
1/27/2021

LIGHTING STUDY

Watchfire Signs has been manufacturing outdoor electric signs since 1932 and LED signs since 1996. Currently, we have more than 60,000 LED signs in operation worldwide.

History of Optical Measurements and Calculations

Outdoor signs using incandescent light bulbs commonly measured illuminance using meters that report brightness in foot-candles. This unit is the standard measurement partly because a light bulb is a source of light that illuminates equally in all directions. LED signs are measured with the same meter even though its light does not illuminate equally in all directions. LED signs are designed to be highly directional, which is an advantage. LEDs allow light to be directed toward an intended audience, rather than dispersed in a wider arc out from the face of the sign.

In the LED industry luminance, or the intensity of visible light, is measured by nits, where one candela per square meter is equal to one nit. However, luminance meters are expensive, difficult to use in the field, and are not ideal for lighting studies commonly used for meeting local permitting requirements. As a result, LED signs are often evaluated using foot-candle measurements.

A foot-candle is the amount of light produced by a single candle when measured from one foot away. For reference, a 100-watt light bulb produces 137 foot-candles from 1 foot away, .0548 foot-candles from 50 feet away, and .0137 foot-candles from 100 feet away.

Watchfire Signs is Compliant with National Lighting Requirements

Watchfire Signs has adopted brightness standards endorsed by both the International Sign Association (ISA) and Outdoor Advertising Association of America (OAAA). Watchfire Signs' products meet the requirements set forth by both associations of no more than 0.3 foot-candles above existing ambient light levels. Total foot-candles are dependent on size and distance and can be adjusted as needed.

Automatic Brightness Adjustment: All Watchfire signs automatically adjust brightness levels using either a 100-step hardware photocell, or what is referred to as a software photocell (hardware photocells are optional on OP Signs). Using the software photocell, the sign will automatically adjust brightness based on the longitude and latitude location of the sign. The sign is appropriately dimmed or brightened based around daily sunrise and sunset. A hardware photocell will automatically adjust a sign's brightness relative to changes in ambient light levels. For both options, a sign operator can manually decrease the brightness from standard settings, but for safety reasons and in conformance to industry codes, Watchfire cannot allow signs to operate brighter than standard settings.

Equipment used by Watchfire Signs to Measure Luminance

Foot-candles/Lux - Minolta Illuminance Meter T-10

Nits/candela/sq. m – Minolta Luminance Meter LS-100

Sign Calibration – Minolta CS-1000 Spectra radiometer

The proceeding study uses actual lab measurements made on modules using an illuminance meter. These measurements and extrapolations were then scaled up to the size of the sign and distance corrections were made using the inverse square law.

SIGN LIGHTING STUDY

Sign Details

Size: 11 x 36 Digital Billboard

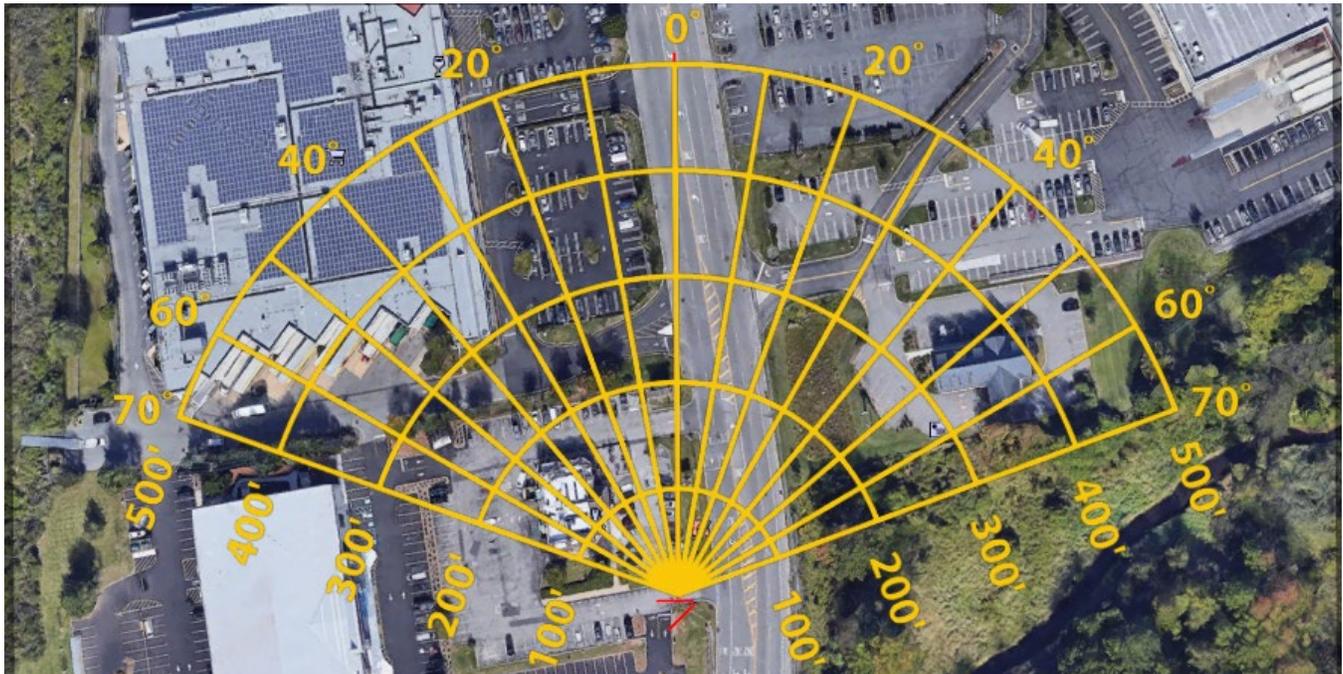
Location: *320 New Jersey 15, Wharton, NJ*

