

Planning Board Admin

From: Richard & Paula <paintedorse@comcast.net>
Sent: Friday, November 20, 2020 3:45 PM
To: Planning Board
Subject: Regarding Lighting at 84 Boston Road
Attachments: AMA CSAPH Report 02-A-16 - LED.pdf

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Newbury Planning Board

Hi Martha,

Please pass my comments and this email to the Planning Board regarding the Boston Road proposed project. Below please find an earlier email that I provided the board back in 2016.

As mentioned in the original email, the lights at the existing facility have a color temperature that exceeds recommendations from several groups including the AMA. I assume that the lighting at the new facility would be the same. I urge the board to rethink the use of such lights. The earlier email outlines the reason for this consideration.

Moreover there is a Massachusetts Bill that has passed the State/House Legislatures and is now in Committee. The bill can be found [here](#). The bill recommends a color temperature of 3000k or less. The storage facility exceeds this recommendation.

I ask that the board request that the new site adhere to these recommendations and if possible that the existing site would entertain a change. The change in color temperature does not alter the illumination/brightness – just the color.

Richard Piccolo
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From: paintedorse [mailto:paintedorse@comcast.net]
Sent: Friday, September 30, 2016 10:26 AM
To: 'Planning Board'
Subject: Planning Board Recommendations on Lighting

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SEP 30 2020

Newbury Planning Board

Hi Martha,

When passing the two buildings (office and private storage) on Rt. 1, I noticed the brightness and color temperature of the lighting. The bluish white lights are very unappealing and as research is beginning to show, it is not a good thing. As you may know, many municipalities, with the recommendation of the utility companies, opt for similar LED lighting that have very high color temperatures. The option has often been suggested due to cost and limitations of LED lighting. But advances in LED lighting is changing rapidly.

Recent research has shown that high color temperature lighting is detrimental humans and wildlife. Moreover high color temperature lights contribute to light pollution. Attached you will find an AMA report on this issue.

In general the industry is leading to more warm lighting (e.g. 2300k or less). The ones at those Rt. 1 buildings look to exceed 5000K.

Here are some links to research that has been done on the issue of outdoor lighting. As you will see the industry is changing to accommodate color temperatures that are similar to warm incandescent lighting.

- <http://www.ledsmagazine.com/articles/2009/10/dark-sky-says-boo-to-blue-light.html>
- <http://www.ledsmagazine.com/articles/print/volume-13/issue-5/features/color-tuning/color-tuning-makes-led-lighting-more-like-an-old-friend.html>
- http://www.earthisland.org/journal/index.php/elist/eListRead/led_streetlights_save_energy_but_could_have_some_serious_side_effects/
- <http://darksky.org/fsa/>

With the latest research Newbury should begin formulating a requirement on new development with respect to lighting. It should include temperature color guidelines on outside lighting. (If such guidelines already exist then perhaps they should be revisited or enforced). Please pass this along to the board members.

Thanks for your consideration on this matter.

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REPORT OF THE COUNCIL ON SCIENCE AND PUBLIC HEALTH

CSAPH Report 2-A-16

Subject: Human and Environmental Effects of Light Emitting Diode (LED) Community Lighting

Presented by: Louis J. Kraus, MD, Chair

Referred to: Reference Committee E
(Theodore Zanker, MD, Chair)

INTRODUCTION

With the advent of highly efficient and bright light emitting diode (LED) lighting, strong economic arguments exist to overhaul the street lighting of U.S. roadways.¹⁻³ Valid and compelling reasons driving the conversion from conventional lighting include the inherent energy efficiency and longer lamp life of LED lighting, leading to savings in energy use and reduced operating costs, including taxes and maintenance, as well as lower air pollution burden from reduced reliance on fossil-based carbon fuels.

