Frequently Asked Questions

Digital Billboard Hold Time, Safety, and Traffic Impacts – 1700 Duane Avenue

The following FAQ addresses concerns raised by the City of Santa Clara Planning Commission regarding the operation of the proposed digital billboard at 1700 Duane Avenue. Responses are based on national and international safety studies, expert reviews, and industry guidance.

Question 1: How does the frequency of message change (e.g., 8 seconds vs 30 seconds) impact traffic safety and driver distraction?

Short Answer: Across the various studies on digital billboards – including federal, state, and international research – glances towards digital signs were occasionally longer than those toward static signs. However, average glance durations consistently remained under 2 seconds (2,000 milliseconds). Notably, even studies that observed increased attention to digital signs did not establish a causal link between message frequency and crashes.

Longer Answer: The Federal Highway Administration ("FHWA") field study tested commercial variable message signs ("CEVMS") with content that changed every 8 or 10 seconds.[1] It recorded driver eye movement and dwell times across both CEVMS and static billboards in Reading, PA, and Richmond, VA. The study found that the "average fixation to CEVMS was 379 milliseconds and to static billboards it was 335 milliseconds." The longest observed fixation was 1.3 seconds.[2] Furthermore, when New York State switched from 24-hour to 8-second display time on digital billboards, that analysis of crash data "suggests there is no change in crash patterns in the vicinity of the off-premise CEVMS billboards."[3]

The Swedish National and Transport Research Institute conducted a controlled driving study on behalf of the Swedish Transport Administration, finding that while digital billboards elicited longer glance durations than static signs, most glances remained under two seconds.[4]

The FHWA also updated another of its studies to emphasize the complexity of assessing safety impacts and suggests that further research is necessary to draft conclusions. They additionally provide, “the measurement of crash rates within the vicinity of CEVMS in comparison with crash rates at matched control locations without CEVMS…is one possible way to determine possible safety impacts. But, the crashes are rare multicausal events which are difficult to measure.”[5] Thus, using an 8-second dwell time does not indicate a tangible risk in traffic safety and driver distraction above what is recognized as still being safe.

As a final note, a study conducted by experts at the University of Utah found that in-vehicle information systems (e.g., gadgets, buttons, etc. inside the vehicle) create “moderate to high level cognitive workload for drivers,” and that after drivers interact with these information

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[1] FHWA, *Driver Visual Behavior in the Presence of CEVMS,* at p.1.
[2] *Id.* at p.2.
[3] 2015 OAAA Technology Brief, p.4.
[4] Swedish National Road and Transport Research Institute, *Effects on Electronic Billboards on Driver Distraction,* available at https://www.scenic.org/wp-content/uploads/2019/09/eebdd.pdf [as of Apr. 28, 2025]; *see also* FHWA, *Driver Visual Behavior in the Presence of Commercial Electronic Variable Message Signs*.
[5] FHWA, *The Effects of Commercial Electronic Variable Message Signs (CEVMS) on Driver Attention and Distraction: An Update* (2009) at p.1.

systems, it takes about 27 seconds to return to normal levels of performance.[6] This study suggests that in-vehicle information systems pose significantly greater risks than CEVMS.

Question 2: How does the frequency of sign placement (distance between signs) impact traffic safety and driver distraction?

Short Answer: None of the studies we examined directly correlated sign distance to any objective measure of safety. Nonetheless, California Business and Professions Code sections 5404, 5405, and 5408 contain spacing and placement requirements for outdoor advertising that address safety concerns regarding frequency of signs through minimum spacing distances for static and digital displays.

