**RESOURCES FOR LED STREET LIGHT ADVOCATES**

**New IES (Illuminating Engineering Society) calculation methods take glare into account.**

NOTE: The light levels are still very conservative. Cities should avoid exceeding them. They may be further reduced in the future.

**NEW! IES RP-8-18** compiles recent IES standards into a single document for roadway and parking lot lighting. It incorporates the previous RP-8-14 into it. There are new discussions of glare, overlighting, environmental and health concerns. It is expensive, but worth getting one per community and strongly urging your city to buy it:

**Chapter 4 outlines the lighting advocated by the International Dark-Sky Association.**

https://www.ies.org/product/american-national-standard-practice-for-design-and-maintenance-of-roadway-and-parking-facility-lighting/

**Discussions of calculation methods and glare vs. uniformity**

**2008 DOE LED Application Series: Outdoor Area Lighting**

See discussion of Light Distribution and Glare on page 5, particularly last paragraph:

<https://www1.eere.energy.gov/buildings/publications/pdfs/alliances/outdoor_area_lighting.pdf>

Excerpt: "Follow IESNA recommendations for designing roadway and parking lot lighting rather than just designing for average illuminance on the paving surface. Illuminance alone does not consider the disabling glare that reduces visibility for the driver. For example, although an IES Type I or Type II distribution may provide the most uniform spread of illuminance with the widest pole spacing along a roadway, the angles of light that allow the very wide spacing are often the angles that subject the driver and pedestrian to disability and discomfort glare."

**2006 Colorado DOT Lighting Guidelines by Clanton and Associates**

See discussion beginning on Page 4:

<https://www.codot.gov/business/designsupport/bulletins_manuals/2006-cdot-lighting-design-guide>

**Article on lighting level and target detection**

http://www.citymetric.com/horizons/why-pedestrians-and-cyclists-disappear-when-it-starts-getting-dark-3456

**Margaret Newman letter to the New York Times:**

<https://www.nytimes.com/2015/10/26/opinion/new-led-streetlights.html>

### [Opinion](https://www.nytimes.com/pages/opinion/index.html) | Letter

# New LED Streetlights

OCT. 26, 2015

**To the Editor:**

Re “[Ruining That Moody Urban Glow](http://www.nytimes.com/2015/10/18/opinion/sunday/ruining-that-moody-urban-glow.html)” (Sunday Review, Oct. 18):

I could not agree more with Lionel Shriver’s statement that the “sensory experience of daily life is not a frivolous matter.” She recognizes that “lighting isn’t only about what you see,” but can also create a specific sense of place by its very presence and physical characteristics.

The move that many cities large and small are making to use LED lighting to replace more inefficient and older technologies is a critical one if you believe that we need to reduce our energy use. Ms. Shriver correctly notes that the color of the new lighting can be selected to better correlate to the warmer color that is familiar and preferable for our residential streets. This warmer color can be achieved with a small sacrifice in energy consumption.

The perceived brightness of the newer, bluer LEDs is much greater than their yellow counterparts, even though they technically provide the same amount of illumination. The lighting level standards that New York City and other cities follow are based on national guidelines that have not been adequately modified to account for newer technologies.

It makes sense from a financial, safety and sustainability view to make this change to LEDs. It should also make sense from an aesthetic perspective. It is possible to achieve both, if engineers are allowed to overrule an outdated need for brightness.

MARGARET NEWMAN

New York

The writer, as a former chief of staff at the New York City Department of Transportation, worked on the testing and conversion program of the city’s streetlights to LEDs

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**Cities that regret their 4000K LED street lights or have moved from 4000K to warmer CCT**

**Las Vegas article: City Takes Dim View of New Streetlights**

<https://www.reviewjournal.com/news/council-takes-dim-view-of-new-streetlights/>

**Davis, CA pulls 4000K LED street lights**

<http://sacramento.cbslocal.com/2014/10/21/davis-will-spend-350000-to-replace-led-lights-after-neighbor-complaints/>

