

Agenda Item: Zoning Application 2019-704, UDO Text Amendment on Illumination of Signs in CrC District

TO: Mayor and Board of Commissioners

FROM: Mary Jo Gollnitz, Senior Planner

DATE: November 4, 2019

Background/Issue:

- Request is to allow internally illuminated signs (including electronic message board) for institutional uses within the CrC District.
- Current sign ordinance only allows external illumination of signs in the CrC District.
- Staff has worked with the applicant and provides suggested text amendment.
- Current sign ordinance only allows for sign copy to change once every 4 hours. This regulation would not be affected by the requested text amendment.
- Any new signage will go through the permitting approval process.
- The text change as proposed would not only apply to the specific site which is the reason for the request, but for any other locations that could take advantage of it. This means other locations could use this text revision to install electronic message boards as part of their freestanding sign within the CrC District.

Proposal/Solution

The text change would allow churches within the CrC District to install digital signs on their properties.

Financial Impact

None

Related Town Goal

Quality of Life
Economic Development/Land Use Planning

Recommended Action

Hold the public hearing on the attached text changes to the Sign section of the Matthews UDO, then refer the amendment to the Planning Board for their review and recommendation.

The proposed revisions here are either revising current wording or adding new language to current sections. New text is indicated by blue font and current text to be deleted is indicated in red font with a strike through.

155.608.7 Signs in all Residential Districts, Including Single-Family, Multi-Family, and Mixes of All or Predominately-All Residential Uses.

- A. ILLUMINATION LIMITATION. Only externally lighted signs are permitted in the R-20, R-15, R-12, R-9, R-MH, R-15MF, R-12MF, and R-VS, ~~and CrC~~ Districts. Internally or externally lighted signs are permitted in the CrC, SRN and C-MF Districts. See § 155.608.5.D for categories of internal and external illumination.
- B. LOCATION PERMITTED. All signs for uses allowed within the various residential districts must be located behind the street right-of-way and out of any sight triangles.
- C. SIGN HEIGHT. No freestanding sign may be over ten feet (10’) in height, except where a lesser maximum height is given in other portions of this Title. See § 155.608.5.E. (Ord. 1127, passed 7-10-00)
- D. TABLE OF SIGN REGULATIONS FOR USES IN THE RESIDENTIAL DISTRICTS.

USE	TYPE AREA PERMITTED	NUMBER PERMITTED ⁽¹⁾	MAXIMUM SIGN (SQUARE FEET)
Church or place of worship, elementary or secondary schools, and similar uses; convents, monasteries, dormitories, colleges and universities, and similar uses	Identification ⁽³⁾	1 per street front, freestanding OR 1 per building, attached	40 for first sign; 25 for others
	Bulletin board	1	6 18

⁽¹⁾ Two (2) freestanding identification signs may be permitted in accordance with the provisions of § 155.608.7.C.

⁽²⁾ Behind street right-of-way and no illumination. ('72 Code, § 24-2110) (Ord. 477, passed 2-8-88; Am. Ord. 789, passed 10-25-93; Am. Ord. 2059, passed 12-8-14) **[formerly § 153.150]**

⁽³⁾ Electronic Message Center (EMC) shall have a day maximum of 5000 Nits and night maximum of 2000 Nits. Electronic Message Center shall be limited to fifty percent (50%) of the principle freestanding sign.

2019-704
9-20-19



232 Matthews Station Street
Matthews, NC 28105
704.847.4411

**ZONING APPLICATION FOR UNIFIED DEVELOPMENT ORDINANCE TEXT CHANGE
AS PROVIDED IN THE UDO AT 155.401.3**

APPLICATION NUMBER _____ DATE FILED 9/16/19
APPLICANT'S NAME MT. MORIAH MISSIONARY BAPTIST CHURCH / LARRY W. WHITLEY
APPLICANT'S MAILING ADDRESS 381 CRESTDALE RD. MATTHEWS, N.C. 28105
APPLICANT'S PHONE NUMBER/EMAIL ADDRESS 704-572-9705 (CELL) LWHIT@MTMORIAHCHURCHCAROLINA.PR.COM
980-245-9090 (B)

I request consideration of the following change in text of the Matthews Unified Development Ordinance:

