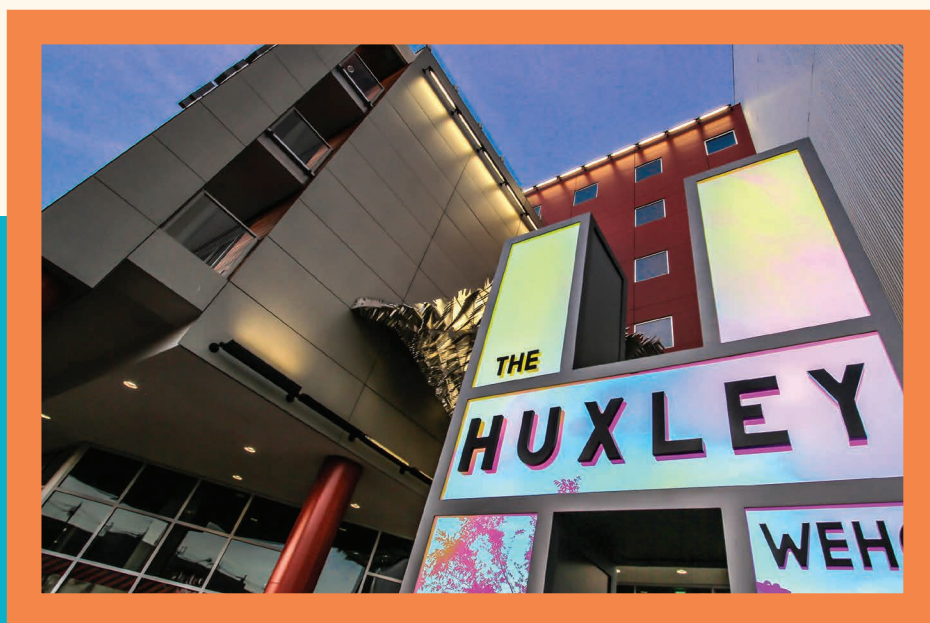


SIGN RESEARCH FOUNDATION EXECUTIVE SUMMARY

ILLUMINATED SIGN CONSPICUITY: WHAT FACTORS MAKE A SIGN NOTICEABLE AND LEGIBLE?



KEY TAKEAWAYS

PAST RESEARCH, INDUSTRY BEST PRACTICES AND CONSENSUS-BASED STANDARDS AND CODES SHOW THAT IT IS POSSIBLE TO PREDICT THE VISUAL EFFECTIVENESS OF SIGNS THROUGH VISUAL PERFORMANCE MODELING.

The Lighting Research Center (LRC) at Rensselaer Polytechnic Institute has undertaken a number of activities for the Sign Research Foundation. Those efforts are summarized in the 2018 report, "Illuminated Sign Conspicuity: What Factors Make a Sign Noticeable and Legible?" Prepared by John D. Bullough, Ph.D. This document includes a summary of published research studies, technical reports and codes and standards related to the visual effectiveness of signage. It also explores several experimental pilot studies that offer preliminary information in areas identified as knowledge gaps.

The report provides techniques for using an illuminance meter to estimate the luminance of a large-format, self-illuminated sign, as well as preliminary guidelines for maximizing conspicuity and legibility of illuminated signs.

Preliminary guidelines for the design of visually effective illuminated signs:

- Use a border around the perimeter of the sign, especially in cluttered or urban environments.
- Avoid clutter within the sign by providing sufficient white space.
- Do not use ornate typefaces or fonts.
- Ensure that characters and symbols have high luminance contrast against the background of the sign, regardless of their colors.
- Avoid large luminance variation within individual characters or symbols.
- Dim sign luminance at night, especially in rural or uncluttered environments; use higher luminances during daytime and in urban or cluttered locations.
- Select a character aspect ratio that ensures rapid visual acquisition for all intended viewing angles of the sign.

- Conspicuity refers to the ability of the sign to attract the attention of a driver or pedestrian, and it is often the first characteristic an illuminated sign requires in order to be effective. Factors that influence a sign's conspicuity are its size, luminance (brightness), color, and the contrast between the characters or symbols on a sign and their background. Placing a border around a sign can help the sign stand out from its background. Importantly, while minimum requirements for sign luminance are important to ensure conspicuity, maximum limits are also specified by many localities, especially for nighttime conditions and in rural or darker areas to avoid discomfort or distraction.
- Legibility refers to a person's ability to read and understand the information on a sign. The contrast between the characters and symbols on a sign and the background is probably the most critical variable in ensuring adequate readability. Avoiding excessive luminances at night will often improve legibility. Making characters large enough to read from the intended viewing distance is also important, but should be balanced by leaving sufficient "white space" on the sign. Visual performance models can be useful tools in predicting a sign's legibility.
- Published literature and guidelines do not always provide consistent guidance as to whether, for example, the *luminance* (brightness) of a sign, or the *illuminance* (the amount of light reaching the eyes of an observer) from the sign are better predictors of conspicuity or legibility. There is also some uncertainty about how specific properties of sign characters, such as the relative height and width of letters, can affect the ability to quickly read a sign.

