ZEIGER
ENGINEERS, INC.
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Berkeley, CA 94708
(510) 452-9391

July 21, 2021

Desiree Dei Rossi
Assistant Project Manager
David J. Powers & Associates, Inc.
1736 Franklin Street, Suite 300,
Oakland, CA 94612

Re: CEQA Analysis of Spill/Glare Light Issues and Effects of Glare on Pilots Approaching from North or South Runways for Two Proposed Billboards along HW101 Adjacent to San Jose Airport, San Jose, California

Dear Desiree,

This report will provide an evaluation of the two proposed billboard's nighttime visual impact based on information provided by Clear Channel Outdoor, and their billboard manufacturer, Media Resources, Inc., Ontario, Canada

Executive Summary:
The north/south faces of the North Site, and the south face of the South Site, have brightness's that conform to the maximum value of 0.3 footcandle over ambient conditions, reducing unwanted spill and trespass light toward the adjacent San Jose airport ground operations. Media Resources is constructing their sign with custom side-shielding of the LED modules in order to successfully eliminate spill light toward the airport control tower located approximately 5,600 feet away.

The north face of the South Site will use a backlighted fixed signage and will have dimming controls needed to limit spill light toward the adjacent creek and riparian zone to conform to the 0.10 footcandle over ambient conditions required by the California Fire and Game Department.

Project Design will also produce very little glare and potential for pilot distraction in the landing approach from the North (Runways 12L/12R) or South (Runways 30L/30R) due to the light control features on the billboards.

I have reviewed the materials, control means, and photometric methods used by Media Resources for these two billboards and am confident of the quality of their product and predicted performance.

General Report

Billboard Description:
The two proposed billboard designs use V- angled displays, approximately 17-feet, four-inches high by 59-feet wide, mounted on an approximately 37-foot, eight-inch high pylon, measuring 60 feet from ground to top. Their faces are angled to align with the freeway's traffic flow directions. The billboards on the North Site will have DIGITAL LED displays, and the billboards on the South Site will have a DIGITAL LED display facing south, and a STATIC BACKLIGHTED LED display facing north toward the riparian zone.

Topography: The topography of the billboard location can be described as generally flat. The creek embankment and riparian zone is near to the South Site.

PROPOSED DIGITAL BILLBOARD DESIGN

Trespass or Spill Light Control from Billboard: The billboards will control unwanted light (trespass or spill light) toward nearby airport operations, airport control tower, and Guadalupe River and riparian habitat. In this regard, the optical design of proposed DIGITAL LED billboard has customizable horizontal light shields, and a vertical alignment of LED RGB modules, to eliminate light into specific zones.

The degree of this shielding is shown on the photometric studies prepared by the manufacturer and is included in the Appendix. It demonstrates that zero light will be directed toward airport ground operations and the airport control tower.

Vertical light control is also needed for control of unwanted upward light. This is provided in the optical design of proposed LED billboard as the LED emitter arrays output have a vertical beam spread of approximately 65 degrees, with limited intensity above 18 degrees and below 47 degrees. This is achieved by the use of narrow matt black horizontal shields over and under the arrays, as well as LED optics with asymmetrical downward bean, rather than conventional symmetrical vertical beam. Manufacturer's information on vertical light control is included in the Appendix.

This control feature mitigates some unwanted upward light, though there is still upward light contribution to sky glow. The limits on upward light proposed by the project design is as effective as angling the signs 15 degrees downward.

Brightness Control: During daytime, the brightness of a LED billboard depends on the intensity of the sunlight directly on the sign face, but just as importantly, on the sky brightness behind the sign (for example, the situation with the sun at a low angle behind the sign, creating a dark sign face, but a bright background, would result in a need for a bright sign face to overcome the glare).

Sign brightness for LED billboards in practice can achieve 9,000 nits under maximum daylight conditions, with a maximized "white light" (that is, where the red/blue/green LEDs are operating uniformly at maximum power). Maximum brightness is only achieved when a billboard is displaying 100 percent "white" color, as opposed to the thousands of other color combinations available from the red-green-blue LEDs. However, to operate at 100 percent

white color, it would require turning off the ambient light sensor and disabling dimming control of the face as well.

Normal advertising images are of course not "white", and the resulting "colored" brightness is greatly less than white as when the LEDs are operating much more efficiently.

Clear Channel guidelines call for signs to be capable of producing a minimum of 7,500 nits at the end of 10 years of operation. The purpose of this is to insure that displays never appear dim over the useful life of the LED modules due to output depreciation. Information received from Clear Channel is included in the Appendix.

The decrease in maximum brightness with advertising images may be as much as 40 percent from the "white" test condition. Considering this, a range of 3,600 - 5,000 nits may be considered as typical of daytime peak power levels.

The proposed LED billboards use multiple photoelectric sensors designed to measure ambient light forward and backward. The electronic sign controllers use the input signals from the photo sensors to modulate sign power and brightness to maintain legibility of sign content. The ambient light sensors are always on.

During nighttime, the proposed LED billboard's brightness is expected to be automatically reduced to a level of 3 percent or lower from its maximum brightness output. This being required to achieve a maximum illumination of 0.3 footcandle (3 lux) over ambient conditions, thereby reducing unwanted spill and trespass light toward the adjacent San Jose airport ground operations.

At all times, the ambient light sensors will adjust the illumination to be in compliance with the City of San José Code to never exceed 0.3 footcandle (3 lux) over ambient conditions. The light sensors are always on.

City of San Jose Code: The billboards do comply with the City of San Jose Code to never exceed 0.3 footcandle (3 lux) over ambient, day or night, and will display no images whatsoever between the hours of 12AM and 6AM.

Lighting Controls: The proposed billboards have built-in programmable controllers, allowing both time of day and intensity programming. Their operating schedule is from 6AM to 12AM per City of San Jose Code.

The proposed STATIC backlight sign will have controls to lower power to as much a one percent to achieve the 0.1 footcandle over ambient lighting in the Guadalupe River, and riparian zone. This is a field adjusted value after installation of the signs. Final nighttime power dimming setting will be determined by Clear Channel technicians during nighttime testing. The dimming setting will meet all City requirements for lighting.

Potential for Pilot Distraction from Billboards: Analysis was completed of the nighttime visibility of billboard display by pilots during landing. Due to the upper shielding on the LED modules providing an 18 degree cutoff, planes within 1-mile of the billboards would need to be below 1,700 feet altitude to first observe the display, and at that distance the

illumination would be less than 0.0012 footcandle (0.012 lux). At a closer distance of 2,000 feet from billboard, the illumination would be less than 0.0084 footcandle (0.084lux). At closer distances, the side-shielding and top shielding, on the LED modules would block nearly all light towards the runways and any planes present.

The above illuminations are much less than illumination of a full Moon, which typically provides only about 0.005 footcandle (0.05lux) –0.01 footcandle (0.1 lux) illumination.

The conclusion is that billboards will provide no more potential for pilot distraction as compared to other commonly found illumination sources, such as moon light, parking lot illumination, automobile headlights, freeway signage, building illumination, etc.

STANDARDS AND PRACTICES

Refer to Glossary of terms for definition of nits, lux, footcandles, etc.

Recommended Practices: The reference source for recommended lighting practices for billboards was the Illuminating Engineering Society of North America (IESNA) "Lighting Handbook 9th Edition (2000) Chapter 17 Lighting for Advertising and Table 17-37, together with their other technical memoranda.

Subsequently, the IES "Lighting Handbook 10th Edition (2011) (the "NA" was dropped) was published, in a completely rewritten format, but it lacks all mention of lighting of outdoor advertising.

The recommendations of this publication were based on a report commissioned by the American Outdoor Advertisers Association. It has become something of a national model code for installation of billboards.

Billboard Surveys: Nighttime surface brightness of conventional billboards have been surveyed in studies conducted in Arizona (2009), New York (2008) and other cities. Those surveys provided results that show a luminance range from <100nits to <150nits.

IESNA Handbook (9th edition) Table 17-37 recommends illuminances for advertising signs in bright nighttime surrounds at 1,000 lux (low average reflectance of advertising copy), and 500 lux (high average reflectance of advertising copy); and similarly, for dark nighttime surrounds, 500 lux and 200 lux.

The units "footcandles" and "lux" are measurements of illumination, i.e., visible light intensity or luminous flux per unit area, equal to the amount of light emitted per second in a unit solid angle of one steradian from a uniform source of one candela. One Lux is equivalent to 0.0929 footcandle.

The unit "nit" is a measurement of the brightness of light or luminance of a surface. One nit is equal to one candela (one candlepower) per square meter. A nit is equal to 0.929 candela/square foot or one candela/square meter, also one lumen/square meter/steradian.

The unit "lumen" is a measurement of luminous flux, analogous to a unit of force, and measures how hard light is pushing off a light source. When light is spread out over a specified flat surface, you get lumens per square meter, analogous to pressure. One lumen per one square meter is exactly one lux. Similarly, a nit measures light "force" per steradian (the curved surface of an LED).