Requested text change is:

- a change in wording to existing Section(s)
- an addition to Section(s)
- a deletion of wording at existing Section(s)

Below is the text requested to be changed, added or deleted:

Existing Section 155.608.10.D TABLE Proposed Section 155.608.10.D TABLE

CHURCHES OR PLACE OF WORSHIP

BULLETINE BOARD ADD INTERNAL ILLUMINATION

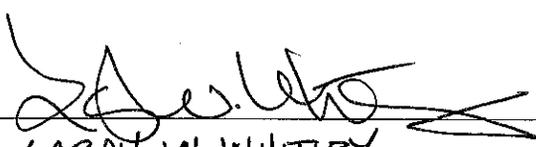
(continue on additional page(s) as necessary)

2019-704
9-20-19

ZONING APPLICATION FOR ORDINANCE TEXT CHANGE
Page 2

What is the intended effect of this request?

TO MAKE CHANGES FOR CHURCH SERVICES FROM VIA
MANUELY TO COMPUTER.

APPLICANT SIGNATURE  PASTOR
LARRY W. WHITLEY

(continue on additional page(s) as necessary)

Understanding LED Sign Brightness

With so many different types of measurements and contributing factors to overall LED sign brightness, the topic can quickly become confusing. However, the sign industry has settled on a standard measurement that will help you to discuss and compare LED signs: the **nit**. Also known as “candelas per square meter”, a nit is a unit of measurement for the total brightness over one square meter of an LED display. This value takes into account *all* of the contributing factors to brightness, such as the number of LEDs per pixel, the pixel pitch (distance between pixels) and the brightness of individual LEDs.

This measurement is different than what is typically used for single light sources such as projectors and flashlights, which are measured in lumens. As the light source gets farther away from the surface it is projecting on, the brightness per square meter decreases (think of this as the same amount of light spread over a larger area).

This measurement assumes that all of the LEDs within the square meter are on at their full brightness as allowed by the sign software and hardware configuration. This means the sign is at its brightest white for a full color display, or brightest red for a shaded red display. A special measurement device is used to deliver the **nit rating** of the sign. Outdoor LED signs can range from 5,000 to 8,000 nits or higher. In comparison, typical televisions range from 500 to 1,000 nits and indoor LED signs from 1,000 to 2,000 nits.

Why does brightness matter?

There are two important things to consider related to sign brightness: **how well it competes with the sun**, and **how long it will compete with the sun**. Ensuring that your sign is readable during the day is vital to the success of having passers by read your sign. The brighter the display, the better able it is to compete with the sun.

In addition, LEDs do not burn out but instead grow dimmer with use. The dimmer an individual LED becomes, the less effective the overall sign is at competing with the sun. Starting with a brighter display ensures that your LED sign will be readable for many years into the future.

Source: SignCommand.com

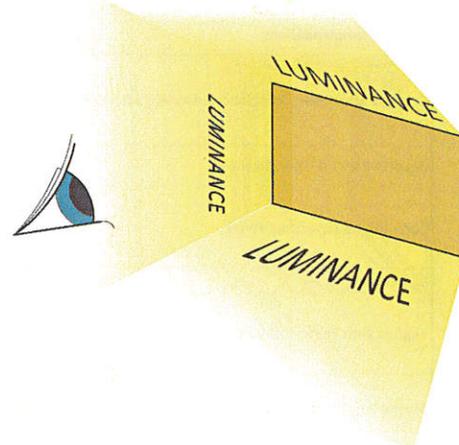
Sign Brightness

Measuring Sign Brightness

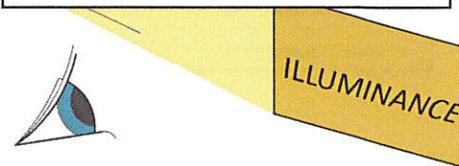
by Gregory Young

Apart from energy consumption, there are the important issues of light trespass and light pollution, which cause distraction, obscure stars in the night sky, and, like any other form of pollution, disrupt ecosystems and cause adverse health effects for humans and wildlife alike. Light trespass¹ is measured in two ways: luminance or illuminance. *Luminance* (measured in nits²) quantifies surface brightness, or the amount of light an object gives off. *Illuminance* (measured in footcandles³) quantifies that amount of light which falls onto an object.