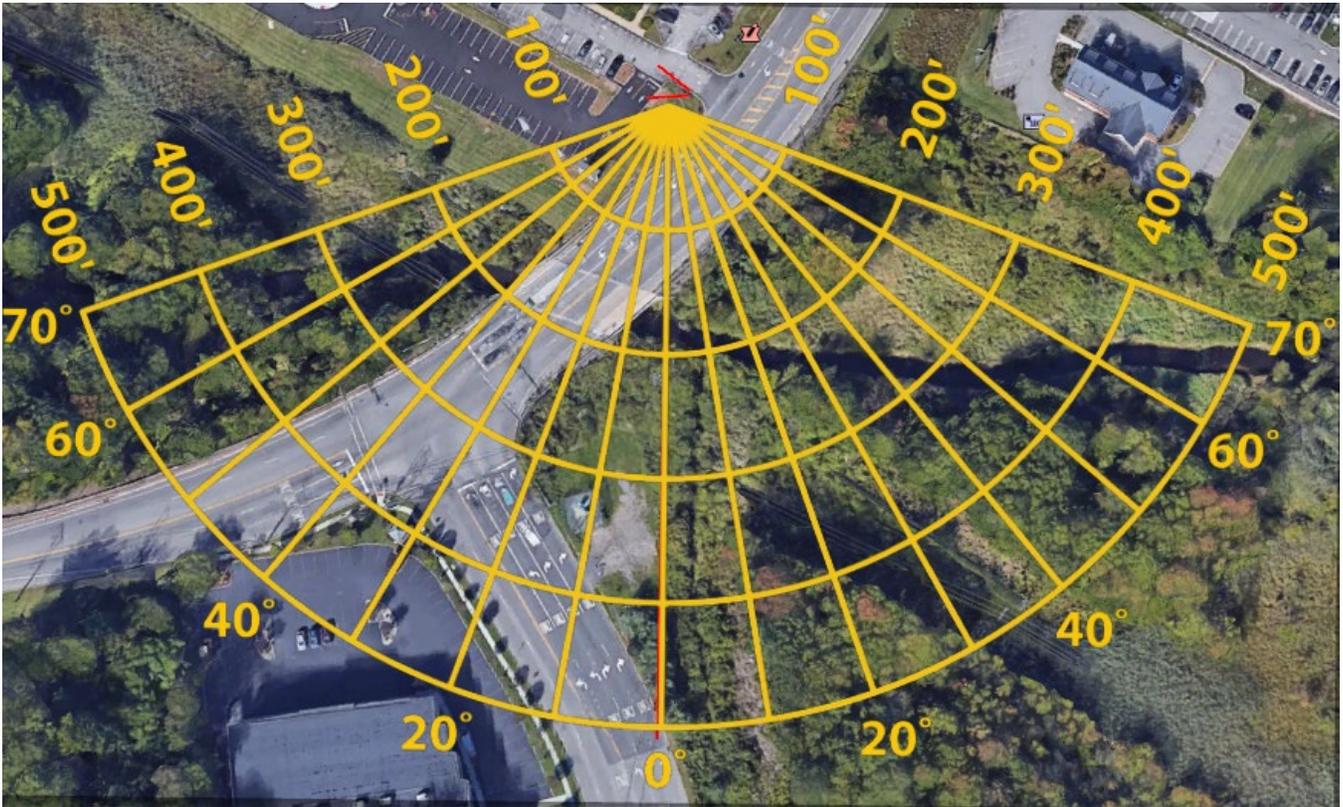
The table below represents a large LED sign, demonstrating the increase in illuminance from the sign during normal night operation. Smaller signs would have less effect than shown below. The values are within the standards of both the ISA and OAAA and indicate that the ambient light broadcast into the surrounding area has minimal effect.

Foot-candles at night under normal operation

Viewing Distance	Horizontal Viewing Angle				
	0 degrees	20 degrees	40 degrees	60 degrees	70 degrees
100'	0.35	0.28	0.19	0.09	0.02
200'	0.09	0.07	0.05	0.02	0.00
300'	0.04	0.03	0.02	0.01	0.00
400'	0.02	0.02	0.01	0.01	0.00
500'	0.01	0.01	0.01	0.00	0.00

Example Broadcast of Light at Distances and Angles





Conclusion

Given the above comparisons and measurements, the area will see an almost undetectable difference in ambient light after installation of the digital LED billboards.