

February 20, 2017

Background on Optical Measurements and Calculations

Watchfire Signs has manufactured outdoor electric signs since 1932 and led signs since 1996. We have more than 50,000 led signs in operation worldwide.

Incandescent signs were commonly measured using illuminance measurements, partly because the light bulb is ideally a point source of light, illuminating equally in all directions, and illuminance meters are commonly available and inexpensive. Foot-candle measurements are made at a defined distance from the sign and the magnitude depends on the physical size of the sign.

LED signs are highly directional however, which is an advantage in an urban setting since the light can be directed more precisely to the intended audience. Luminance measurements have been used to specify LED signs by the industry. The candela per square meter (NITs) unit allows a specification that does not depend on size or viewing distance.

The study done on the sign adjacent to a residential area used actual lab measurements made on modules using an illuminance meter. These measurements and extrapolations are then scaled up to the size of the sign and the distance corrections are made using the inverse square law. These calculations allow the study to be made in foot-candles and will show the amount of light at a given angle and distance from the digital billboard relative to the size of the display. The total increase in ambient light will not exceed 0.3 foot-candles above existing ambient light levels at night at a distance 250' for a 14' x 48' digital billboard, as recommended by OAAA. Brightness settings can be further dimmed to lower levels. Watchfire does comply with LA county building codes as it applies to Digital billboards. The proposed digital billboard for 840 E. Walnut street in Carson will require the necessary permits obtained through the City of Carson.

Watchfire adopted brightness standards set forth by both the ISA (International sign Association) and OAAA (Outdoor Advertising Association of America). The standards used are based on the studies of Dr. Lewin and the IESNA (Illuminating Engineering Society of North America)

Below is a list of some of the measurement equipment used by Watchfire engineers.

Equipment used by Watchfire engineers to make lighting measurements:

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

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

Sign Calibration – Minolta CS-1000 Spectra radiometer

SIGN LIGHTING STUDY

Sign Details

Size: 14x48 Digital Billboard at an installed height of 56 feet.

Location: 840 E Walnut St Carson, CA

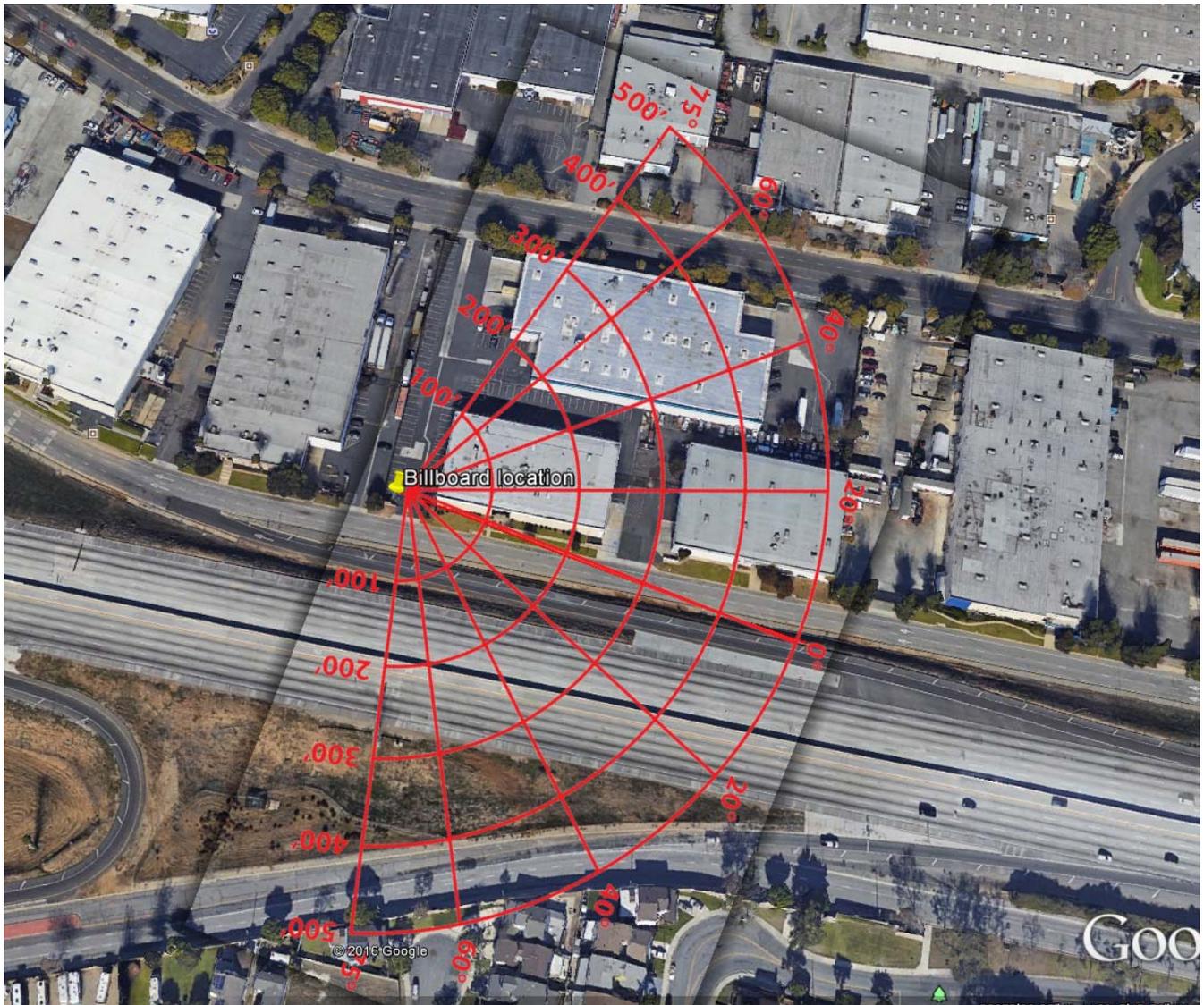
Data Collection

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

The table represents the total increase in ambient light produced by the sign under normal or typical operation at night. The ambient light increases will actually be less than shown in the chart since they fail to consider any objects blocking the line of site to the sign. Obstructions such as trees would further reduce real world overall ambient light increases. In addition to obstructions any existing light within the viewing cone will further diminish any light increase

	0 degrees	20 degrees	40 degrees	60 degrees	90 degrees
100'	0.5110	0.4216	0.2846	0.1288	0.0256
200'	0.1278	0.1054	0.0712	0.0322	0.0064
300'	0.0568	0.0468	0.0316	0.0143	0.0028
400'	0.0319	0.0264	0.0178	0.0080	0.0016
500'	0.0204	0.0169	0.0114	0.0052	0.0010

Light values in foot-candles at night under typical operation





Conclusion

Given the above comparisons and measurements, the residential area will see an almost undetectable difference in ambient light after installation of a billboard. Ambient light levels in the neighborhood are more heavily impacted by porch lights and landscape lights than the increases produced by a billboard.

Ray Digby

office 800-637-2645 x3006 Fax 217-442-1020

ray.digby@watchfiresigns.com