To understand what the IES recommendation equates to in nits, it is necessary to convert the lux units to nits. This conversion is necessary to determine the surface luminance of such signs with high reflectance copy in bright surroundings. Implicit to this conversion is the assumption of an 80% reflectance, which would indicate values of:

Bright Nighttime Surrounds: 128 nits
Dark Nighttime Surrounds: 58 nits

For low reflectance copy, the values would be:

Bright Nighttime Surrounds: 256 nits
Dark Nighttime Surrounds: 126 nits

Illuminance Measurements: To determine the illuminance produced by the source (billboard) for bright nighttime surrounds, the equation is:

$E = LA/D^2$

Where:

A = Area of billboard, in square feet

E = illuminance measured as produced by source, in footcandles

L = luminance of source, in nits

D = test distance from source to plane of the illuminance measurement

Letting the maximum value of the light beam be 256 nits, as shown for the maximum value for bright nighttime surroundings for low reflectance copy, at a test distance of 350 feet perpendicular from sign (not at ground level), the resulting vertical illumination for a 20 feet x 60 feet billboard (1,200ft^2) would calculate as:

$E = 256 \text{ nits} \times 0.092903 \text{ footcandle/nit} \times 1200ft^2/350ft^2 = 0.231 \text{ footcandle (vertical)}$

The industry has adopted a value of 0.3 footcandle (vertical) over ambient light as the standard for performance for the 17ft x 59ft digital, and 20ft x 60ft static, billboards. The proposal DIGITAL LED billboard conforms to this value as indicated in their photometric studies, see Appendix.

Field Testing:
The value of <0.3 footcandle is relatively low but can be measured with a handheld photometer. Readings are to be made with the light receptor pointing directly at the sign held in the vertical position. With conventional DIGITAL LED displays the readings are to be taken directly at the sign, with light receptor held about five feet above ground level.

For the proposal DIGITAL LED display using asymmetric output LED modules the readings can be made with photometer held 5 feet above ground at 350 feet distance.

For the STATIC LED BACKLIGHTED display readings are to be made with the photometer held approximately 3 feet above ground, at locations along embankment and at level of the creek.

Maximum brightness is only achieved when a billboard is displaying 100 percent "white" color, as opposed to the thousands of other color combinations available from the red-green-blue LEDs. Normal advertising images are of course not "white", and the resulting "colored" brightness is greatly less than white as the LEDs are operating much more efficiently. The decrease in brightness may be as much as 40 percent from the "white" test condition.

The field test of sign brightness is done in practice not with a "white" color, but with the programmed advertising. This study will be taken upon completion of sign construction and prior to operation of the signs. Should brightness levels be found above a particular maximum such as 0.3 footcandle over ambient light, then technicians will be expected to make the necessary field adjustments in order to meet all required conditions for sign operation.

Clear Channel's field-testing procedures and recording forms are attached in Appendix.

Additional Brightness Control Measures: The proposed DIGITAL LED billboards and Static billboards have external sensors monitoring the displays. Should measurement communications between the electronic brightness control software fail, the sign controller itself drops to 3 percent by default, called ***Brightness Safety Watchdog.*** This control feature safeguards against possible driver safety, or pilot and ground control safety issues at the San Jose airport.

Moving Display: Another common concern with DIGITAL LED billboards is potential distraction from moving displays. Issues associated with moving billboard displays have already been addressed by the Federal Highway Administration under the Highway Beautification Act (HBA) codified at Title 23 United States Code 131, particularly with reference to the Guidance on Off-Premises Changeable Message Signs", FHA September 25, 2007. As such, displays containing movement are prohibited pursuant to this statue.

The State of California, USC 131 was also incorporated by reference into Caltrans "Outdoor Advertising Act and Regulations" 2011 Edition. The cited acts have been the primary control for the design of billboards for many years.

In brief, States that do allow off-premises changeable electronic variable message signs (CEVMS) adjacent to controlled routes shall incorporate standards pertaining to:

1. Duration of Message
2. Transition Time
3. Brightness
4. Spacing
5. Locations

Most importantly because of FHWA recommendations, outside of special entertainment districts, billboard manufacturers do not use moving displays. The industry commonly uses approximately an 8 second duration time between static messages. The proposed signs comply with the Standards, and in particular will not display movement, motion, or animation. They will contain still or static images only. They will use 8 second duration of time between static messages, rather than the minimum 4 second duration time of the Standards. The State of California does not have a set standard.

VITAE:
President of Zeiger Engineers Inc. for the past thirty-nine years, Mr. Zeiger has been actively engaged in electrical engineering since 1965. His wide ranging experience includes: extensive experience with lighting design, specifications, and photometric analysis for street, area, landscape and sports lighting; engineering for clinics and medical facilities, research and industrial manufacturing facilities, office buildings, court buildings, hospital and laboratory facilities, university buildings, performing arts facilities, museums, theaters, hotels, schools, housing projects, churches, libraries, restaurants, community centers, high voltage utilities, engine-generators UPS power supplies, and solar voltaic power systems.

EDUCATION University of California, Berkeley - B.S. in Electrical Engineering, 1965

REGISTRATION Professional Electrical Engineer, 1969, California E7218
Please call should you have any questions for require additional information.

Sincerely,

ZEIGER ENGINEERS, INC.

Ronald Zeiger, PE
President

Glossary:

Footcandle – a unit of illuminance equal to one lumen per square foot. 1 footcandle = 10.764 lux.

Illuminance – photopic irradiance. The unit is "lumens per square meter", or, equivalently, "lux".

Intensity – flux per solid angle. The radiometric unit is "watts per steradian"; the photopic unit is the "candela".

Irradiance – flux per unit area impinging onto a surface. The radiometric unit is "watts per square meter; " the photopic unit is "lumens per square meter" or, equivalently, "lux".

Lumen – a quantitative measure of the human visual response to optical flux.

Luminance – photopic radiance. The unit is "lumens per square meter per steradian" or, equivalently, "candela per square meter".

Luminous efficacy – the efficiency of a light source in producing visible light, expressed in lumens per watt**.**

Lux – a unit of illuminance equal to one lumen per square meter.

Nit – a unit of luminance equal to one candela per square meter ($cd/m^{2)}$) or equivalently, one lumen per square meter per steradian ($lm/m^2/sr$).

Photopic – pertaining to the human visual system and its response to light.

Projected area – the area of a surface as projected on a plane perpendicular to the viewing direction. The projected area is equal to the actual area times the cosine of the angle between the normal to the surface and the viewing direction.

Projected solid angle – used in calculating radiative transfer when the directions between all parts of the source and all parts of the receiver are not essentially the same. The projected solid angle does not lend itself to a simple short definition.

Radiance – the amount of flux radiated by a projected area of surface per steradian of solid angle. The radiometric unit is "watts per square meter per steradian";

Radiometric – pertaining to physical units of light measurement.

Solid angle – the two-dimensional space contained in a [symmetrical or irregularly shaped] cone radiating from a point. It is analogous to the one-dimensional space between two lines radiating from a point, which we call a plane angle. Solid angle is measured in steradians.

Spectra (n.) - Plural of spectrum

Spectral (adj.) – a description of light that separates it into its wavelength-by-wavelength (or frequency-by-frequency) components.

Spectrophotometer – an instrument for measuring the spectral transmitting or reflecting properties of materials. A spectrophotometer is not a device for measuring light, but rather for measuring the optical properties of materials.

Spectroradiometer (n.) – a device for measuring spectral flux, spectral radiance, or spectral irradiance.

Spectroradiometric (adj.) – a measurement of light that looks at its spectral components.

Spectrum (n.) – a description of light that separates it into its wavelength-by-wavelength (or frequency-by-frequency) components.

Steradian – (ab. sr) a measurement of solid angle. A solid angle of one steradian from a point is formed by a (symmetrical or irregularly shaped) cone radiating from the point that intersects an area equal to the square of the radius on a sphere centered at the point. There are 4π steradians in a sphere.

Watt – a physical unit of power or the flow of energy.