Not all LED light is optimal, however, when used as street lighting. Improper design of the lighting fixture can result in glare, creating a road hazard condition.^{4,5} LED lighting also is available in various color correlated temperatures. Many early designs of white LED lighting generated a color spectrum with excessive blue wavelength. This feature further contributes to disability glare, i.e., visual impairment due to stray light, as blue wavelengths are associated with more scattering in the human eye, and sufficiently intense blue spectrum damages retinas.^{6,7} The excessive blue spectrum also is environmentally disruptive for many nocturnal species. Accordingly, significant human and environmental concerns are associated with short wavelength (blue) LED emission. Currently, approximately 10% of existing U.S. street lighting has been converted to solid state LED technology, with efforts underway to accelerate this conversion. The Council is undertaking this report to assist in advising communities on selecting among LED lighting options in order to minimize potentially harmful human health and environmental effects.

METHODS

English language reports published between 2005 and 2016 were selected from a search of the PubMed and Google Scholar databases using the MeSH terms “light,” “lighting methods,” “color,” “photostimulation,” and “adverse effects,” in combination with “circadian rhythm/physiology/radiation effects,” “radiation dosage/effects,” “sleep/physiology,” “ecosystem,” “environment,” and “environmental monitoring.” Additional searches using the text terms “LED” and “community,” “street,” and “roadway lighting” were conducted. Additional information and perspective were supplied by recognized experts in the field.

ADVANTAGES AND DISADVANTAGES OF LED STREET LIGHTS

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Action of the AMA House of Delegates 2016 Annual Meeting: Council on Science and Public Health Report 2 Recommendations Adopted and Remainder of Report Filed.

The main reason for converting to LED street lighting is energy efficiency; LED lighting can reduce energy consumption by up to 50% compared with conventional high pressure sodium (HPS) lighting. LED lighting has no warm up requirement with a rapid “turn on and off” at full intensity. In the event of a power outage, LED lights can turn on instantly when power is restored, as opposed to sodium-based lighting requiring prolonged warm up periods. LED lighting also has the inherent capability to be dimmed or tuned, so that during off peak usage times (e.g., 1 to 5 AM), further energy savings can be achieved by reducing illumination levels. LED lighting also has a much longer lifetime (15 to 20 years, or 50,000 hours), reducing maintenance costs by decreasing the frequency of fixture or bulb replacement. That lifespan exceeds that of conventional HPS lighting by 2-4 times. Also, LED lighting has no mercury or lead, and does not release any toxic substances if damaged, unlike mercury or HPS lighting. The light output is very consistent across cold or warm temperature gradients. LED lights also do not require any internal reflectors or glass covers, allowing higher efficiency as well, if designed properly.^{8,9}

Despite the benefits of LED lighting, some potential disadvantages are apparent. The initial cost is higher than conventional lighting; several years of energy savings may be required to recoup that initial expense.¹⁰ The spectral characteristics of LED lighting also can be problematic. LED lighting is inherently narrow bandwidth, with “white” being obtained by adding phosphor coating layers to a high energy (such as blue) LED. These phosphor layers can wear with time leading to a higher spectral response than was designed or intended. Manufacturers address this problem with more resistant coatings, blocking filters, or use of lower color temperature LEDs. With proper design, higher spectral responses can be minimized. LED lighting does not tend to abruptly “burn out,” rather it dims slowly over many years. An LED fixture generally needs to be replaced after it has dimmed by 30% from initial specifications, usually after about 15 to 20 years.^{1,11}

Depending on the design, a large amount blue light is emitted from some LEDs that appear white to the naked eye. The excess blue and green emissions from some LEDs lead to increased light pollution, as these wavelengths scatter more within the eye and have detrimental environmental and glare effects. LED’s light emissions are characterized by their correlated color temperature (CCT) index.^{12,13} The first generation of LED outdoor lighting and units that are still widely being installed are “4000K” LED units. This nomenclature (Kelvin scale) reflects the equivalent color of a heated metal object to that temperature. The LEDs are cool to the touch and the nomenclature has nothing to do with the operating temperature of the LED itself. By comparison, the CCT associated with daylight light levels is equivalent to 6500K, and high pressure sodium lighting (the current standard) has a CCT of 2100K. Twenty-nine percent of the spectrum of 4000K LED lighting is emitted as blue light, which the human eye perceives as a harsh white color. Due to the point-source nature of LED lighting, studies have shown that this intense blue point source leads to discomfort and disability glare.¹⁴