Longer Answer: California Business and Professions Code sections 5404, 5405, and 5408 establish minimum distance requirements for the placement of billboards along highways, and these minimum distances affect the frequency of sign visibility to drivers. Specifically, Section 5405 requires that "no message center display may be placed within 1,000 feet of another message center display on the same side of the highway. This minimum distance creates a 10.49 second interval between digital signs for a driver travelling at 65pmh. The 1,404 feet distance proposed between the Outfront sign and the nearest digital display would take approximately 14.73 seconds to travel at 65mph, creating an even greater sign distance and related view frequency than mandated by State law. Likewise, Section 5405 requires that static signs on the same side of the highway, be placed at least 500 feet apart. The proposed digital display will be more than 500 feet from any static billboard and more than 1,000 feet from any digital billboard display. Although, the reviewed studies do not directly correlate sign distance to an objective measure of safety, the proposed sign exceeds all state requirements for distance to static signs and distance to digital signs. Absent any compelling evidence to the contrary, which has not been presented or identified, the City should defer to the State on the appropriate sign distances as relates to safety.

Question 3: What is the impact of digital billboards on vehicle and traffic safety in Bay Area jurisdictions or along Highway 101?

Answer: While no direct studies have been conducted on digital billboard safety along Highway 101, the FHWA study, and other studies, were conducted in conditions comparable to Highway 101. Specifically, the research tested CEVMS located on both arterials and freeways, making its findings relevant to high-speed, high-traffic corridors like Highway 101.[7] Such studies did not find a statistically significant safety risk associated with digital billboards. The 2012 FHWA study cited above concluded that "the presence of CEVMS did not appear to be related to a decrease in looking toward the road ahead."[8]

Question 4: Do the brightness or illumination methods of digital billboards increase distraction or reduce driver visibility?

Short Answer: The available research – including FHWA studies – did not measure a statistically significant relationship between billboard brightness and driver distraction. Even when digital signs attracted more glances than static signs, the fixation durations were within

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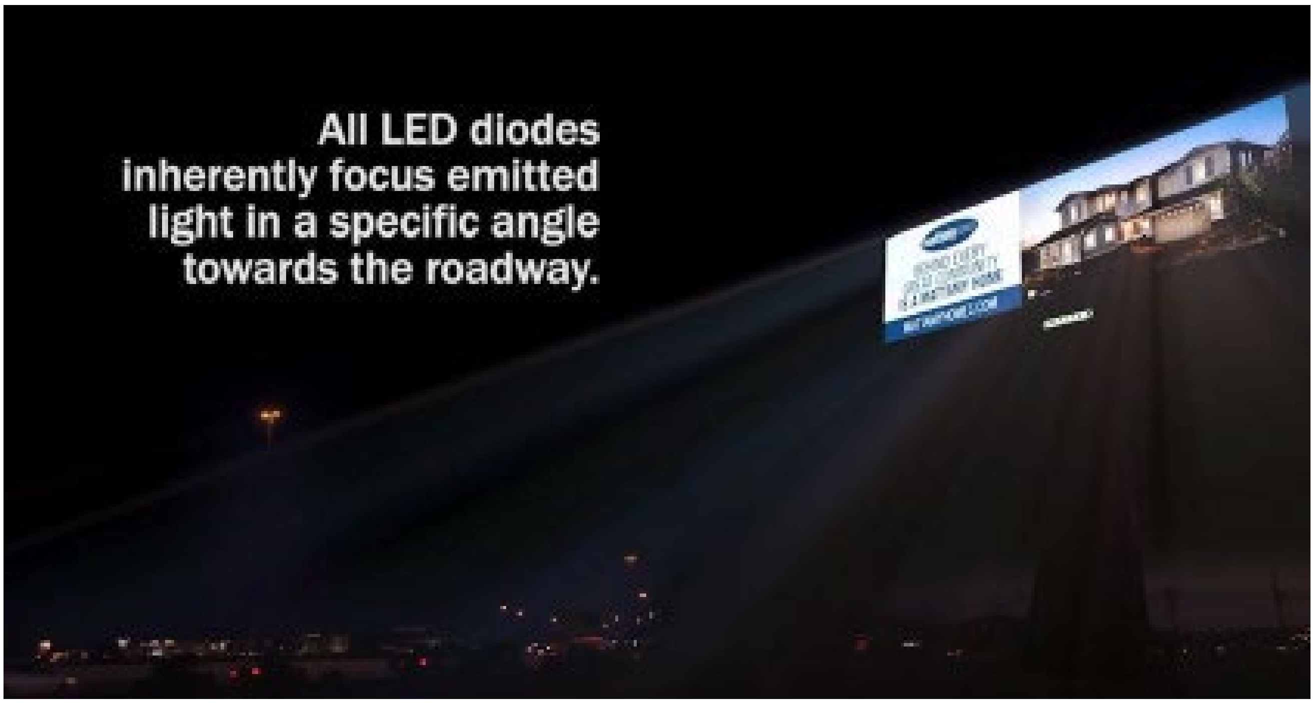
[6] Ken Klein, *The Hunt For Distractions Leads To Inside The Vehicle* (May 4, 2016) Billboard Insider <http://billboardinsider.com/the-hunt-for-districtions-leads-to-insider-the-vehicle/> [as of May 18, 2025].
[7] FHWA, *Driver Visual Behavior in the Presence of CEVMS,* at pp. 8-9.
[8] *Id.* at p.2.