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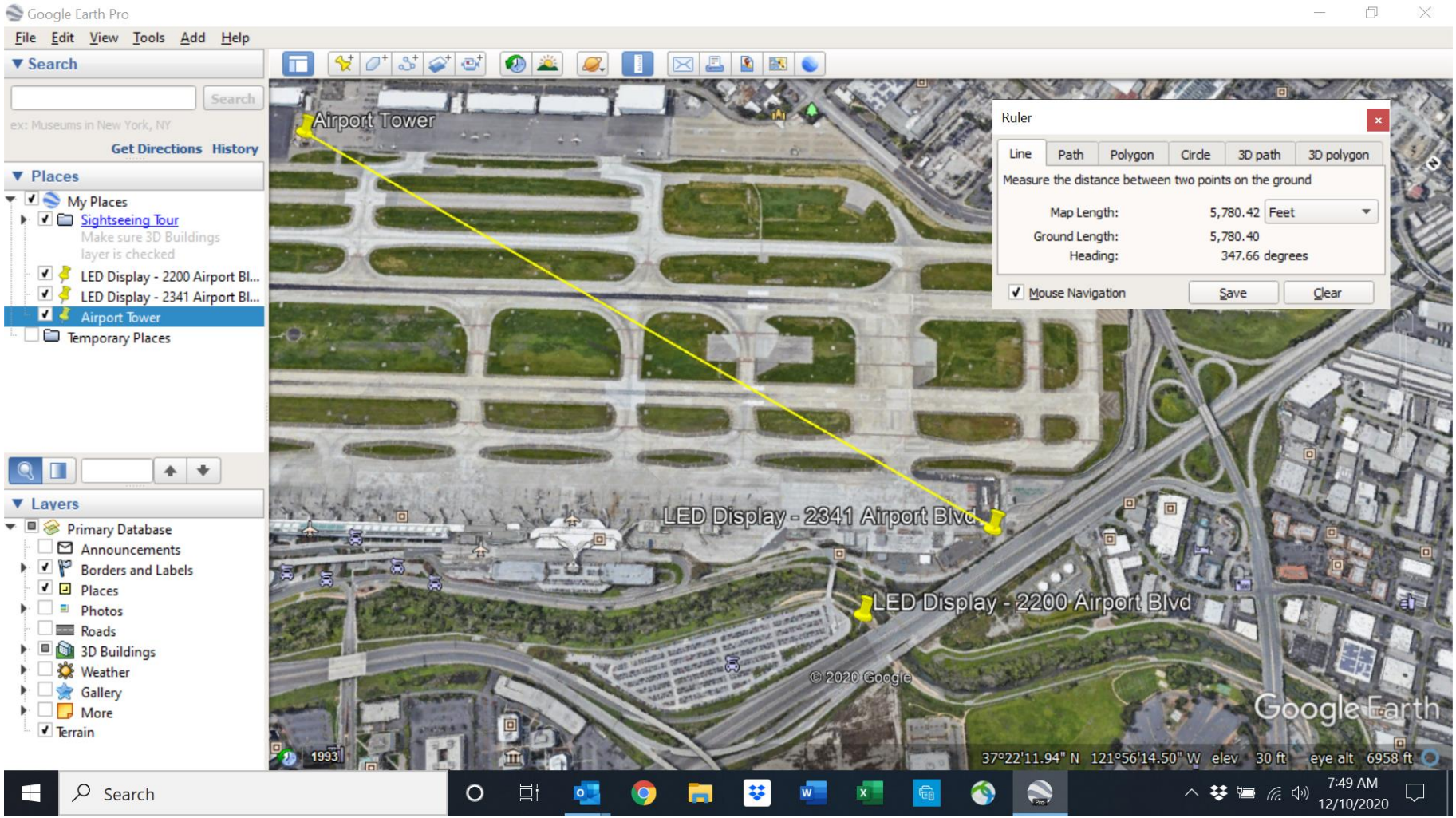
APPENDIX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Get Directions History
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Sightseeing Tour
Make sure 3D Buildings layer is checked
LED Display - 2200 Airport Bl...
LED Display - 2341 Airport Bl...
Airport Tower
Temporary Places
Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Airport Tower
LED Display - 2341 Airport Blvd
LED Display - 2200 Airport Blvd
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Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length: 5,780.42 Feet
Ground Length: 5,780.40
Heading: 347.66 degrees
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© 2020 Google
Google Earth
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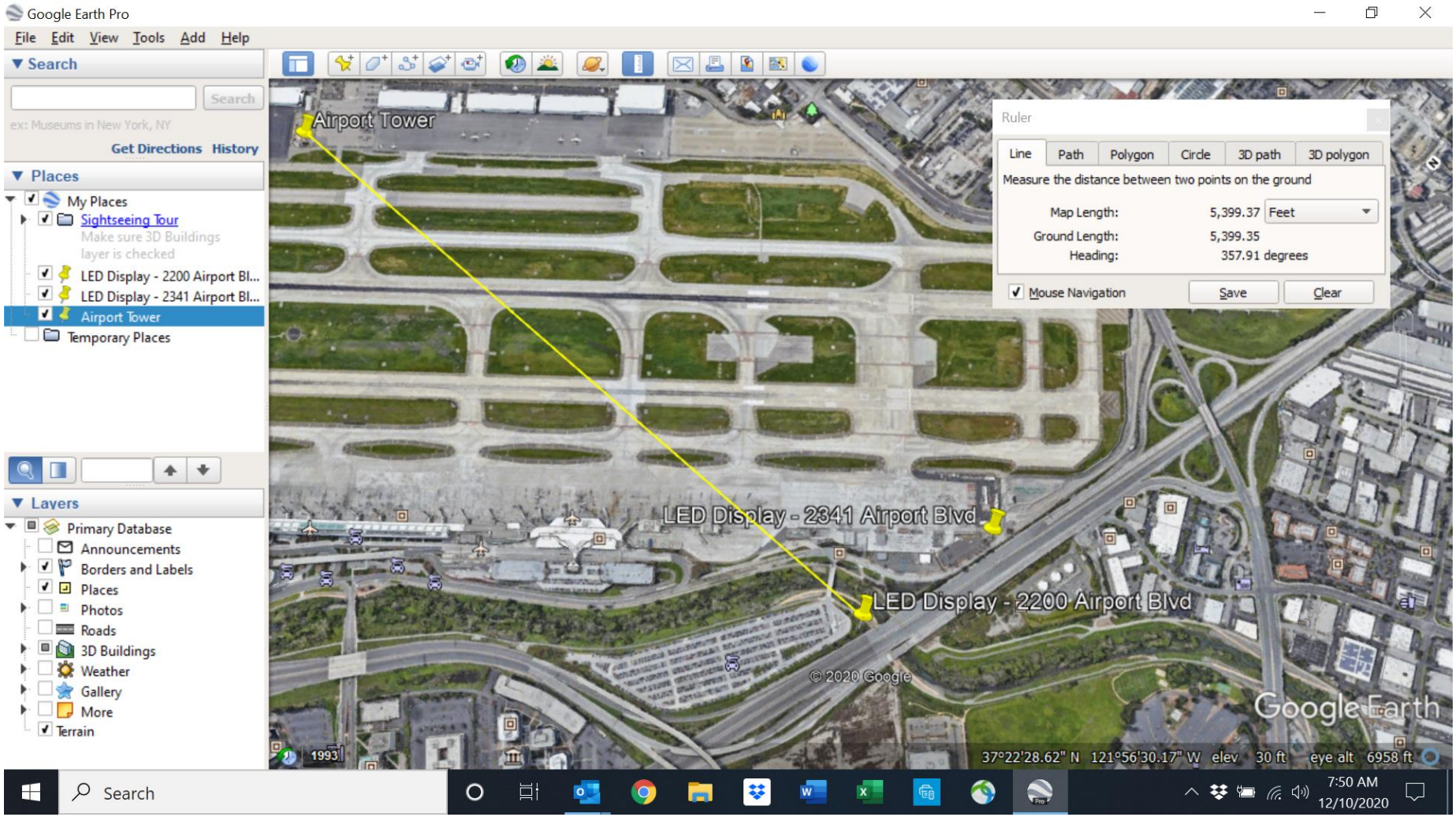
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Ground Length: 5,399.35
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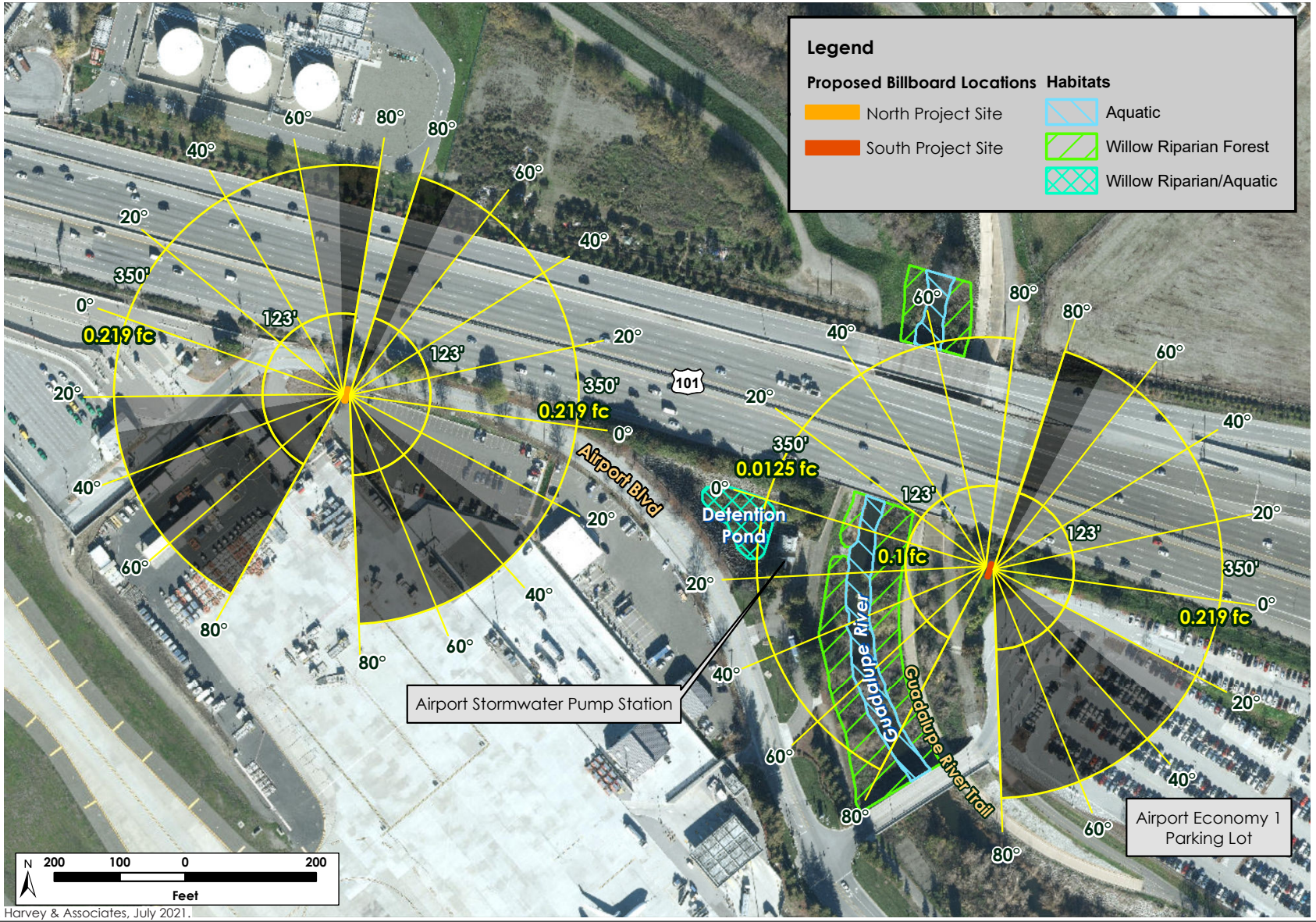
12/10/2020