**Compilation of large cities moving to warm LEDs:**

**The following cities are examples of major metropolises choosing warmer white LED street lights.** **In the case of Los Angeles, New York City and Washington DC, they are making this move going forward in spite of having already installed tens of thousands of white 4000K LED street lights.**

**1. Chicago:**  see last paragraph

<http://chicagoinfrastructure.org/2017/03/30/streetlights-headed-to-the-south-west-sides-as-city-selects-vendor-for-chicago-smart-lighting-project/>

Quote:

"Following a neighborhood demonstration project that installed sample LED lights in seven neighborhoods, the City issued specifications for the new lights that feature a “shielded” design to ensure the light is focused downward toward the street and sidewalk where it is needed. In addition, all LED fixtures will be limited to a maximum correlated color temperature (CCT) of 3000K or less, and most will contain dimmable power sources that provide the ability to remotely adjust light levels where needed."

**2. Los Angeles** list updated May 2017 (also attached) of new 3000K LED street lights vs. older 4000K LED street lights for cobrahead replacement:  **WW or 30K = warm white or 3000K in the new version model numbers shown in bold face.**  NW or 40K = neutral white or 4000K and is still seen in the old versions.  **Wattage drops can be seen in the right hand column** from the older lighting in plain type to the newer lighting in bold face.  **Los Angeles also says at the top of the page that it will constantly update the list and instructs designers to use the lowest wattage that does the job.  Lower glare allows lower wattage to do the same job.**

Link to current cobrahead and decorative fixtures is on this page:

<http://bsl.lacity.org/led-contractors-vendors.html>

**2018 article, Los Angeles changes from using 4000K and saving 40% energy to using 3000K and 2700K and saving 70% in energy:**

<http://lightedmag.com/la-lighting-the-way/?fbclid=IwAR11ZMmFDOyc93HDZtnJ1cHsPJI6IPszxKDo88gU0rY409KatR5z8bmLG4w>

**3. Washington DC:** See second paragraph

<http://www.ledinside.com/news/2017/3/dc_residents_complain_about_too_bright_led_street_lights>

Quote:

**"In response, the city says it takes these complaints very seriously and promises to use LED lights with *lower Kelvin ratings* and remote controls for adjusting intensity in the next phase of LED conversion."**

**May 2018 revised LED specs for Washington DC…see page 10:**

[**https://www.ncpc.gov/docs/actions/2018May/7985\_District\_of\_Columbia\_Smart\_Street\_Lighting\_Project\_Information\_Sheet\_May2018.pdf**](https://www.ncpc.gov/docs/actions/2018May/7985_District_of_Columbia_Smart_Street_Lighting_Project_Information_Sheet_May2018.pdf)

**4.  New York City:**  see fifth paragraph from the bottom:

[**http://gothamist.com/2017/02/02/no\_sleep\_in\_brooklyn.php**](http://gothamist.com/2017/02/02/no_sleep_in_brooklyn.php)

Quote:

**"After several months of email correspondence requesting further information for an article, a DOT spokeswoman wrote back, "DOT will move forward in installing 3,000K LED street light fixtures given their *lower cost;* softer aesthetic quality; the AMA recommendations; and the timing of the contracting process to procure the LED street light fixtures in Manhattan, the Bronx, and Staten Island."**

**"A quick glance between the lines will reveal that there are no plans to stop installing the *harsh, blue 4,000K fixtures* in Brooklyn and Queens, or to replace the ones that are already installed there. The LED bulbs the city is using have a lifespan of 7-20 years, according to various DOT statements."**

**5.  San Francisco:**

<http://sfwater.org/modules/showdocument.aspx?documentid=10866>

Quote:

**Q: What is the correlated color temperature (CCT) of the LEDs to be installed in San Francisco?**

**A: During our outreach, residents expressed a preference for lights with a warmer color temperature. That’s why this project will feature LEDs with a CCT of 3,000° Kelvin (K). These LEDs will feature a warmer white light than the LEDs installed by most of the other cities and counties across the US, which feature a CCT range of 4,000-6,000°K. In this regard, San Francisco is approaching its LED streetlight conversion differently than other cities in the country. In fact, for the past few years, San Francisco has only purchased LEDs with a CCT of 3,000°K.**

