

# Emergency Lighting Measurement of Exit Sign

## Overview

The main reasons for having an emergency lighting system is to ensure adequate lighting levels to allow orderly evacuation and also fulfill the function of clearly indicating exit routes including the “Emergency Exits”. Well-designed and properly installed emergency exit signs are essential for emergency exits to be effective and meet relevant codes (fire, building, health and safety).

Conventionally, emergency exit signs displayed the word “EXIT” or equivalent in local language in large, well-lit, green or red letters, but the pictorial “running green man” symbol developed in 1980 and introduced in 2003 by ISO 7010 has increasingly been used as exit signs in many countries, such as Germany, Canada, Australia and parts of Asia Pacific, including Singapore.



In cases where exits are not immediately visible to occupants, access to exits should be marked by readily visible signs. Readily visible exit signs, either internally or externally illuminated, are a legal requirement.

Several factors may affect the visibility of an exit sign; they include viewing distance, letter size, spacing between letters and photometric and colorimetric characteristics of the exit signs.

In this paper, we will explain the photometric and colorimetric compliance requirements for exit signs, namely:

- Luminance of the letters or pictogram (legend)
- Luminance contrast between the legend and the background
- Luminance uniformity within the legend and within the background

- Color difference between the legend and the background

## Photometric and Colorimetric Characteristics

### Luminance

Also known as photometric brightness, luminance is a measure of the flux emitted from, or reflected by, a relatively flat and uniform surface. Luminance may be thought of as luminous intensity per unit area. The unit is candelas per square meter (cd/m<sup>2</sup>), or nit. The original non-metric British unit is the footlambert (fL). 1 fL = 1 candela/π ft<sup>2</sup> = 3.43 cd/m<sup>2</sup>

### Luminance Contrast

Luminance contrast quantifies the relative perceived brightness of an object against its background. For an exit sign, the relevant contrast is between the luminance of the letters/pictogram (legend) and the luminance of the rest of the sign face (background). The luminance contrast used in Underwriters Laboratories Standard UL 924 is defined as the difference between the two luminances divided by the lower luminance as shown below:

- $C = (L_g - L_l) / L_g$
- Where C = luminance contrast
- L<sub>g</sub> = greater luminance (mean luminance of either legend or background)
- L<sub>l</sub> = lesser luminance (mean luminance of either legend or background)

Luminance contrast calculated with this formula can vary from zero to one. The closer the luminance contrast to one, the more visible the legend is against the background.

Lately, a much simpler method involving “The ratio of the luminance of the legend to that of the adjacent background” is used to replace luminance contrast specification in some relevant codes.

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## Luminance Uniformity

Luminance uniformity can be defined as the range of perceived brightness of a surface. For exit signs, luminance uniformity of respective legend and background is important for the visibility of the sign. Luminance uniformity is of little concern when the viewer is close to the sign but as the distance of the viewer from the sign increases, uniformity becomes more important for the readability of the sign.

Luminance uniformity for exit signs is commonly specified as “Variation in luminance within the legend and within the background” calculated based on the ratio of maximum to minimum luminance.

## Color

Exit signs are generally made with two contrasting colors to ensure visibility. The most common combinations are green or red legend on a white background or white legend on a green or red background. Some jurisdictions limit the choice of color combination and normally suggest the use of same color combination throughout the building for easy recognition.

The color requirement for exit sign is normally specified by CIE x,y chromaticity coordinates.

Example: Safety color specification based on ISO-3864-4

Green:  $x=0.026, y=0.399$

White:  $x=0.305, y=0.315$

Konica Minolta Luminance Meter [LS-100](#) and Luminance Meter [LS-110](#) are commonly used by many certification bodies and exit sign manufacturers for measuring luminance of exit or safety signs. Chroma Meter [CS-100A](#) and Chroma Meter [CS-200](#) are the preferred models if both luminance and chromaticity measurements are required. For more information on light measuring instruments, please visit Konica Minolta website at <http://sensing.konicaminolta.asia/applications/light-measurement/>

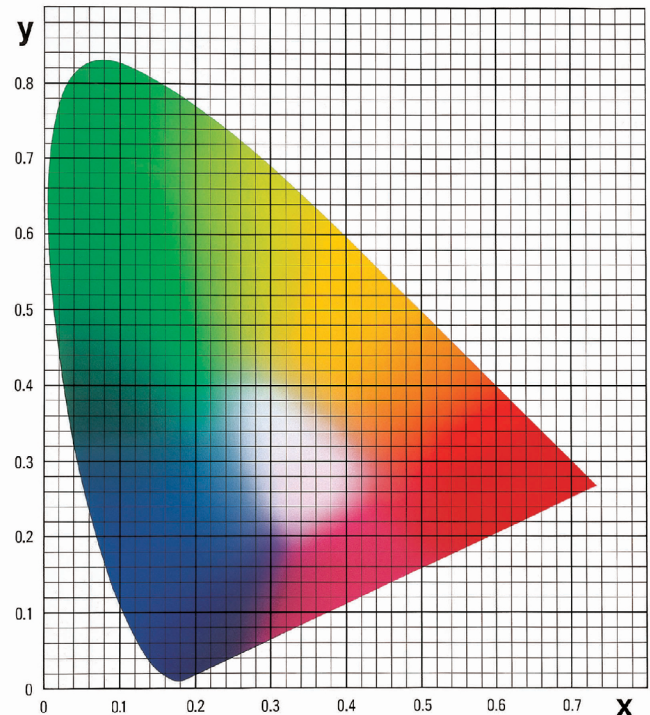


Fig. 3 – CIE 1931 x,y Chromaticity Chart

You can visit this website [https://www.konicaminolta.net/instruments/registration\\_index/](https://www.konicaminolta.net/instruments/registration_index/) to download our education handbook, The Language of Light, which explains basic concepts of photometry and colorimetry in an easy approach. This handbook also gives an overview on photometric and colorimetric instrumentations and addresses important considerations on instrument’s selection.

## References

Singapore Standard CP 19 : 2000  
Code of practice for the installation and maintenance of emergency lighting and power supply systems in buildings.

ICEL 1006 (May 2012)  
Emergency Lighting Design Guide