Source: H.T. Harvey & Associates, July 2021.

SPILL LIGHT IN FOOTCANDLES

FIGURE 3.1-1

1-800-667-4554
1387 Cornwall Rd.
Oakville, ON L6J 7T5
mediaresources.com

Oct 13, 2020

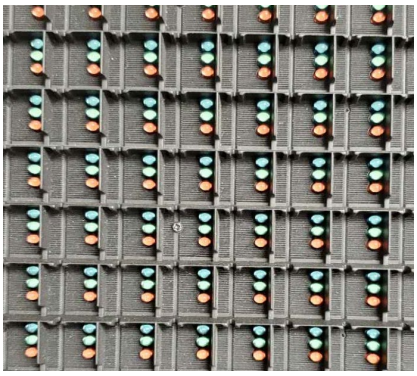
Skyglow and Vertical Light Emission Patterns

To whom it may concern,

Media Resources Inc. is a premiere manufacturer of LED digital displays for the Out-Of-Home Advertising industry. As a provider of technical and product solutions for decades, we have seen and participated in a greater sense of environmental awareness and sensitivity. Specifically, inadvertent lighting has become an increasing concern, one which we have sought to provide technological answers for.

Our outdoor digital displays are designed with many features to manage light output dynamically, dependably and directionally. This note describes some of the directional features deployed in our product to mitigate concerns around skyglow.

1. Media Resources Inc. invented a horizontal light mitigation technology called "SITELINE". The SITELINE product specifically to address the issues surrounding individual areas where light emission into nearby areas is undesirable. The SITELINE system employs a patent-pending mechanical baffle system similar to luminaire baffles to eliminate all projection of light from the Light Emitting Diodes (LEDs) into a "protected region". As a result, the protection is physical (See Figure 1 and 2) – reliable, permanent, and not the outcome of any programming or settings.



Figures 1 and 2. Close up photographs of SITELINE module face viewed from front (left) and from side (right). Note the red, green and blue diode lenses are directly visible from front direction but are obscured behind baffles viewed from the side.

mediaresources
Solutions for the sign industry.

1-800-667-4554
1387 Cornwall Rd.
Oakville, ON L6J 7T5
mediaresources.com

2. Our digital billboard products are all designed with horizontal shading louvers that protect the LEDs from sun, impact and limit upward angle. These louvers act to reduce the available upward view angle while maintaining good downward visibility. This design supersedes the need for any top mounted rimmed edge baffle on the cabinet; a secondary baffle would be ineffective and unnecessary. The following sectional view represents the upward and downward view angles of the LED diodes, as positioned in a SITELINE product.

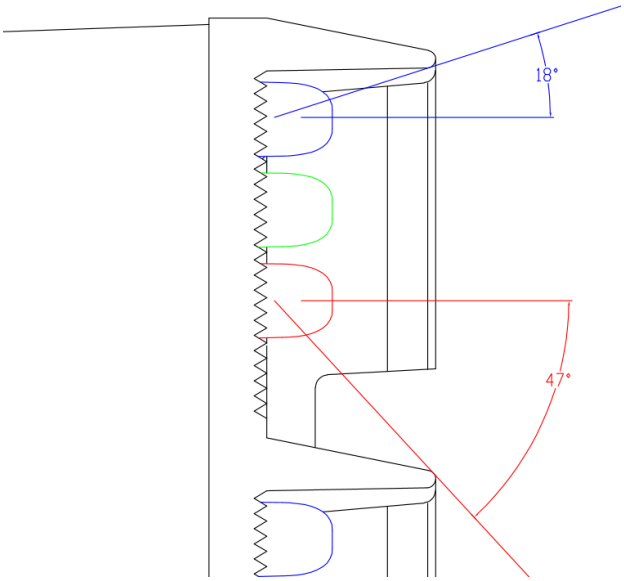


Figure 3. Section close-up of view angles in a SITELINE module. Image loses brightness above 18 degrees and below 47 degrees

3. MRI Digital Billboards employ "down-angle" LEDs supplied by Nichia, the world's top brand in LEDs. The development and selection of this type of LED is specifically tailored to outdoor advertising, where it provides better downward imaging while reducing upward light waste. In a comparison between standard and "down-angle" LED radiation patterns, the "down-angle" pattern outputs roughly 2/3^{rds} of its emission down below the horizon line and leaving 1/3rd above, while the standard patterns symmetrically output half above and half below the horizon line.

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mediaresources.com

We are always committed to the responsible application of LED digital technology and are happy to engage with regulatory stakeholders at any time. Please feel free to contact us if you have any questions.

Sincerely,

Cheng Qian
Chief Product Architect
Media Resources Inc.
(905) 586-1064
cqian@mediaresources.com

Measuring Digital Billboard Brightness With a Light Meter

December 18, 2020

EasyView™ Light Meter with Memory

Store and recall up to 50 measurements

With realtive or real time clock stamp

Features:

- Wide measurement range to 99,990Fc (999,900Lux) with resolution of 0.001Fc and 0.01Lux
- Luminous intensity (candela) calculations
- Ripple function excludes the effect of stray light from the primary light source measurement
- Auto Power off with disable feature
- Multiple point average function
- Timed-Hold, Relative in absolute value or % deviation, and Comparator function with high low alarms
- Cosine and color corrected, CNS 5119 Class II
- Complete with built-in stand, light sensor and protective cover with 36" (0.9m) cable, protective holster, 6 AAA batteries, and carrying case

When you will use the light meter

- Verify if a complaint that a sign is too bright
- Compare brightness of signs
- Demonstrating to a public official how to measure a digital sign brightness
- Use in the field to support a request to corporate to either replace the LED or increase sign output of a display that is nearing end of useful life, but not close enough for replacement.