**6.  Toronto Health Department recommendation:**

<https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=4eca7a1ba20c8510VgnVCM10000071d60f89RCRD>

Excerpt:

**Recommendations:**

1. **The City of Toronto to install LED streetlights with a colour temperature rating of 3000K or less with options for dimming lights during non-peak times and shielding to reduce glare**
2. **Toronto Public Health to monitor the research related to the impacts of LED lighting on health.**

**7. Georgia Power letter from Kevin Fitzmaurice explaining decision to use 3000K instead of 4000K, glare complaints reduced 70 to 80% with no extra expense for warm CCT (color temperature).**

This communication comes from the utility lighting the state of Georgia and was forwarded to the lighting e-mail group by Dr. Mario Motta of the American Medical Association.

Kevin Fitzmaurice, who heads up Georgia Power Company’s lighting design division and an IES member himself were just talking about this topic last week.  Apparently, GPC has made the decision to move forward with using 3000K statewide and here is the thought process for it:

In reference to the 3000K CCT versus 4000K CCT question, I will provide a summary below and hope to discuss this in more detail with you at the IES RLC meeting this spring or via telephone before then.  Believe it or not—this is the short version.  I am in no way saying that any CCT selection is correct or incorrect.  I am just explaining what we do and why we do it.  We always ensure the lighting levels using any CCT still exceed what is necessary to provide an effective lighting system.

 As you aware, a roadway can effectively be lighted with 2000K CCT (HPS), 3000K CCT (CMH or LED) or 4000K CCT (MH or LED) as long as the designer uses high quality luminaires installed in the correct locations and designed by a professional lighting designer (PE or LC).  Recent improvements in yellow phosphors now allow 3000K CCT LED luminaires to be nearly as efficacious as their 4000K counterparts and have similar lumen maintenance.

 The reduction in lumens per watt of 3000K for most products we purchase is only 3-5% when compared to the same wattage fixture is 4000K.  This means we can move to 3000K without drastically sacrificing efficacy or lumen maintenance and provide a warmer white light for our customers--something that most of our customer’s request, and sometimes demand, on a regular basis.   Another plus is that the phosphors are getting better each month, so this 3-5% difference will keep reducing.

 Our customers also claim that 3000K luminaires create much less “apparent” glare.  As you know, glare is an interesting phenomenon and not easy to measure.  This is why I refer to it as “apparent” glare when viewed by a person and not measured by a meter or calculated in a photometric model such as AGI 32.  I believe RP-8-14 handles this well with the veiling luminance metric.

 Many of our governmental customers have recently adopted, or are about to adopt, requirements for LED lighting to be 3000K or warmer in an effort to reduce the harsh blue “apparent” glare and sky glow when compared to 4000K CCT.   We have seen a drastic reduction from complaints from motorists and residents in the area of these lighting systems when we use 3000K in comparison to 4000K applications.   Don’t let me understate the drastic reduction of complaints.  It is probably about a 70-80% reduction.

 We made the decision to change to 3000K CCT early last summer and a few weeks before the AMA report was released.  We do not believe there is any medical reason or advantage for selecting 3000K over 4000K.  We still install 4000K lighting systems in commercial parking areas where the customers prefer the enhanced apparent brightness.

 We do not see any negatives with 3000K and we do see many positives.  This change also allows Georgia Power to remain a leader in providing high quality LED products that our customers want and not be one of the many utilities that is "forced" to comply later with a 3000K governmental customer’s mandate.