Read the full Illuminated Sign Conspicuity: What Factors Make a Sign Noticeable and Legible? report at: www.signresearch.org/illuminated

CURRENT MODELS MAY BE INCOMPLETE REGARDING THE INFLUENCE OF FACTORS BEYOND LUMINANCE, SIZE AND CONTRAST OF SIGNS AND SIGN CHARACTERS.

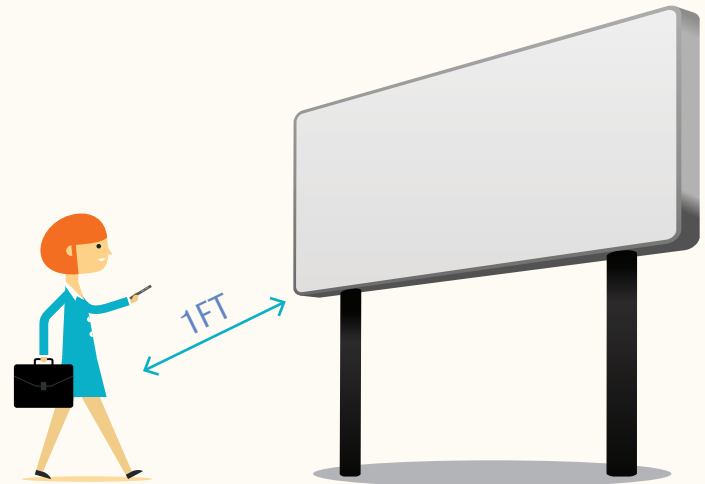
- In order to address information gaps identified during the knowledge review, two experimental pilot studies were conducted to assess how different factors impact legibility and visual comfort.
- In one pilot study, observers viewed sign characters differing in their luminance contrast and in their height:width (aspect) ratios, and were asked to identify differences in similar pairs of five-digit numbers. When the aspect ratio differed greatly from one, study participants took longer to correctly identify differences, even though the apparent area of the characters was the same. This is important, because most visual performance models will predict that characters with different aspect ratios but equal apparent areas are equally legible.
- In the other pilot study, people judged the conspicuity (attention-getting property) of scale model sign panels, and their visual comfort when viewing them. The panels all produced identical illuminances at their eyes, but had different luminances because of differing size characteristics. Luminances varied by a factor of three from about 300 to 1000 cd/m². All of the sign panels were judged about equal in terms of their attention-getting properties, but people consistently rated the smaller panels with higher luminances as less comfortable to look at. This suggests that the luminance of a sign is an important parameter to measure in order to assess its impacts on visual comfort.

IF IT IS POSSIBLE TO APPROACH AN ILLUMINATED SIGN, ITS MAXIMUM LUMINANCE CAN BE ESTIMATED USING AN ILLUMINANCE METER.

- Instrumentation to measure luminance is inherently more expensive than illuminance measurement instruments, by a factor of ten or more. For this reason, many jurisdictions who wish to conduct field measurements of signs do not own luminance meters. However, if an individual can get close to an illuminated sign, an illuminance meter can be used to estimate the luminance of a portion of a sign by facing it toward the sign. The luminance (L , in cd/m²) can be estimated from the illuminance (E , in lux, or ten times the illuminance in footcandles) by the following equation:

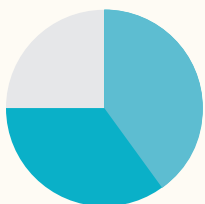
$$L = E / p$$

It should be noted that this measurement method does not yield high precision.



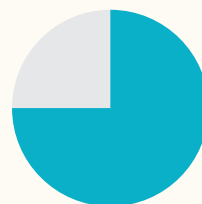
BY THE NUMBERS: LIMITS ON LEGIBILITY AND VISIBILITY

8 The maximum number of words per sign to enhance legibility and visibility, as suggested by the City of Saratoga Springs, NY.



40-75%
The maximum amount of a sign's area that can contain characters, according to the Town of Huntersville, N.C. (2009).

12:1 The luminance ratio between the brighter and less bright elements of a sign and its characters that best supports legibility.



75%
The maximum amount of a sign's area that can contain characters, according to the City of West Hollywood (2002), City of Davis (2010) and City of Bellflower (2016), all in California.

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