safe limits. Perceived brightness is often a function of contrast and resolution, not actual luminance.

Longer Answer: To best understand the answer to this question, it first is necessary to understand how traditional, static billboards are illuminated. To reach an audience, the illumination of static billboards is imprecise; the billboard face is blasted with light at a level ranging from 31 to 312 times the brightness of an LED bulb (where brightness depends on color), and light reflects off the sign's vinyl surface in all different directions. As such, the target audience is reached along with a host of others, and this is why receptors see, for instance, sky glow from traditional, static signs.

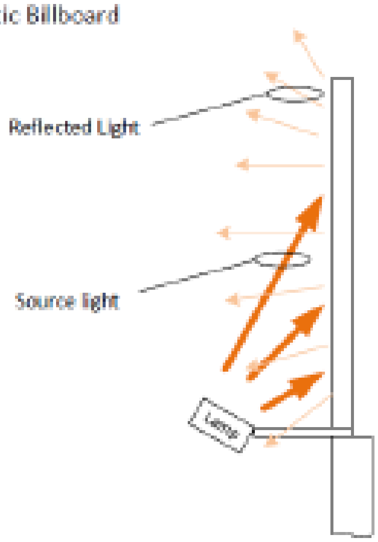
By contrast, LED billboards are very precise, in that they are focused on and directed at a specific target audience, and receptors in the periphery are affected at a much lesser level. The graphics below illustrate this "targeting" principle and the difference between LEDs and static billboards.



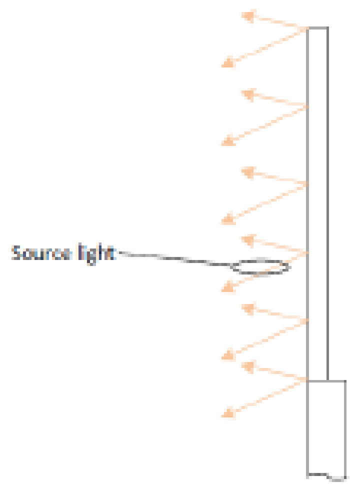
[Graphic continued on next page]

Efficiency of Static vs Digital Billboards

Static Billboard



Digital Billboard



Description	Static	Digital	Comment
Technical description of light	Illumination	Lumination	
Light source	4 each Metal Halide Floods	LED surface	
Light angles at light source	Directed through glass lens	Specific to diodes and louvers	Flood lamps are set to 30 degree apex for calcs
Light pattern from sign face	Scattered	Specific to diodes and louvers	
Number of fixtures	4	N/A, surface light only	
Candelas per fixture	31300	Surface output is variable	
Total candelas	584789	Surface output is variable	
Light to specific target	Random	Mathematically determinable	Variations of lens, reflectivity of copy, etc effect flood light scatter
Source light output for full white copy in candela	584789	18729	Static is 31 times more candela at light source (Fig A)
Source light output for full green copy in candela	584789	11267	Static is 52 times more candela at light source (Fig B)
Source light output for full red copy in candela	584789	5618	Static is 104 times more candela at light source (Fig C)
Source light output for full blue copy in candela	584789	1873	Static is 312 times more candela at light source (Fig D)
Source light output for typical copy without white background	584789	6000	Static is 97 times more candela at light source (Fig E)