By either measure, digital signage can create significant problems. “During daylight, an unlit static billboard will have a brightness which “fits in” with its surroundings; it will not cause excessive distraction because of excessive luminance” (Carhart, 2010, p.4). But, to capture drivers’ attention, digital signs must be set to very high luminance levels, as they are essentially competing with the sun, which has a luminance level of 6,500 nits. If this extreme brightness is not modulated to fit nighttime conditions, we face issues including very high energy consumption during the day, light pollution in the evening, and potential driver distraction at all times. The OAAA (Outdoor Advertising Association of America) has guidelines to address brightness limits, but they are not mandated.



This sign (above) gives off light. Its **Luminance** is measured in **nits**.



This sign (above) is being lit by a light source. Its **Illuminance** is measured in **footcandles**.

¹ **Light trespass** occurs when unwanted light enters one's property, for instance, by shining over a neighbor's fence. A common light trespass problem occurs when a strong light enters the window of one's home from the outside

² **Nit**—term used to describe a metric unit of luminance. It is defined as candela per square meter (cd/m^2). The unit is based on the candela, the modern metric unit of luminous intensity; and the square meter.

³ **Footcandle** – Unit of light density incident on a plane (assumed to be horizontal unless otherwise specified), and measurable with an illuminance meter, a.k.a. light meter.

Observed and Recommended Levels of Brightness		
Information Source	Product type	Luminance (surface brightness)
(C.Luginbuhl study)	Typical Ambient Roadway Illumination	1 Nit
(C. Luginbuhl study)	Typical Floodlit Billboard	approximately 100 Nits
Digital Billboards: New Regulations for New Technology by Drew Carhart	Traditionally lit static billboards	98% were under 150 Nits, 83% were under 100 Nits (Arizona Study); 124 Nits average (New York Study)
IESNA recommendations	Recommendations for Digital Billboard Luminance	250 Nits (day), 125 Nits (night)
Outdoor Advertising Association of America (Ian Lewin Study)	Recommendations for Digital Billboard Luminance	300-350 Nits suggested (study based on light trespass readings)
Hewlett-Packard (Specifications)	47" LCD Digital Signage Display	500 Nits
Corn Digital (Specifications)	32" & 42" LCD Posters	500 Nits (32") 700 Nits (42")
Carhart study	Daytime sky (sunny)	5,000-7,000 Nits
Virginia Tech Transportation Inst.	The Sun	6,500 Nits
Senzen Top Technology Co., Ltd (specifications)	seires PH12 (14'x48' full-color LED billboard	8,000+ Nits
EraLED (Specifications)	Series P20 full-color LED billboard (assorted sizes)	8,500 Nits
ProVIDEO Billboard Panels (specifications)	Series 1515-4, 14'x48' full-color LED billboard	11,000+ Nits
Optec Displays (specifications)	model 1248, 14'x48' full-color LED billboard	11,000+ Nits
Optec Displays (specifications)	model 2040-5, 14'x48' full-color LED billboard	11,000+ Nits