More recently engineered LED lighting is now available at 3000K or lower. At 3000K, the human eye still perceives the light as “white,” but it is slightly warmer in tone, and has about 21% of its emission in the blue-appearing part of the spectrum. This emission is still very blue for the nighttime environment, but is a significant improvement over the 4000K lighting because it reduces discomfort and disability glare. Because of different coatings, the energy efficiency of 3000K lighting is only 3% less than 4000K, but the light is more pleasing to humans and has less of an impact on wildlife.

Glare

Disability glare is defined by the Department of Transportation (DOT) as the following:

“Disability glare occurs when the introduction of stray light into the eye reduces the ability to resolve spatial detail. It is an objective impairment in visual performance.”

Classic models of this type of glare attribute the deleterious effects to intraocular light scatter in the eye. Scattering produces a veiling luminance over the retina, which effectively reduces the contrast of stimulus images formed on the retina. The disabling effect of the veiling luminance has serious implications for nighttime driving visibility.¹⁵

Although LED lighting is cost efficient and inherently directional, it paradoxically can lead to worse glare than conventional lighting. This glare can be greatly minimized by proper lighting design and engineering. Glare can be magnified by improper color temperature of the LED, such as blue-rich LED lighting. LEDs are very intense point sources that cause vision discomfort when viewed by the human eye, especially by older drivers. This effect is magnified by higher color temperature LEDs, because blue light scatters more within the human eye, leading to increased disability glare.¹⁶

In addition to disability glare and its impact on drivers, many residents are unhappy with bright LED lights. In many localities where 4000K and higher lighting has been installed, community complaints of glare and a “prison atmosphere” by the high intensity blue-rich lighting are common. Residents in Seattle, WA have demanded shielding, complaining they need heavy drapes to be comfortable in their own homes at night.¹⁷ Residents in Davis, CA demanded and succeeded in getting a complete replacement of the originally installed 4000K LED lights with the 3000K version throughout the town at great expense.¹⁸ In Cambridge, MA, 4000K lighting with dimming controls was installed to mitigate the harsh blue-rich lighting late at night. Even in places with a high level of ambient nighttime lighting, such as Queens in New York City, many complaints were made about the harshness and glare from 4000K lighting.¹⁹ In contrast, 3000K lighting has been much better received by citizens in general.

Unshielded LED Lighting

Unshielded LED lighting causes significant discomfort from glare. A French government report published in 2013 stated that due to the point source nature of LED lighting, the luminance level of unshielded LED lighting is sufficiently high to cause visual discomfort regardless of the position, as long as it is in the field of vision. As the emission surfaces of LEDs are highly concentrated point sources, the luminance of each individual source easily exceeds the level of visual discomfort, in some cases by a factor of 1000.¹⁷

Discomfort and disability glare can decrease visual acuity, decreasing safety and creating a road hazard. Various testing measures have been devised to determine and quantify the level of glare and vision impairment by poorly designed LED lighting.²⁰ Lighting installations are typically tested by measuring foot-candles per square meter on the ground. This is useful for determining the efficiency and evenness of lighting installations. This method, however, does not take into account the human biological response to the point source. It is well known that unshielded light sources cause pupillary constriction, leading to worse nighttime vision between lighting fixtures and causing a “veil of illuminance” beyond the lighting fixture. This leads to worse vision than if the light never existed at all, defeating the purpose of the lighting fixture. Ideally LED lighting installations should be tested in real life scenarios with effects on visual acuity evaluated in order to ascertain the best designs for public safety.

