticity region for blue lights is defined and some guidance on the use of blue lights is given.

Part 2 – Calculation, Definition and Notation of Luminous Range describes how the illumination at the eye of an observer varies with distance and how to quantify Luminous Range. A definition of Luminous Range is given as well as criteria for calculating Nominal Range. The necessary formulae to be used for these calculations are described. Factors to be consider in the design of range of marine signals lights are presented. These are useful when calculating the nominal range of an existing light as well as when calculating the required luminous intensity of a new light with a given required range.

Part 3 – Measurement describes the recommended principles for measuring photometric and colorimetric characteristics of marine signal lights. Recommendations are given on laboratory procedures and equipment as well as details of methods such as zero length photometry, outdoor telephotometry, tristimulus colorimetry and spectroradiometry.

Part 4 – Determination and Calculation of Effective Intensity describes how to calculate the Effective Intensity of a flashing signal light. It describes four different methods for calculating effective intensity and presents limits of these methods. Also it recommends when and for what type of flash these methods may be applied. Furthermore, part 4 gives some indications of what effective intensity is and what it is not. It introduces the concept of apparent intensity to avoid misunderstanding and confusion in the users.

Part 5 – Estimation of the Performance of Optical Apparatus describes how to calculate the performance of optical apparatus (intensity) when direct measurement is impossible or impractical. It is intended as a guide to estimation of the luminous intensity and angle of divergence of the beam from various types of beam projection apparatus with two methods of estimation. The first method would be applied when no measurement information on similar

combinations of light source and optical system are available; the second method would be applied when data can be obtained by direct measurement on similar but not identical combinations of light source and optical system. The second method is described as a comparison or “ratio-ing” technique.

4.3 How to use the E-200 series of Recommendations

There are two main ways of using the E-200 series of recommendations, Top Down and Bottom Up.

Top-Down

From the navigational requirements, the required effective luminous intensity under given service conditions can be derived. If the design of the optical apparatus is known the photometric intensity can hereafter be determined.

Bottom-Up

For a given beacon the photometric intensity can be measured or calculated by the tools made available in part 3 or part 5. The results may then be used to obtain the value of the effective intensity under given service conditions and thus the luminous range.

Figure 1 gives the link between the parts of the recommendation.

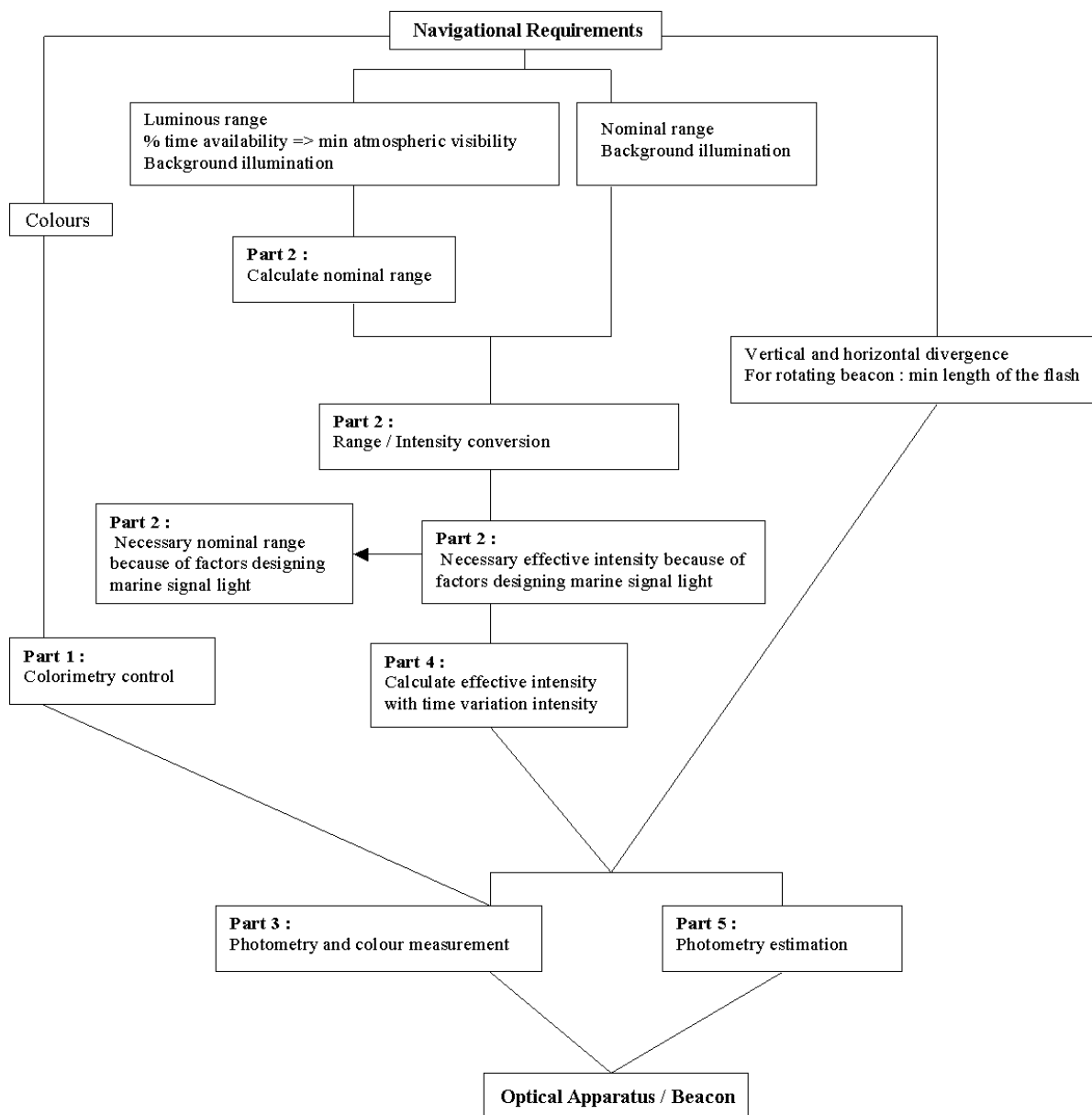


Figure 1 Schematic of the E-200 series of documents

In most cases the colour of a signal light (part 1) can be treated separately. However, it has influence on the description of the navigational requirements and on the measurement (part 3).

5 INDEX OF SELECTED TOPICS

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Note: Consideration is given to the problem of background lighting in E-200 part 2.

6 GENERAL DEFINITIONS

The general definitions used throughout E-200 can be found in the IALA Dictionary.

7 REFERENCES

- [1] IALA Recommendation for the colours of light signals on aids to navigation (Dec. 1977);
- [2] IALA Recommendation on the determination of the luminous intensity of a marine aid to navigation light (Dec. 1977);
- [3] IALA Recommendation on the calculation of the effective intensity of a rhythmic light (Nov. 1980);
- [4] IALA Recommendation E-122 on the photometry of marine aids to navigation signal lights (Oct 2004);
- [5] Recommendation for the notation of luminous intensity and range of lights (1966);
- [6] Recommendation for a definition of the nominal daytime range of maritime signal lights intended for the guidance of shipping by day (1974).