Limiting Sign Brightness

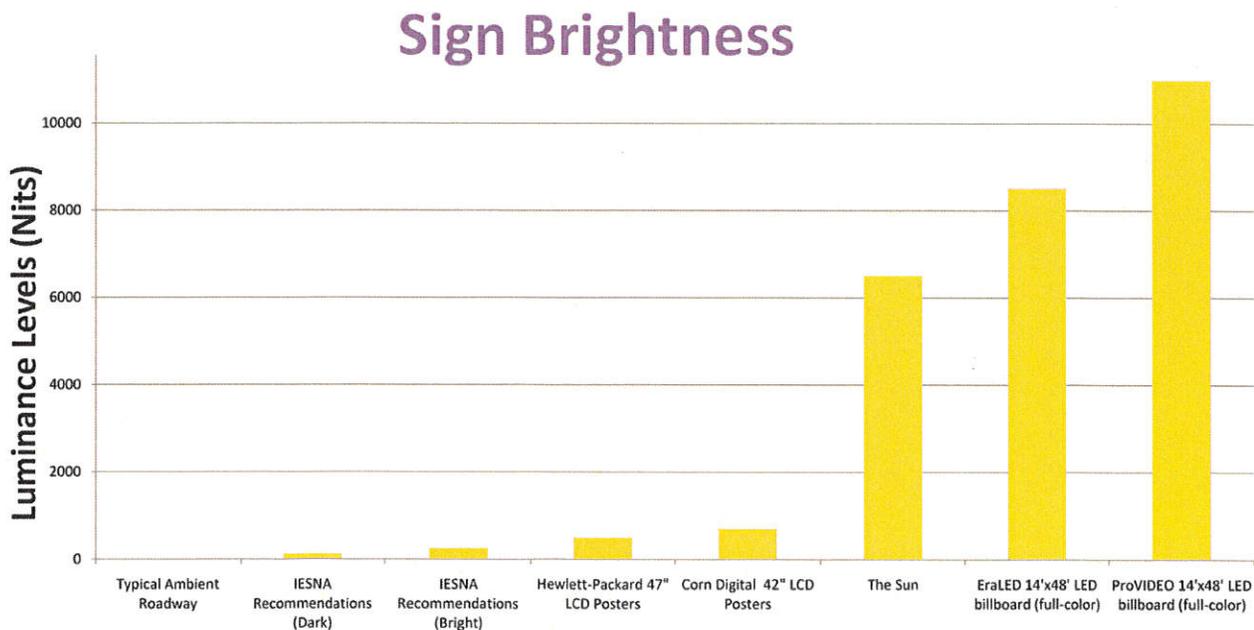
Proposed limits on sign brightness have caused much debate. Research provided by the Illuminating Engineering Society of North America (IESNA) states that drivers should be subjected to points of brightness no greater than 40 times the average brightness level of their general surroundings; this proportion is known as the contrast ratio. "As roadway lighting and automobile headlights provide ambient nighttime lighting levels of about one nit, this implies signage should appear no brighter than about 40 nits" (Luginbuhl, 2010, p.1). Surprisingly, the IESNA's own recommendations for signage luminance suggest limits between 250-1400 nits---greatly exceeding their stated maximum contrast ratio of 40:1.

The OAAA, has deemed 300-350 nits an acceptable level of night brightness. However, their guidance is based on the use of the IEEE standard for light trespass (IESNA-TM-11-00), when, for reasons of traffic safety and glare in drivers' eyes, it should have been based on IEEE's standard for roadway sign lighting (IESNA RP-19-01).

Traditionally floodlit static billboards rarely exceed 100 nits; experts on both driver distraction and light pollution recommended that, as a means of compromise, the new technologies should not exceed this value. In many areas, including Philadelphia, brightness levels are currently unregulated, and many manufacturers publicize their signs' capabilities to reach up to 11,000 nits.

Digital signage advocates mention the horizontal louvers⁴ included in many billboards as an effective measure to prevent light pollution. In reality, these louver systems were designed primarily to shade each diode from sunlight (thus increasing their prominence), not to limit nighttime glow.⁵ As Luginbuhl states in "Lighting and Astronomy," horizontal light (that which is emitted between 0° and roughly ±20°, and not restricted by horizontal louvers) contributes even more to skyglow than light emitted at higher angles. The effects of lower-angle lighting---such as that used to captivate approaching drivers-- are visible over a much broader area (Carhart, 2010).

A better option is to simply operate signs at less than maximum brightness. Not surprisingly, sign brightness and energy usage are directly related; beyond reducing light pollution and distraction, lowering luminance reduces total power consumption. One manufacturer experimented with running their digital displays at half-brightness; they were able to reduce power usage by nearly 40%, while maintaining full sign readability (Noventri, see in chart). Another option for reducing unnecessary brightness (and thus power usage) is to equip signs with sensors which automatically lower light output in accordance with atmospheric conditions. For example, sign brightness would mechanically be dimmed during dusk, early morning hours, or during cloudy or overcast weather. Again, OAAA does have guidelines for dimming, but they are not mandatory.



⁴ A **louver** is a slat that is angled to keep out rain, direct sunshine, etc. The angle of the slats may be adjustable or fixed.

⁵Retrieved from <http://www.optec.com>