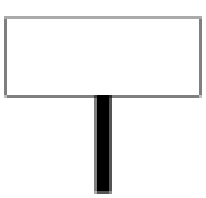


Fig A

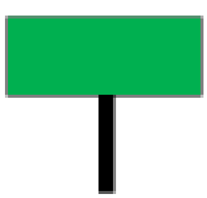


Fig B

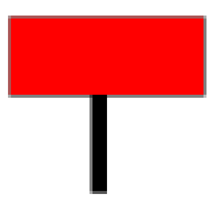


Fig C

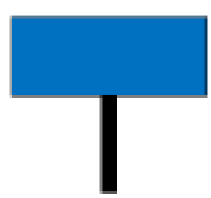


Fig D

Fig E

Further, Outfront Media operates its signs with brightness levels that are a fraction of what State law permits. Under section 5403 of the Business and Professions Code and section 21466.5 of the Vehicle Code, the most conservative brightness limit with which digital displays must comply to comply is 500 foot lamberts above ambient levels,[9] which is equivalent to 1713 nits above ambient levels. Outfront Media operate its displays with a night-time limit of 300 candela per square meter, also known as 300 nits, above ambient levels. This brightness level equates to 0.3 foot candles at 250 feet,[10] meaning that the signs' maximum brightness is about one-sixth of the maximum brightness level allowed under California state law.

Thus, any difference in brightness between a static and LED billboard is negligible beyond 250 feet, and likely would not even register on a light meter.

The FHWA study measured eye movement but not luminance levels. However, it found that driver attention to the forward roadway remained high across both digital and static billboard environments.[11]

Notably, although drivers in Richmond looked at CEVMS more often at night than static signs, their gaze dwell time still averaged only 1.09 seconds.[12] In Reading, gaze dwell times were .981 seconds for CEVMS and 1.3 seconds for static billboards, showing that even at night, gaze dwell times were de minimis, and statistically insignificant when compared to static boards. These findings suggest that digital billboards, when properly spaced and regulated, do not meaningfully alter driver visual attention in urban freeway settings due to brightness.[13]

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[9] This calculation assumes a minimum measured brightness in the field of view of less than 10 foot-lamberts, and a view angle of zero degrees (i.e., directly in front of the driver).
[10] Setting a standard in foot candles is a more appropriate metric by which to judge impacts on sensitive receptors, as a foot candela measures light intensity experienced at the receptor, whereas measurement in candela/square meters or nits reveals only the intensity of light at its source.
[11] FHWA, *Driver Visual Behavior in the Presence of CEVMS,* at p. 2.
[12] *Id.* at p.3.
[13] *Id.* at p. 3.

California Department of Transportation

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August 21, 2023 **CERTIFIED NUMBER: 7018 0360 0000 8453 2265**

Chris Steinbacher
Outfront Media LLC
1731 Workman Street
Los Angeles, CA 90031

Re: Outdoor Advertising Preliminary Application Number P04-3619

Dear Chris Steinbacher:

Thank you for your outdoor advertising preliminary application for an outdoor advertising display comprised of a one side display to be placed in the County of Santa Clara, adjacent to southbound State Route 101, at Post Mile marker 41.618L, and 1875 feet south of San Thomas Expressway. A true and correct copy of your preliminary application is enclosed for your reference. The proposed display location is identified as conforming to the requirements of the Outdoor Advertising Act at this time.

Within one year of the above date, if you submit an outdoor advertising application for a state permit, one hundred dollars of the preliminary review fees paid from the Preliminary Review Request shall be credited towards your outdoor advertising application.

If you have any questions, please contact our office at (916) 654-6473.

Sincerely,

GEORGE ANZO
ODA Permits Manager
Enclosures