“Foot candles”

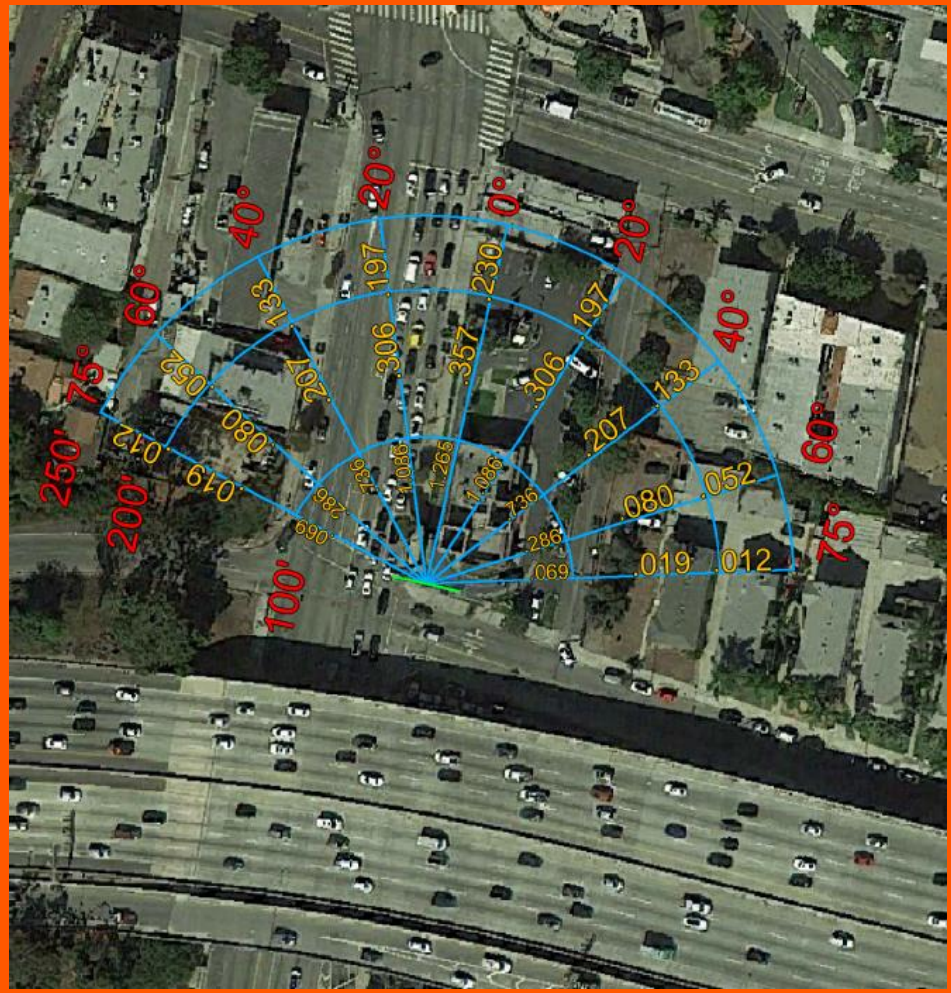
Two methods to measure brightness

Evaluating the brightness of a display:

For regulatory compliance or in response to a complaint is typically measured using a light meter, **measuring foot candles**.

When considering cleaning, calibration or replacing the display with a new digital face, measuring should be done using a nit gun (or luminance meter) **measuring nits**.

When explaining how to measure sign brightness, foundation knowledge of the basics of digital lighting are required



Operational Features

Static messages show once every 8 seconds

No Movement.

No Motion.

No Video.

A New Way to Change Faces

Light Emitting Diode

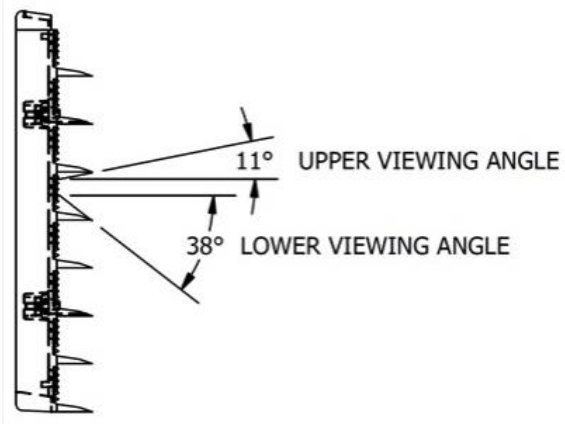
ONE Red LED

LED Pixels

LED: Contribute less to Sky Glow and Light Trespass

- LED diodes focus the emitted light in a beam
- Signs aimed at roadway
- Horizontal louvers help direct light downward

Photo of Daktronics module



Angle graphic provided by Prismview

Dimming Capabilities

An ambient light sensor dimming the sign is not compatible with a nit standard

Insure a digital sign is never too bright for conditions

There are 3 necessary components to insure a digital billboard will never be too bright for conditions.

1. Maximum brightness limits incorporating a footcandle standard
2. An ambient light sensor installed on the sign structure
3. Dimming software

Industry standards for maximum brightness: 0.3 foot candles

OAAA Recommended Brightness Guidelines

Criteria #1 - Lighting Standards – Measurements:
The industry recommended criteria follows the lighting standards established by the Illuminating Engineering Society of North America (IESNA). The OAAA and member companies voluntarily adhere to the following guidance.

Recommended regulatory criteria:
Lighting levels should not exceed 0.3 foot candles (over ambient levels) as measured using a foot candle meter at a pre-set distance.

Pre-set distances to measure the foot candles impact vary with the expected viewing distances of each size sign. Measurements should be taken as close to perpendicular to the face as practical.

Measurement distance criteria:

Nominal Face Size	Distance to Measure From
12' x 24'	150'
10'6 x 36'	200'
14' x 48'	250'
20' x 60'	350'

Each display must have a light sensing device that will adjust the brightness as ambient light conditions change.

These criteria are not open to negotiation

Foot Candle Language

0.3 foot candles

The presence of a foot candle limit without a set distance from which to measure creates an inaccurate and ineffective limit. All signs will be simultaneously in compliance and out of compliance

Why was 0.3 Footcandles chosen as the limit?

Carefully derived from a report completed by a former president of the IESNA. Based on accepted IESNA practice for “light trespass.”

OAAA commissioned the late Dr. Ian Lewin, in 2008 to recommend criteria for brightness levels on digital billboards. The standards are designed to minimize the risk of glare or unreasonable driver distraction.

Footcandle measurements are common. Footcandle measurements are widely used in the lighting industry, photography, film, television, conservation lighting, and construction related engineering and building code regulations. In addition, footcandles are frequently cited in OSHA regulations.

TWO WAYS TO MEASURE

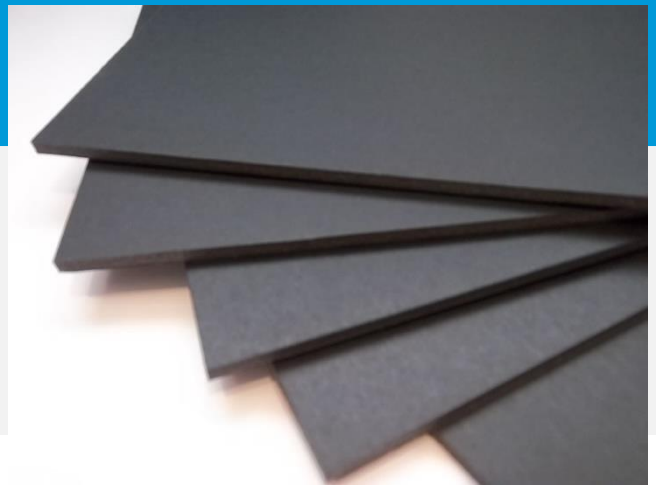
1. With the sign company's knowledge and assistance. Regulators may be skeptical.

2. Without the sign company's knowledge. A few more steps are required, we will detail.

How to Measure Footcandles in the Field– Without Sign Company Knowledge

This procedure is extremely simple and requires a helper, a footcandle meter and a piece of cardboard cut to the proper size 12 inches by 40 inches.

Step 1 Regular cardboard can be used and painted flat black, or purchased foam board in black



How to Measure Footcandles in the Field– Without Sign Company Knowledge

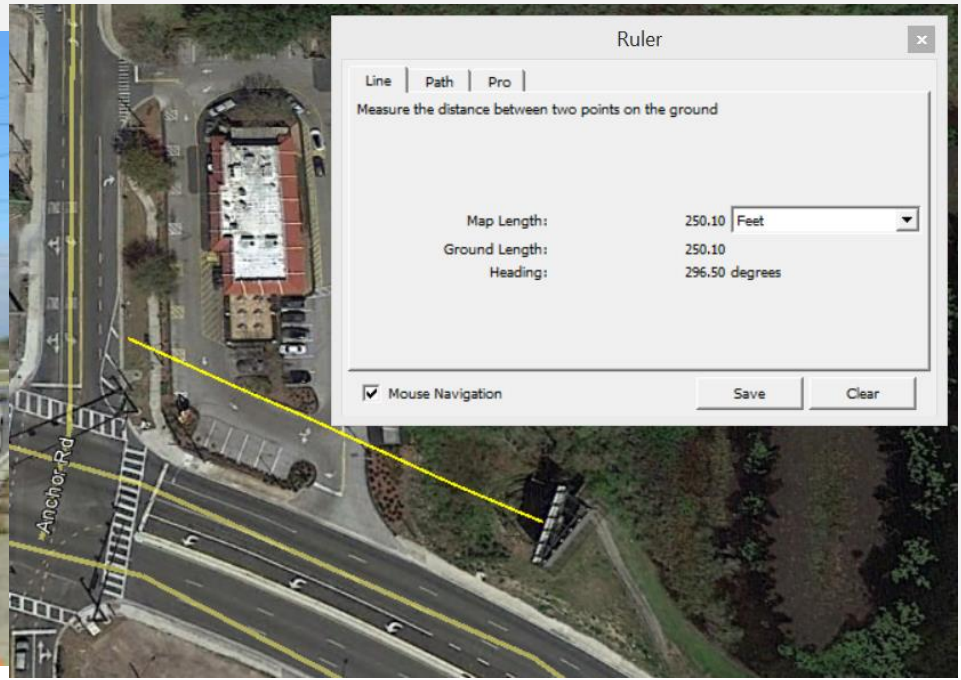
Step 2

Determine how far away from the face to stand to take the measurement

Billboard Nominal Face Dimensions (ft.)	Distance in (ft.)
11 x 22	150
10.5 x 36	200
14 x 48	250
20 x 60	350