**Phoenix pulls 4000K and chooses 2700K citywide:**

<https://www.nbcnews.com/mach/space/here-s-what-it-will-take-reclaim-night-sky-n710766>

**Montreal pulls 4000K and chooses 3000K citywide:**

<http://www.rcinet.ca/en/2017/01/19/montreal-decides-on-warmer-led-lighting/>

**Polling results: warm is preferred over cool**

**Columbus, OH chooses 3000K**:

<http://www.thisweeknews.com/content/stories/clintonville/news/2017/01/09/favorite-emerges-in-trial-run-of-led-streetlights.html>

**Davis, CA City Council Minutes with poll results and decision, pulls 29 watt 4000K and installs 19 watt 2700K**

**see pages 5 and 6.**

<http://city-council.cityofdavis.org/Media/Default/Documents/PDF/CityCouncil/CouncilMeetings/Agendas/20141021/09-LED-Streetlights-Update.pdf>

**Phoenix poll results:**

<https://www.phoenix.gov/streetssite/Pages/LED-Street-Light-Public-Input-Survey-Results.aspx>

**Suzhou, China prefers 3000K**

<https://www.ledinside.com/news/2013/7/philips_first_introduces_3000k_warm_white_led_road_lighting_solutions_to_chinese_market_20130705>

**Study for Nantucket downtown historical lights, see particularly section 4.3.3 on document page 53 for preference for warm color (not pdf page), Figure 29 on page 55 for color results bar graph, Recommendation 5 at the bottom of page 76, and Conclusion 7 on page 78 in which the most preferred colors were the warmest (either 2400K or 4000K with an amber diffuser) and the one considered best for brightness was a 2700K light...the 4000K light loses out everywhere!:**

<http://wp.wpi.edu/nantucket/files/2014/11/NEO-IQP-Final-Report.pdf>

**Seattle moves to 3000K:**

<http://kuow.org/post/seattle-street-lights-may-disrupt-your-sleep-dont-expect-new-ones-while>

**Dimming studies and anecdotes:**

**Davis CA study, see pages 5 and 6**:

<http://city-council.cityofdavis.org/Media/Default/Documents/PDF/CityCouncil/CouncilMeetings/Agendas/20141021/09-LED-Streetlights-Update.pdf>

**San Francisco study, dimming pages copied below:**

<http://sfwater.org/modules/showdocument.aspx?documentid=5972>

**From the San Francisco LED street light study:**

**Dimming**

SFPUC grouped survey data across both installation sites, and including both the online survey and the facilitated survey, based on whether respondents were observing dimmed or full output LED streetlights in order to draw some preliminary conclusions regarding the impact of dimming on perception of public safety, visual comfort, and light quality. These results are presented in the following report sections.

***Pedestrian Safety***

**Based on survey responses, dimming the LED streetlights did not negatively impact pedestrians’ sense of safety.** Though predictably, fewer respondents found the lighting to be too bright when the lights were dimmed, and **the percentage of respondents agreeing with the statement, “there is not enough light on the street,” did not increase when the lights were dimmed, and in fact decreased from 20% to 12%. Additionally, there was almost no discernible difference between survey responses to dimmed versus full output lights on issues of nighttime safety.** To the statement, “It would be safe to walk on the sidewalk here at night,” 100% of the facilitated survey participants answered either “neutral, agree or strongly agree” both when the lights were full output, and when they were operating at 50% dimmed.

***Visual Comfort***

**Based on survey responses, dimming the lights resulted in increased visual comfort without compromising safety. A greater number of respondents agreed or strongly agreed with the sentiment “The lighting is comfortable,” when the lights were dimmed** **than when the lights were operated at full output** (60% versus 48%). **Similarly, the survey results appear to indicate that dimming increased public receptiveness to LED lights in place of the incumbent fixtures.** When you compare responses to the statement, “How does the overall quality and appearance of the new lighting compare to the previous lighting?” 80% of those who were viewing dimmed lights reported that the LED lights were improved or much improved lighting. This compares to 60% of participants who viewed lights without dimming.

