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Precaution is advised about installing LED bulbs inside and around public spaces

By Elizabeth Kelley

I want to help bring more light to consideration of proposal to install LED light bulbs in public spaces. Public gathering spaces require be taken to provide a safe environment and that accommodates those who are functionally impaired due to an environmental disability.

Here is a summary of my major concerns I have:

- 1. Blue/white and glare can cause sleep problems and retinal damage;**
- 2 Diode bulb breakage can cause release of copper and nickel on the concrete floor requiring a hazardous waste cleanup**
- 3 The use of low voltage lighting saves energy but generates a large problem at the back end as high transients, or "dirty electricity" that backs in to the electrical wiring can cause health problems. But, since federal law prohibits retail sale of incandescent light bulbs, and a safer alternative is not yet on the market, the public has little recourse.**

In more detail:

- 1. Blue/white light and glare from LEDs can cause toxic stress that can lead to retinal damage.**

An article in LEDs Magazine outlines the concerns raised about the effects of LED lighting on health, reports that children, people who are light-sensitive and workers who are occupationally exposed are most at risk. See:

<http://www.ledsmagazine.com/articles/2010/11/light-and-human-health-led-risks-highlighted.html>

The article states:

ANSES, the French Agency for Food, Environmental and Occupational Health & Safety, has published a report entitled (in English): " **Lighting systems using light-emitting diodes: health issues to be considered,**" which focuses squarely on potential problems caused by LED lighting.

The full report is available in French only, but the report summary (in English) says that risks have been identified concerning the use of certain LED lamps, raising potential health concerns for the general population and professionals. **"The issues of most concern identified by the Agency concern the eye due to the toxic effect of blue light and the risk of glare,"** says the report, adding that the blue light necessary to obtain white LEDs causes **"toxic stress" to the retina.**

Blue light causes a photochemical risk to the eye, says the report, the level of which depends on the accumulated dose of blue light to which the person has been exposed, which is generally the result of low-intensity exposure repeated over long periods. "Blue light is...recognized as being harmful and dangerous for the retina, as a result of cellular oxidative stress," says the report, adding that 3 groups are particularly at risk; children, populations which are already light-sensitive, and workers likely to be exposed to high-intensity lighting.

The other main risk is from glare. The report says that, for indoor lighting, it is generally agreed that luminance higher than 10,000 cd/m² causes visual discomfort whatever the position of the lighting unit in the field of vision. Because the emission surfaces of LEDs are highly-concentrated point sources, the luminance of each individual source can be 1000 times higher than the discomfort level. The level of direct radiation from this type of source can therefore easily exceed the level of visual discomfort. Other risks related to the use of LED lighting systems have also been raised, but further study is required.

The report says that the photo biological safety standard (EN 62471) seems ill-adapted to lighting systems using LEDs, and that the Unified Glaring Rate used for the other types of lighting is unsuitable for LEDs. Among various recommendations, ANSES says that only LEDs falling into risk groups similar to those of traditional lighting systems be available to the general public and that the highest risk lighting systems be reserved for professional use under conditions in which it is possible to guarantee the safety of workers.

Manufacturers and integrators of lighting systems using LEDs are encouraged to use optics or diffusers, for example, so that the beams of light emitted by the LEDs cannot be seen directly, to avoid glare. Manufacturers should also take account of the progressive wear of layers of phosphor in white LEDs, which in time could lead to devices being moved from one photo biological risk group to a higher one, according to ANSES.

Another article, online at LiveStrong.com, refers to the potential for LEDs to cause retinal damage among people of more advanced ages and those who have macular degeneration.

<http://www.livestrong.com/article/291567-health-risks-of-high-power-led-lights/>

2. Diode bulb breakage can cause release of copper and nickel on hard surface flooring requiring a hazardous waste cleanup

A 2012 Scientific American article refers to release of copper and nickel due to LED bulbs breaking on the concrete, absorbed through air, water and soil. In the Common House, the bulbs would fall on a concrete floor where children and adults congregate.

This article and another article on metal toxicity health dangers follow:

<http://www.scientificamerican.com/article/led-lightbulb-concerns/http://www.globalhealingcenter.com/natural-health/metal-toxicity-health-dangers-nickel/>

The U.S. CDC Agency for Toxic Substances and Disease Registry defines nickel and copper as toxic substances and the potential for adverse health effects is dose dependant. Twenty percent of the population is allergic to nickel and would have a stronger reaction to a nickel spill from a broken LED bulb.

Nickel: <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=244&tid=44>

Copper: <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=205&tid=37>

3. The use of low voltage lighting saves energy but generates a large problem at the back end as high transients, or “dirty electricity” that backs in to the electrical wiring can cause health problems. But, since federal law prohibits the retail sales of incandescent light bulbs, the public has little recourse

I refer you to a 2013 peer reviewed paper by Samuel Milham, MD and David Stetzer, Electrical Engineer, who report,

“Dirty electricity, also called electrical pollution, is high-frequency voltage transients riding along the 50 or 60 Hz electricity provided by the electric utilities. It is generated by arcing, by sparking and by any device that interrupts current flow, especially switching power supplies. It has been associated with cancer, diabetes and attention deficit hyperactivity disorder in humans.”

See <http://www.sammilham.com/Milham-Stetzer-2013-Dirty-electricity,-chronic-stress,-neurotransmitters-and-disease.pdf>

The report ends by stating that, “Buchner and Eger's surmise that the morbidity and mortality associated with cell tower EMF exposure is mediated through a chronic stress reaction seems accurate and suggests that the body recognizes EMF as a foreign invader and mounts an acute stress response to it. With chronic exposure and stress, neuroendocrine and immune system dysregulation results in a wide spectrum of human morbidity and mortality. Our work shows that lowering of dirty electricity in an office environment results in increased urinary levels of dopamine and PEA in exposed persons. This is evidence that dirty electricity and probably other types of EMF exposure act as chronic stressors, causing neurotransmitter changes and disease. Neurotransmitters may be biomarkers of dirty electricity and EMF exposures.

I prepared this report to raise awareness about adverse health effects from low voltage LED lighting. There is little research but still a strong suggestion that these bulbs present health risks and require close management. Many public spaces already have installed low-voltage CFL bulbs. Federal law prohibits the sale of incandescent light bulbs which present few health risks and the selling point is that these bulbs waste electricity. More will be learned over time and

perhaps, someday, a manufacturer will market a low energy usage light bulb that does not cause health problems.