



ISA Electronic Message Display Brightness Guide

This guide has been developed to assist stakeholders concerned with development of brightness standards for large-format, electronic displays used for on-premise sign applications. This guide comprises:

- 1) an overview of the importance of ensuring appropriate brightness,
- 2) technology utilized to ensure appropriate brightness,
- 3) recommended brightness standards, and
- 4) brightness measurement methodology.

1. Overview of the importance of ensuring appropriate brightness.

Electronic displays that are too bright can be offensive and ineffective. There are significant advantages to ensuring that an electronic display is not overly bright. These advantages include:

- Conservation of energy
- Increased life expectancy of the electronic display components
- Building goodwill with the community
- Increasing the legibility of the display

It is in the best interest of all stakeholders to ensure that electronic displays are sufficiently bright to ensure clear legibility, while at the same time avoiding a display that is overly bright.

2. Technology utilized to ensure appropriate brightness.

Most electronic displays are designed to produce sufficient brightness to ensure clear legibility during daylight hours. However, daytime brightness settings are usually inappropriate for nighttime viewing. The following general methods are used to dim an electronic display for appropriate nighttime viewing:

1. Manual Dimming. Using this method, the sign operator dims the display in response to changing ambient light conditions. This method alone, however, is not an acceptable approach.
2. Scheduled Dimming. Sunset-sunrise tables allow an electronic display to be programmed to dim at the same time that the sun sets and rises. This method is generally acceptable, but is more effective when used as a backup to automatic dimming controls capability, such as photocell technology.
3. Photocell Technology. An electronic display that utilizes photocell technology can automatically dim as light conditions change. A photocell sensor alerts the display to adjust brightness according to ambient light conditions. This is the best method to control brightness.

3. Recommended brightness standards.

ISA commissioned Dr. Ian Lewin of Lighting Sciences, Inc. to develop brightness criteria for on-premise electronic displays. Dr. Lewin is a leading lighting expert with over thirty years experience in the lighting industry.

Dr. Lewin recommended the development of brightness criteria based on the Illuminating Engineering Society's (IES) well-established standards pertaining to light trespass, IES Publication TM-11-00. The theory of light trespass is based on the concept of determining the amount of light that can spill over (or "trespass") into an adjacent area without being offensive.



As a result of Dr. Lewin's research and field testing, he developed brightness criteria for on-premise electronic displays in accordance with Table 1 below.

- A footcandle (fc) meter (described below) is used to determine whether the electronic display is compliant.
- Footcandle measurements are taken with the sign displaying all white (maximum brightness) and then taken again with the sign switched off. These measurements are taken at a distance of 100 feet perpendicular to the display (assuming that the size of the display is 100 square feet).
- The difference between these measurements is then compared with the Eye Illuminance Limit column of Table 1.
- If the difference is less than or equal to the Eye Illuminance Limit for the particular lighting zone where the display is located, then the display conforms to an appropriate brightness level.

Each lighting zone is further described in Table 2 below. While IES recognizes four lighting zones, the recommended brightness guidelines for on-premise, electronic displays are focused on two zones for simplicity and ease of enforcement.

Dr. Lewin's field testing and research is based on a 100-square-foot display. If the sign size is other than 100 sq. ft., the measured reading needs to be prorated to what an otherwise identical sign of 100 sq. ft. area would produce:

$$\text{Prorated footcandles} = \text{Measured footcandles above ambient} \times 100 / \text{sign area (sq. ft.)}$$

The prorated, measured footcandle value is then used to compare to the 0.3 or 0.8 fc limit.

Example: Evaluation of a 200 sq. ft. sign. Assume that the measured illuminance at 100 ft. is 1.0 fc above ambient. i.e. With sign on and showing an all white display, the reading at 100 ft. is 1.0 fc greater than with the sign switched off.

$$\begin{aligned} \text{The Prorated footcandles} &= 1.0 \times \frac{100}{200} \\ &= 0.5 \text{ fc} \end{aligned}$$

In this example, the sign meets the requirement for zone E3 because its prorated footcandles are less than 0.8 fc, but it does not meet the recommended condition for zone E2 because the prorated footcandles exceed 0.3 fc. In order for the sign to meet the requirements of Zone E2, it would need to be dimmed further.

Table 1 Eye Illuminance Limits (Light Produced by Sign, above Ambient)		
Zone	Description	Eye Illuminance Limit (fc)
E2	Low ambient electric light	0.3
E3/E4	Medium ambient electric light	0.8



Table 2 Description of the Lighting Environmental Zones (from IES publication TM-11-00)	
Zone	Description
E2	Areas of low ambient brightness. These may be suburban and rural residential areas. Roadways may be lighted to typical residential standards.
E3	Areas of medium ambient brightness. These will generally be urban residential areas. Roadway lighting will normally be to traffic route standards.
E4	Areas of high ambient brightness. Normally this category will include dense urban areas with mixed residential and commercial use with a high level of nighttime activity.
Additional information on these classifications is provided in publication RP-33-99, "Lighting for Exterior Environments," Illuminating Engineering Society, New York. Pages 11-12.	

4. Brightness measurement methodology.

There are two generally accepted measures of brightness in the sign industry; illuminance and luminance. Illuminance, the preferred method, is a measure of the amount of light intercepting an object at a given distance from a light source and is measured in footcandles or its metric equivalent, lux. Illuminance can be measured with a footcandle meter (also known as a luxmeter), which are relatively inexpensive (\$100-1000) and commonly available. The footcandle meter should be accurate to two decimal points for accurate measurements. The second method, luminance, is an absolute measure of the amount of brightness that is being emitted from a light source and is usually measured in candelas per square meter, also known as "nits." Luminance can be measured by use of a "nit gun", which are expensive (~\$3,000) and difficult to procure. The preferred method of measurement is illuminance using a footcandle meter because a measure of luminance fails to account for ambient light conditions.

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