***Light quality***

Interestingly, dimming had conflicting impacts on respondents’ perception of the lights’ color rendering ability. Both the number of respondents that strongly disagreed and strongly agreed with the sentiment,

“I cannot tell the colors of things due to the lighting,” increased. This may be linked to respondents’ perception of light distribution uniformity, where after the lights were dimmed, participants noticed a decrease uniformity. In responding to the statement, “The light is uneven,” the percentage of participants who agreed or strongly agreed with this statement increased when observing lighting in the dimmed state. **Although while in the past, lighting designers sought to achieve greater street lighting uniformity, recent lighting research has started to question the idea that more uniform lighting results in improved visual acuity.**

**Seattle report**:  **dimming to 50%, difficult to tell the difference in visibility, dimming to 25% needed to perceive that less light is being used and yet still feels safe.**  **When installed at full brightness, Seattle experienced numerous complaints:**

<http://www.ledsmagazine.com/articles/2012/05/seattle-conducts-led-street-light-testing-and-hosts-symposium-magazine.html>

Pertinent quotes:

"We were also afforded the opportunity to view the LED lights dimmed to 50% and 25% of full light output. One of the project team members used an iPad to change the light levels of individual luminaires and groups of luminaires. While you could see the dimming happening by focusing on the light projected on the road, it was difficult to discern any difference in visibility once the luminaires were stable at 50%. There was noticeably less light at 25%, although I’m not sure I would have felt unsafe walking in that light."

"During the symposium, Gibbons said, **“Lighting level has very little to do with detection.”** Gibbons said the human body responds to sensory things like lighting on a logarithmic scale. He added, “”Foot candles are meaningless. It’s all about detection distance.”

We will cover the results once released and the finding will surely be interesting. **Gibbons said in similar previous tests, the team had not been able to reduce the light level of the LEDs low enough to render the tested lights unsuitable in terms of detection distance.** We will see if the 25% level in Seattle does so, and what impact the asymmetric pattern may have had on detection distance."

**Cambridge, MA finds no objection to dimming to 35% suddenly after 10:00 pm based on one year of use in a community of 107,000 with *zero* complaints.**  Lights are operated at 70% before 10:00 pm.  **2700K in residential areas is being used after initial protests.** This 19 minute presentation is well worth listening to as it describes pitfalls and solutions for LED street lights for the layperson.  **Please note that Cambridge chose to dim the lights for comfort and visibility even though they are not yet fully realizing the energy savings:**

<http://www.lampartners.com/glenn-heinmiller-on-led-street-lighting/>

**Hertfordshire, UK dimming 80% still had adequate visibility:**

<http://www.whtimes.co.uk/news/hertfordshire-county-council-set-to-extend-street-lights-policy-1-5699977>

**Lighting and crime:**

**England study:**

<http://jech.bmj.com/content/early/2015/07/08/jech-2015-206012?utm_source=TrendMD&utm_medium=cpc&utm_campaign=J_Epidemiol_Community_Health_TrendMD-0>

**Los Angeles 2015 article re crime trends.** Their first wave of 4000K LED street lights was installed by 2013:

<http://www.latimes.com/opinion/op-ed/la-oe-domanick-los-angeles-rising-crime-20150827-story.html>

**Los Angeles study on LED street lights vs. previous street lights shows modest INCREASE in property crime and very slight decrease in violent crime with increased brightness:**

 [https://appam.confex.com/appam/2018/webprogram/Paper27899.html](%20https%3A/appam.confex.com/appam/2018/webprogram/Paper27899.html)

**July 2018 article: Anchorage, AK, early adopted of 4000K LED lights has property crime spike:**

<https://www.adn.com/alaska-life/2018/07/19/as-anchorage-crime-soars-security-cameras-are-catching-more-than-just-criminals/>

**New York City’s “Omnipresence” campaign of bright lighting in Harlem and Brooklyn disturbs residents:**

<https://splinternews.com/new-york-city-has-been-shining-surveillance-lights-on-i-1793856900>

**Washington Post compilation of crime studies:**

<https://www.washingtonpost.com/news/wonk/wp/2017/11/02/what-actually-happens-to-crime-when-the-lights-are-on-as-rick-perry-suggests/?utm_term=.63413f4b6e51>