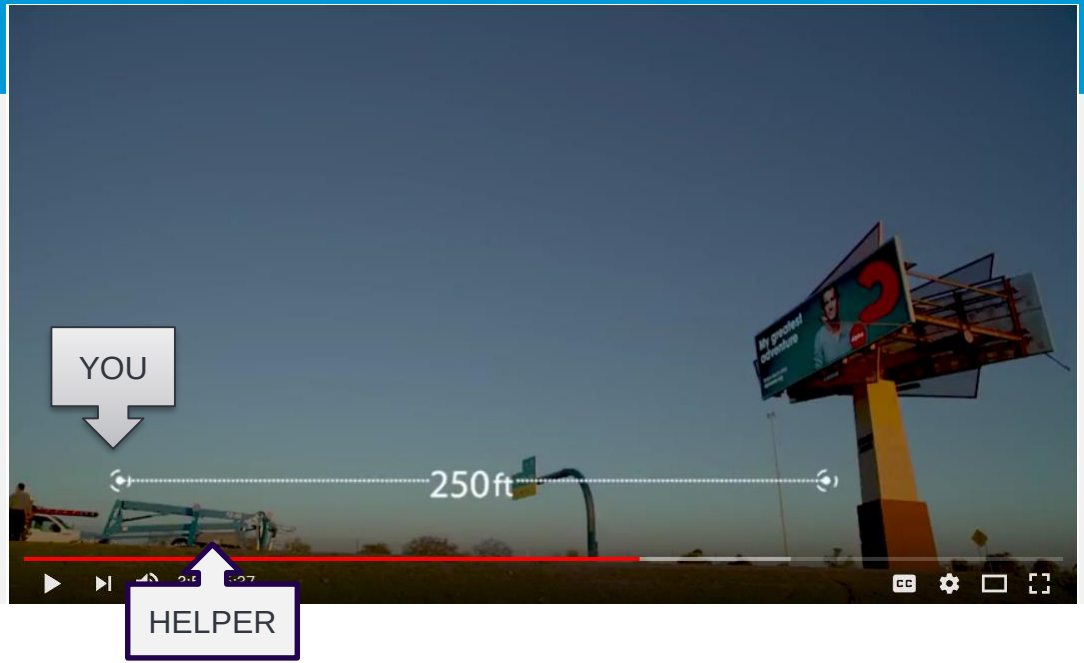
How to Measure Footcandles in the Field– Without Sign Company Knowledge

Step 3 Advance work from your desk. Google earth
Find where to stand to take the measurement, distance from the face.



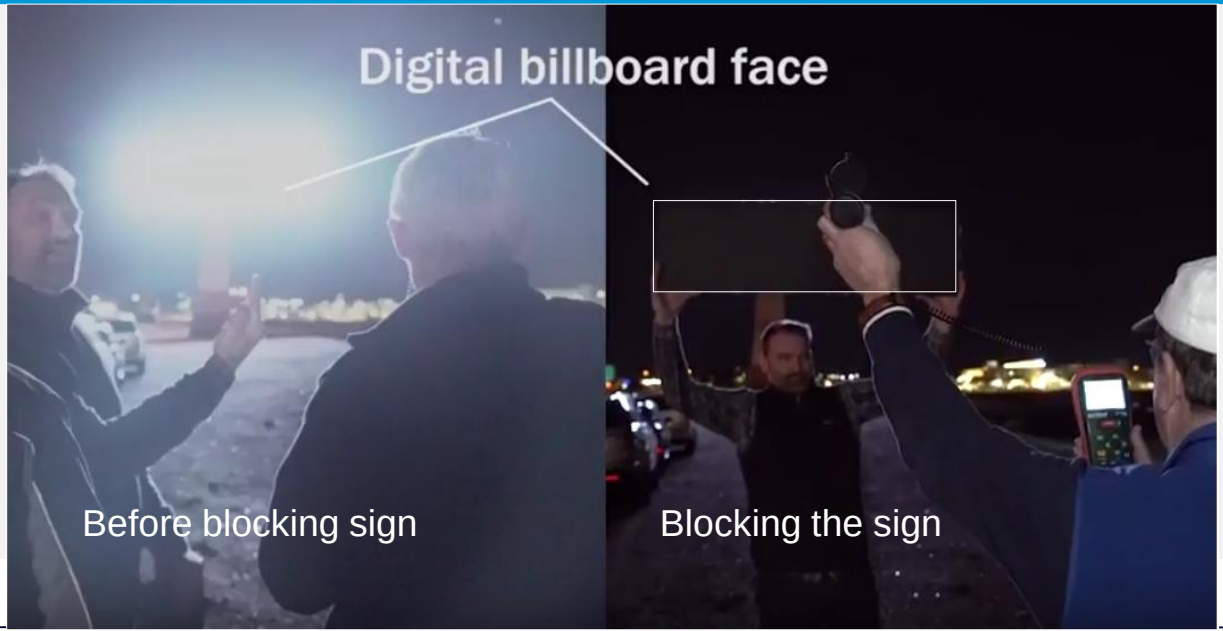
How to Measure Footcandles in the Field– Without Sign Company Knowledge

Step 4
Position yourself at the pre determined distance to hold up black cardboard to block light from subject sign



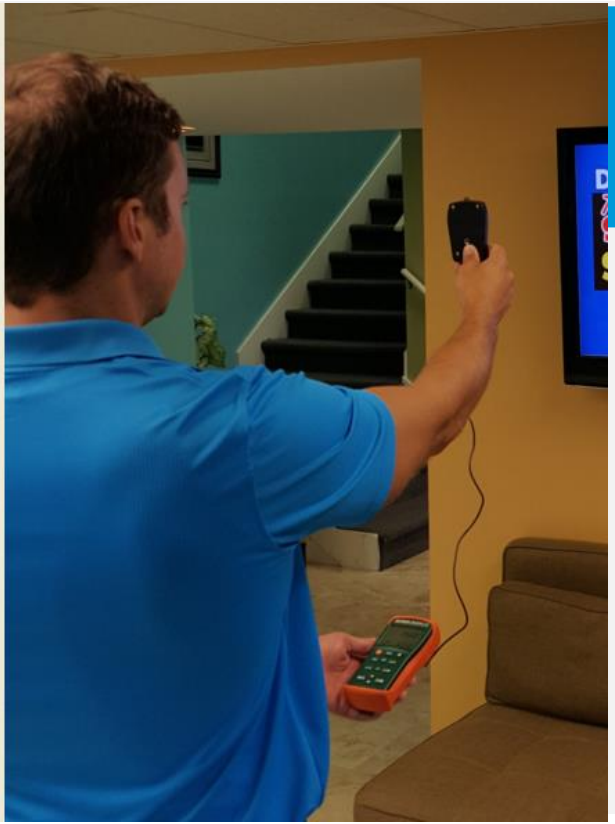
How to Measure Footcandles in the Field– Without Sign Company Knowledge

Step 5
Measure the ambient light of the area, without the light generated by the sign. Your helper should stand 7- 10 feet away and hold up black cardboard to block light from subject sign