Proper Shielding

With any LED lighting, proper attention should be paid to the design and engineering features. LED lighting is inherently a bright point source and can cause eye fatigue and disability glare if it is allowed to directly shine into human eyes from roadway lighting. This is mitigated by proper design, shielding and installation ensuring that no light shines above 80 degrees from the horizontal. Proper shielding also should be used to prevent light trespass into homes alongside the road, a common cause of citizen complaints. Unlike current HPS street lighting, LEDs have the

ability to be controlled electronically and dimmed from a central location. Providing this additional control increases the installation cost, but may be worthwhile because it increases long term energy savings and minimizes detrimental human and environmental lighting effects. In environmentally sensitive or rural areas where wildlife can be especially affected (e.g., near national parks or bio-rich zones where nocturnal animals need such protection), strong consideration should be made for lower emission LEDs (e.g., 3000K or lower lighting with effective shielding). Strong consideration also should be given to the use of filters to block blue wavelengths (as used in Hawaii), or to the use of inherent amber LEDs, such as those deployed in Quebec. Blue light scatters more widely (the reason the daytime sky is “blue”), and unshielded blue-rich lighting that travels along the horizontal plane increases glare and dramatically increases the nighttime sky glow caused by excessive light pollution.

POTENTIAL HEALTH EFFECTS OF “WHITE” LED STREET LIGHTING

Much has been learned over the past decade about the potential adverse health effects of electric light exposure, particularly at night.²¹⁻²⁵ The core concern is disruption of circadian rhythmicity. With waning ambient light, and in the absence of electric lighting, humans begin the transition to nighttime physiology at about dusk; melatonin blood concentrations rise, body temperature drops, sleepiness grows, and hunger abates, along with several other responses.

A number of controlled laboratory studies have shown delays in the normal transition to nighttime physiology from evening exposure to tablet computer screens, backlit e-readers, and room light typical of residential settings.²⁶⁻²⁸ These effects are wavelength and intensity dependent, implicating bright, short wavelength (blue) electric light sources as disrupting transition. These effects are not seen with dimmer, longer wavelength light (as from wood fires or low wattage incandescent bulbs). In human studies, a short-term detriment in sleep quality has been observed after exposure to short wavelength light before bedtime. Although data are still emerging, some evidence supports a long-term increase in the risk for cancer, diabetes, cardiovascular disease and obesity from chronic sleep disruption or shiftwork and associated with exposure to brighter light sources in the evening or night.^{25,29}

Electric lights differ in terms of their circadian impact.³⁰ Understanding the neuroscience of circadian light perception can help optimize the design of electric lighting to minimize circadian disruption and improve visual effectiveness. White LED streetlights are currently being marketed to cities and towns throughout the country in the name of energy efficiency and long term cost savings, but such lights have a spectrum containing a strong spike at the wavelength that most effectively suppresses melatonin during the night. It is estimated that a “white” LED lamp is at least 5 times more powerful in influencing circadian physiology than a high pressure sodium light based on melatonin suppression.³¹ Recent large surveys found that brighter residential nighttime lighting is associated with reduced sleep time, dissatisfaction with sleep quality, nighttime awakenings, excessive sleepiness, impaired daytime functioning, and obesity.^{29,32} Thus, white LED street lighting patterns also could contribute to the risk of chronic disease in the populations of cities in which they have been installed. Measurements at street level from white LED street lamps are needed to more accurately assess the potential circadian impact of evening/nighttime exposure to these lights.

ENVIRONMENTAL EFFECTS OF LED LIGHTING

The detrimental effects of inefficient lighting are not limited to humans; 60% of animals are nocturnal and are potentially adversely affected by exposure to nighttime electrical lighting. Many birds navigate by the moon and star reflections at night; excessive nighttime lighting can lead to reflections on glass high rise towers and other objects, leading to confusion, collisions and death.³³ Many insects need a dark environment to procreate, the most obvious example being lightning bugs that cannot “see” each other when light pollution is pronounced. Other environmentally beneficial insects are attracted to blue-rich lighting, circling under them until they are exhausted and die.^{34,35} Unshielded lighting on beach areas has led to a massive drop in turtle populations as hatchlings are disoriented by electrical light and sky glow, preventing them from reaching the water safely.³⁵⁻³⁷ Excessive outdoor lighting diverts the hatchlings inland to their demise. Even bridge lighting that is “too blue” has been shown to inhibit upstream migration of certain fish species such as salmon returning to spawn. One such overly lit bridge in Washington State now is shut off during salmon spawning season.