**Houston Kinder Institute study on street lights and crime:**

<https://phys.org/news/2017-08-higher-streetlights-safety.html>

[**https://kinder.rice.edu/sites/g/files/bxs1676/f/documents/FINAL\_Streetlights\_Report.pdf**](https://kinder.rice.edu/sites/g/files/bxs1676/f/documents/FINAL_Streetlights_Report.pdf)

[**https://kinder.rice.edu/sites/g/files/bxs1676/f/documents/Kinder%20Streetlights%20and%20Crime%20report.pdf**](https://kinder.rice.edu/sites/g/files/bxs1676/f/documents/Kinder%20Streetlights%20and%20Crime%20report.pdf)

**Los Angeles 4000K LEDs and crime study abstract:**

[**https://appam.confex.com/appam/2018/webprogram/Paper27899.html**](https://appam.confex.com/appam/2018/webprogram/Paper27899.html)

**Surrey street light cutoff and crime:**

<https://www.eagleradio.co.uk/news/local-news/2601689/legal-action-threat-over-surrey-street-light-switch-off/>

<https://www.getsurrey.co.uk/news/surrey-news/surrey-street-lights-switch-off-13964855>

**Juvenile crime and sleep disruption:**

<http://brainblogger.com/2016/06/06/newfound-causes-of-juvenile-delinquency-sleep-deprivation-low-self-control/>

**RING Floodlight Cam:**

When used correctly, complies with IDA lighting principles. Has angled shields, customizable motion detection and uses 3000K LED light for best video. The promotional video shows the effectiveness of motion detection at the end with the woman sitting on her sofa.

<https://shop.ring.com/products/floodlight-cam>

Promotional video, motion detection alerts resident at 1:17:

<https://www.youtube.com/watch?v=2-d5PeET0co>

**Anecdotes from Houston Nextdoor posts:**

[Car Broken Into last night.](https://nextdoor.com/news_feed/?post=70920565)

Yes we made the mistake of leaving our car door unlock, but we catch the guy on video. Does anyone recognize this thief? The break in occurred on the corner of Effingham and Braewick .



[+6](https://d3926qxcw0e1bh.cloudfront.net/post_photos/ee/26/ee2667f15d1b242b5e607b5cbc0881fc.jpg)

[](https://d3926qxcw0e1bh.cloudfront.net/post_photos/ee/26/ee2667f15d1b242b5e607b5cbc0881fc.jpg)

11h ago · 32 neighborhoods in [General](https://nextdoor.com/general/)



**Successful class action suit in Monterey, CA against bright LED street lights:**

<http://www.montereycountyweekly.com/blogs/news_blog/city-of-monterey-loses-lawsuit-over-streetlights/article_89e8e764-d3b2-11e6-b53b-935d775754e7.html>

**Great Neck resident lawsuit in progress:**

<https://theislandnow.com/great_neck/new-documents-filed-in-great-neck-led-lighting-case/>

**Personal injury lawyers hanging out the shingle re LED street light glare:**

<https://www.trantololaw.com/law-firm-blog/car-accidents/dangers-led-streetlights/>

<http://www.wagnerreese.com/blog/vehicular-accident/ama-says-led-streetlights-pose-health-and-driving-risks/>

<https://www.edgarsnyder.com/blog/2016/10/17-pittsburgh-led-problems.html>

**Cree RSW video ad:**

<https://www.youtube.com/watch?v=7Wgi9uPvNHY>

**Cree Wavemax technology for uniformity and low glare, including warm outdoor lighting toward the end:**

<https://www.youtube.com/watch?v=MkNJJ5ubEAs>

**Lumican web site, developing warm Dark Sky street light**

<http://lumican.com/darkskyseries/>

**Leotek Comfortview Technical Overview makes the case for warm LED lighting right on the brochure:**

<https://leotek.com/greencobra/comfortview/>

**Lighting and health**

**AMA June 2016 report on LED street lighting (copy and paste in your browser):**

[**https://circadianlight.com/images/pdfs/newscience/American-Medical-Association-2016-Health-Effects-of-LED-Street-Lighting.pdf**](https://circadianlight.com/images/pdfs/newscience/American-Medical-Association-2016-Health-Effects-of-LED-Street-Lighting.pdf)