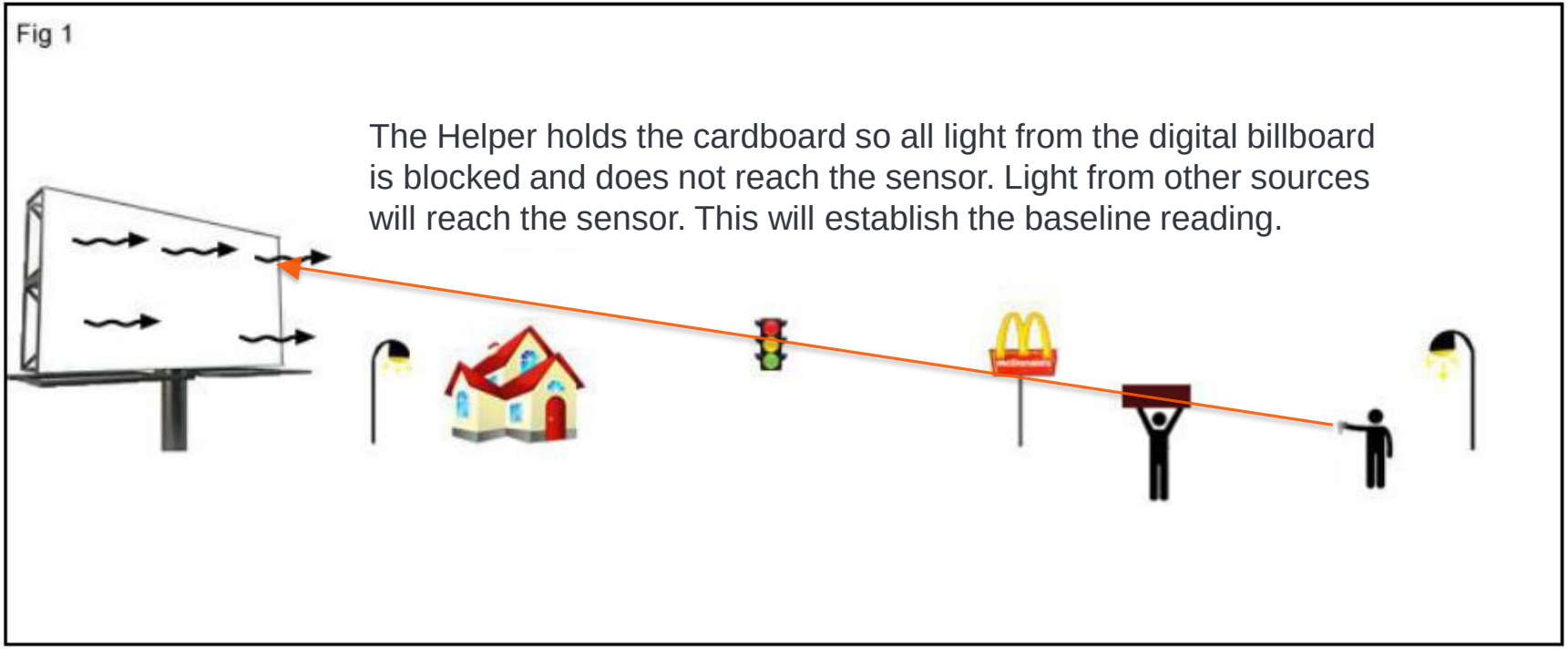


How to Measure Footcandles in the Field– Without Sign Company Knowledge

Step 6
Point the light meter sensor at the display
at about 5 feet high, approximately eye level



How to Measure Footcandles in the Field– Without Sign Company Knowledge



How to Measure Footcandles in the Field– Without Sign Company Knowledge

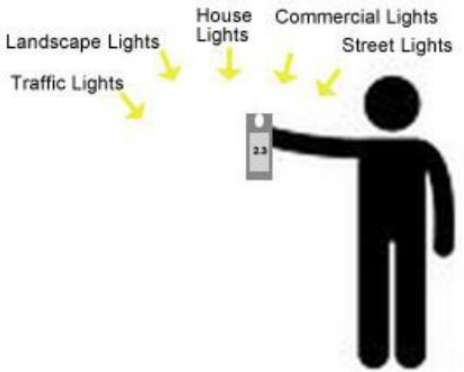
Step 7
Take the ambient light reading with no light from the digital billboard visible
Write it down

Fig 2

After the cardboard block is held in place, a reading should be taken for the ambient light.

In this example, various light sources are impacting the photocell measuring 2.3 foot-candles of ambient light.

This is the baseline for the measurement. Write it down.



How to Measure Footcandles in the Field– Without Sign Company Knowledge

Step 7
Take a second reading **with light from the digital billboard visible**.

Remove the black painted cardboard from blocking the digital billboard.

Watch the footcandle meter for 3 to 5 minutes to see if the max brightness level is exceeded by any of the images on the digital billboard.

Write it down

How to Measure Footcandles in the Field– Without Sign Company Knowledge

a. If the 2nd reading does not exceed the max brightness level, then the billboard illumination is in compliance.

b. If any of readings consistently exceed the max brightness level, the lighting level is not in compliance.

How to Measure Footcandles in the Field– Without Sign Company Knowledge

Review:

Once the baseline level is established, add 0.3 fc to the baseline level to calculate the max brightness limit. (For example: Baseline reading is 2.35 fc. The Max brightness level is 2.65 fc.)

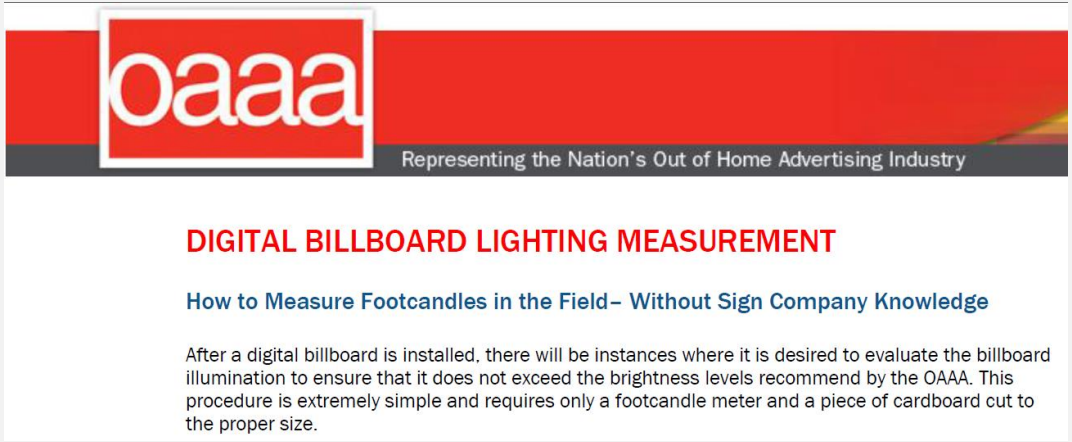
The math:

2.35 fc + 0.3 fc = maximum 2.65 fc to be in compliance

How to Measure Footcandles in the Field– Without Sign Company Knowledge

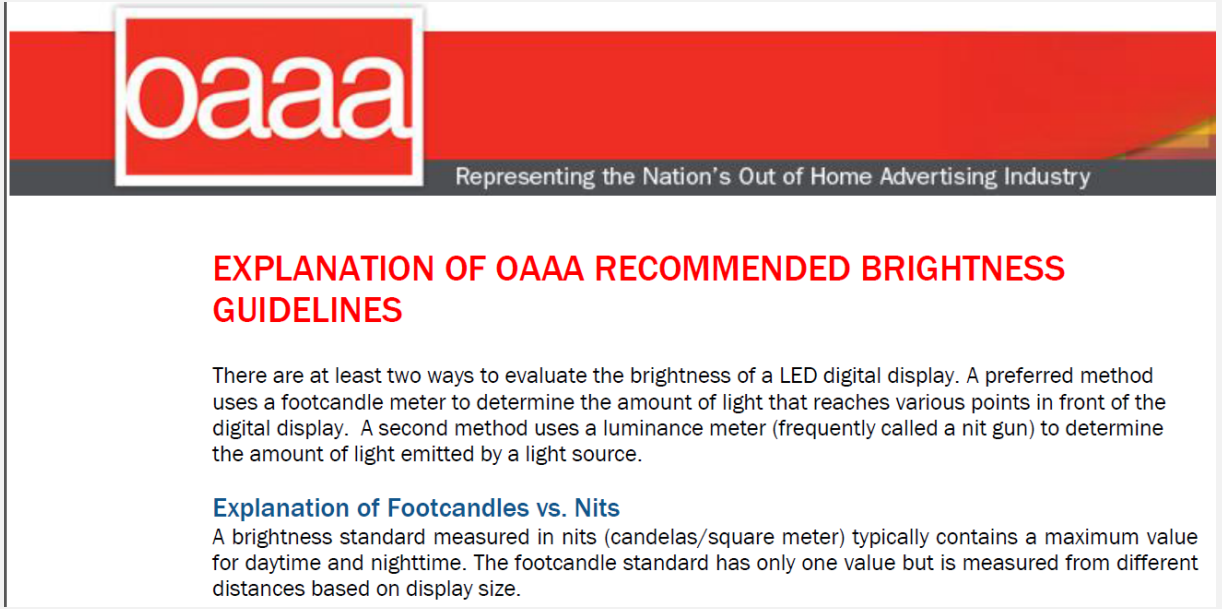
For additional information, visit the Digital Regulatory Page & www.oaaa.org

How to measure foot candles in the field.