Recognizing the detrimental effects of light pollution on nocturnal species, U.S. national parks have adopted best lighting practices and now require minimal and shielded lighting. Light pollution along the borders of national parks leads to detrimental effects on the local bio-environment. For example, the glow of Miami, FL extends throughout the Everglades National Park. Proper shielding and proper color temperature of the lighting installations can greatly minimize these types of harmful effects on our environment.

CONCLUSION

Current AMA Policy supports efforts to reduce light pollution. Specific to street lighting, Policy H-135.932 supports the implementation of technologies to reduce glare from roadway lighting. Thus, the Council recommends that communities considering conversion to energy efficient LED street lighting use lower CCT lights that will minimize potential health and environmental effects. The Council previously reviewed the adverse health effects of nighttime lighting, and concluded that pervasive use of nighttime lighting disrupts various biological processes, creating potentially harmful health effects related to disability glare and sleep disturbance.²⁵

RECOMMENDATIONS

The Council on Science and Public Health recommends that the following statements be adopted, and the remainder of the report filed.

1. That our American Medical Association (AMA) support the proper conversion to community-based Light Emitting Diode (LED) lighting, which reduces energy consumption and decreases the use of fossil fuels. (New HOD Policy)
2. That our AMA encourage minimizing and controlling blue-rich environmental lighting by using the lowest emission of blue light possible to reduce glare. (New HOD Policy)
3. That our AMA encourage the use of 3000K or lower lighting for outdoor installations such as roadways. All LED lighting should be properly shielded to minimize glare and detrimental human and environmental effects, and consideration should be given to utilize the ability of LED lighting to be dimmed for off-peak time periods. (New HOD Policy)

Fiscal Note: Less than \$500

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Planning Board

From: Harmony Wilson <harmonywilson@gmail.com>
Sent: Wednesday, February 17, 2021 11:51 AM
To: Planning Board
Subject: 84 Boston Rd | Abutter Concerns

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FEB 17 2021

Hello,

Newbury Planning Board

My name is Harmony Wilson and I am on the Board of Directors for Merroshawke Nature School. Merroshawke is a non-profit school that is committed to 100% learning guided in nature. We have an agreement with Greenbelt to use the Jennie Lagoulis Reservation and have continued to run programs, safely, at this location through the pandemic. Currently we have about 10 children there every day and even more in the summer.

We have concerns with the 84 Boston Rd project. We understand that this area is zoned commercial, but we are hoping there may be steps that could be taken to lessen the burden. The noise from the storage facility construction is sometimes unbearable and we are not sure if we could manage running programs during the construction phase of this project since it is even closer to us.

Unfortunately, I only recently learned of this project. I have watched all of the recorded Planning Board meetings and I attended last night's Conservation Meeting. I was disappointed that the only abutter mentioned was the town dump. Besides our daily programming, we sometimes have evening events and family campouts. Beyond the Merroshawke usage, the Jennie Lagoulis Reservation is used by many people seeking to hike.

Our main concerns are as follows:

- Truck traffic and timing (our programs typically have children dropped off at 9AM with pick up between 1PM and 3PM)
- Light pollution
- Truck idling
- Blasting and ledge removal
- Clear cutting (it appears necessary, but we would request a tree buffer be left or planted at the border of Sled Rd)

Once again, we realize that this area is zoned commercial and this project may be permitted. We hope to work with the Planning Board and Applicant so that our programs and the applicant's business may coexist peacefully.

Thank you,

Harmony Wilson

978-857-4137