**Blue light, melatonin and cancer studies:**

<http://www.health.harvard.edu/staying-healthy/blue-light-has-a-dark-side>

Dr. Russel Reiter, melatonin and cancer researcher:

Biography:

<http://uthscsa.edu/csb/faculty/reiter.asp>

Presentation on YouTube (12 minutes) by Dr. Reiter on melatonin and cancer:

<https://www.youtube.com/watch?v=2DcLnIFXzoE>

Blind women and low incidence of breast cancer:

<http://news.cancerconnect.com/blind-women-have-lower-risk-for-breast-cancer/>

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4184327/>

More recent studies:

<http://www.ncbi.nlm.nih.gov/pubmed/24604162>

<http://www.ncbi.nlm.nih.gov/pubmed/19124483>

<http://www.ncbi.nlm.nih.gov/pubmed/24131150>

<http://environment.about.com/od/pollution/a/light_pollution.htm>

Here is a 2014 study about night light inhibiting the effects of

tamoxifen in breast cancer treatment

<http://www.medicalnewstoday.com/articles/280194.php>

Below is a study focusing on the blue light in computer and phone

screens and melatonin suppression. This was cited as a reason not to

worry about white street lighting when the Houston Chronicle first

announced it since everyone uses computers anyway. (4000K light does

have a blue component in its spectrum.) But as mentioned in the

article, there are remedies to the computer screen problem. LED street

lighting can and should avoid the blue wavelengths implicated in the

suppression of melatonin. For that reason, the International Dark-Sky

Association has decided very recently to change their light fixture Seal

of Approval to include no lighting warmer in color than 3000K after

initially expressing concern about bluer LED street lighting in 2010,

and after noting that the preponderance of scientific evidence since

then continues to support that conclusion.

<http://chriskresser.com/how-artificial-light-is-wrecking-your-sleep-and-what-to-do-about-it/>

International Dark-Sky Association 2010 paper on Blue light:

<http://www.darksky.org/assets/documents/Reports/IDA-Blue-Rich-Light-White-Paper.pdf>

International Dark-Sky Association new standards for Fixture Seal of

Approval including new limit to 3000K and warmer in color (or lower in

temperature):

<http://www.darksky.org/ida-fixture-seal-of-approval/about-fsa>

**Studies correlating light at night and breast cancer rates:**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002207/>

<https://www.hsph.harvard.edu/news/press-releases/outdoor-light-night-breast-cancer/>

**University of Exeter Spain study, bluer LED street lights and double prostate cancer, 1.5 x breast cancer rates:**

<https://www.exeter.ac.uk/news/featurednews/title_655460_en.html>

**AMA on blue light and vision:**

<https://www.lshf.org/sight--hearing-in-the-news/doctors-warn-that-new-led-streetlights-can-damage-vision>

**Letters to the Editor:**

<http://www2.ljworld.com/news/2017/nov/03/letter-editor-bulbs-too-bright/>

<http://www.idahocountyfreepress.com/news/2018/may/30/urge-you-change-course-leds-too-many-are-installed/>

**Visual aids:**

**Tucson 3000K LED installation:**

<https://www.youtube.com/watch?v=kJL-WPwjMQM>

**Quebec Village converts from 4000K to PC Amber LED street lights:**

<http://ricemm.org/en/photos/>

**Video: Austrian villages test amber and warm white lighting. Many before and after 4000K to warm LED lighting photos:**

<https://www.youtube.com/watch?v=_9tMAvjc3VA>

**Video: Murrieta, CA installs 14 watt 2700K GE Current LED street lights in residential areas:**

<https://www.youtube.com/watch?v=7DU9ev3VuXw>

**Web site for the general public:**

[www.softlighthouston.com](http://www.softlighthouston.com)

Also:

[www.darksky.org](http://www.darksky.org)

[www.idatexas.org](http://www.idatexas.org)