How to Measure Footcandles in the Field– Without Sign Company Knowledge

For additional information, visit the Digital Regulatory Page & www.oaaa.org
OAAA Recommended Lighting Guidelines.



oaaa

Representing the Nation's Out of Home Advertising Industry

EXPLANATION OF OAAA RECOMMENDED BRIGHTNESS GUIDELINES

There are at least two ways to evaluate the brightness of a LED digital display. A preferred method uses a footcandle meter to determine the amount of light that reaches various points in front of the digital display. A second method uses a luminance meter (frequently called a nit gun) to determine the amount of light emitted by a light source.

Explanation of Footcandles vs. Nits

A brightness standard measured in nits (candelas/square meter) typically contains a maximum value for daytime and nighttime. The footcandle standard has only one value but is measured from different distances based on display size.

How to Measure Footcandles in the Field– Without Sign Company Knowledge

Document your results

Clear Channel Outdoor

BRIGHTNESS MEASUREMENT CHECKLIST

LOCATION DESCRIPTION:	US 1 WS .4mi N/O SR 404 Pineda Cswy F/S - 1						
DATE:	7/9/2015		CITY	Melbourne		MARKET	Melbourne
TIME STARTED:	9:30pm			ADDRESS:	6210 N US Hwy 1, Melbourne, FL 3		
TIME ENDED:	10:00pm			LOC NICKNAME:	Digital Switch		
Board #	5316	FACING:	South				
INSTALL DATE:	7/8/2015						
LED MANUFACTURER	Yesco						
MODLE # OR GENERATION	Rev B			528 x 152			
FACE SIZE OF LED	10.5	x		36	RESOLUTION mm		20
HEIGHT OF STRUCTURE	38ft						
HAS LED BEEN CLEANED PER MANUFACTURER SPECS?					YES		
HAS LED BEEN RECALIBRATED BY LED MAUNFACTURER?					YES		
DISTANCE MEASURED FROM		200ft					
MEASURED PREPENDICULAR FROM FACE? IF NOT GIVE ANGLE						YES	
PERSONS TAKING PART IN MEASUREMENT:	Matt Ashley / Pete Mack / Joe Schmitt						
BRAND AND NAME OF LIGHT METER USED:	ExTech EA33 Easy View						
LAST DATE OF LIGHT METER CALIBRATION (IF KNOWN)							N/A
TEST PERFORMED WITH ALL WHITE COPY? Y OR N							No
1. AMBIENT LIGHT READINGS (WITH DISPLAY OFF OR WITH LIGHT BLOCKED)							
2.05fc	1.88fc	2.26fc	2.30fc	2.08fc	2.36fc		
					AVERAGE:		2.15fc

How to Measure Footcandles in the Field– Without Sign Company Knowledge

Document your results

2. FOOT CANDLE MEASUREMENTS OF ACTIVE COPY OR FULL WHITE COPY			
2.41	fc	Copy name:	Zoo
2.42	fc	Copy name:	Lawyer
2.41	fc	Copy name:	Public Service
2.39	fc	Copy name:	Victory
2.42	fc	Copy name:	Victory
2.38	fc	Copy name:	Florida Air Tour
2.49	fc	Copy name:	Parrish
2.37	fc	Copy name:	Shelter Mortgage
2.41	fc AVERAGE OF ACTIVE COPY OR FULL WHITE COPY		
2.15	SUBTRACT AMBIENT LIGHT READING FROM 1 ABOVE		
0.26	fc AVERAGE ABOVE AMBIENT LIGHT		
	Note- if value is 0.3 fc or less, sign is in compliance with industry standard		
Conclusion:			
	Board is in compliance with Brevard County Sec 62.3306 which is attached		

How do you measure with the Sign Company knowledge?

How to Measure Footcandles in the Field– Without Sign Company Knowledge

Document your results

Outdoor Advertising Association of America

BRIGHTNESS MEASUREMENT CHECKLIST
LOCATED NEXT TO SECURITY SHACK

LOCATION DESCRIPTION:	Lankershim ES 50ft S/O Chandler			34.167879 -118.376149	
DATE: 8/9/2017		CITY	Los Angeles	MARKET	LAX
TIME STARTED: 8:30 PM	SUNSET	7:45 PM	ADDRESS:	5300 Lankershim	
TIME ENDED: 9:30 PM			LOC NICKNAME	NoHo Commons	
PANEL # LAX007488	FACING	N			
INSTALL DATE OF CURRENT UNIT:			4/21/2009		
OAAA MEMBER SIGN OPERATOR	Clear Channel Outdoor				
LED MANUFACTURER	Daktronics				
MODLE # OR GENERATION		DB 2100			
FACE SIZE OF LED	14	x	48	RESOLUTION mm	20
HEIGHT OF STRUCTURE	70 ft		(FROM GRADE TO TOP OF SIGN)		
HAS LED BEEN CLEANED PER MANUFACTURER SPECS?				No	
HAS LED BEEN RECALIBRATED BY LED MAUNFACTURER?				No	
DISTANCE MEASURED FROM	250 ft				
MEASURED PREPENDICULAR FROM FACE? IF NOT GIVE ANGLE	Slightly off perpendicular				
PERSONS TAKING PART IN MEASUREMENT:	Lou Musica, Layne Lawson, Danny La Rosa				
Representatives from the City of Los Angeles Department of Building and Safety.					
BRAND AND NAME OF LIGHT METER USED:	Easyview Extech EA33				
LAST DATE OF LIGHT METER CALIBRATION (IF KNOWN)					

How to Measure Footcandles in the Field– Without Sign Company Knowledge

Document your results

1. AMBIENT LIGHT READINGS (WITH SIGN BLOCKED OR WITH SIGN FULL BLACK)					
1.80	fc with sign blocked			fc with sign full black	3.80
	Average if receiving changing ambient readings				
2. FOOT CANDLE MEASUREMENTS OF					
1.90		ACTIVE COPY		fc with sign full white	4.01
	fc	Copy name:			
	fc	Copy name:			
	fc	Copy name:			
	fc	Copy name:			
	fc	Copy name:			
	fc	Copy name:			
	fc	Copy name:			
	fc	Copy name:			
1.90	fc AVG OF ACTIVE COPY OR FULL WHITE COPY FROM 2 ABOVE				4.01
1.80	SUBTRACT AMBIENT LIGHT READING FROM 1 ABOVE				3.80
0.10	fc AVERAGE ABOVE AMBIENT LIGHT				0.21
	Note- if value is 0.3 fc or less, sign is in compliance with industry standard				
Conclusion:	When measuring both scenarios, the sign face is in compliance. One with blocked face and active copy. The second with the face off and on full white. Note first scenario with cardboard had much lower readings due to changing ambient conditions between the two measurements				

GET SEEN. BE LOVED.

Watch the OAAA instructional video located here: http://oaaa.org/AboutOOH/GuidelinesStandards/DigitalLightingGuidelines.aspx

Clear Channel Outdoor

THANK YOU!

Outdoor Advertising Association of America

BRIGHTNESS MEASUREMENT CHECKLIST

LOCATION DESCRIPTION: _____

DATE: _____ CITY _____ MARKET _____

TIME STARTED: _____ SUNSET _____ ADDRESS: _____

TIME ENDED: _____ LOC NICKNAME: _____

Board # _____ FACING: _____ _____

INSTALL DATE: _____

OAAA MEMBER SIGN OPERATOR _____

LED MANUFACTURER _____

MODLE # OR GENERATION _____

FACE SIZE OF LED _____ x _____ **RESOLUTION mm** _____

HEIGHT OF STRUCTURE _____

HAS LED BEEN CLEANED PER MANUFACTURER SPECS? _____

HAS LED BEEN RECALIBRATED BY LED MAUNFACTURER? _____

DISTANCE MEASURED FROM

MEASURED PREPENDICULAR FROM FACE? IF NOT GIVE ANGLE

PERSONS TAKING PART IN MEASUREMENT:

BRAND AND NAME OF LIGHT METER USED:

LAST DATE OF LIGHT METER CALIBRATION (IF KNOWN)

TEST PERFORMED WITH ALL WHITE AND ALL BLACK COPY? Y OR N _____

1. AMBIENT LIGHT READINGS (WITH DISPLAY OFF OR WITH LIGHT BLOCKED)

fc fc fc fc fc fc

AVERAGE: _____

2. FOOT CANDLE MEASUREMENTS OF

_____ ACTIVE COPY _____ FULL WHITE COPY

fc Copy name:

fc Copy name:

fc Copy name:

fc Copy name:

fc Copy name:

fc Copy name:

fc Copy name:

fc Copy name:

_____ fc AVERAGE OF ACTIVE COPY OR FULL WHITE COPY

_____ SUBTRACT AMBIENT LIGHT READING FROM 1 ABOVE

_____ fc AVERAGE ABOVE AMBIENT LIGHT

_____ Note- if value is 0.3 fc or less, sign is in compliance with industry standard