Report from the Street

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Topics

- Glare
- Spectral Power and Color Temperature
- **Light Trespass**
- **Fix Previous Mistakes**
- **Decorative Fixture Selection**
- **Pilot Tests**
- **Adaptive Dimming**

Context – Cambridge Project

- Dense commercial and residential
  7.1 mi^2, Pop. 107,000
- City owns and maintains streetlighting
- 5000 cobra-heads, unmetered
- 2000 various specialty fixtures, metered
- Wireless adaptive dimming
- Lam Partners/Parsons Brinckerhoff

Glare

- Intensity of exposed LEDs
- High-angle peak candela
- SSL Postings
  "Coming to Grips with Glare"
  http://energy.gov/sites/prod/files/2015/06/f24/postings_06-29-15.pdf

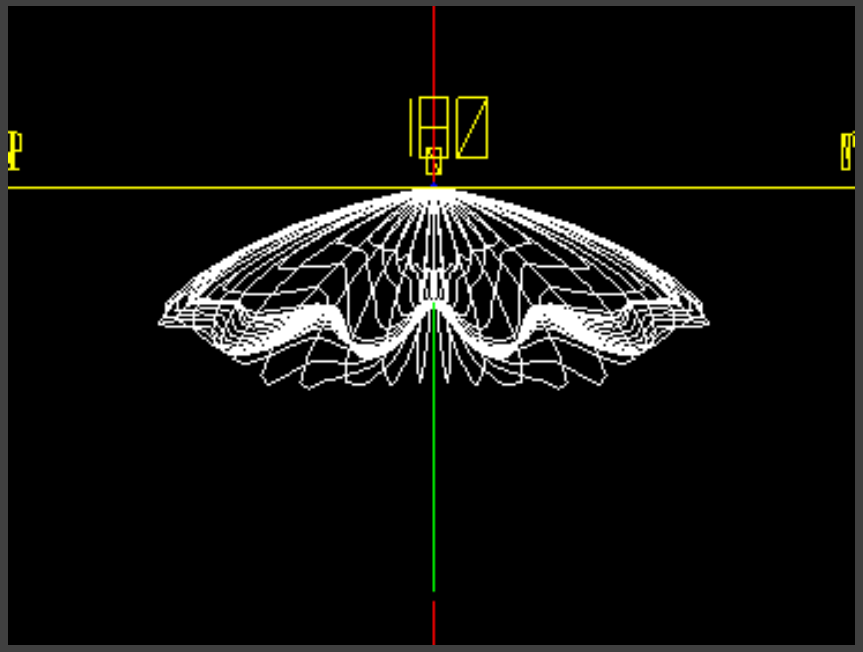
  Gateway Report
  http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2013_gateway_pedestrian.pdf

Glare

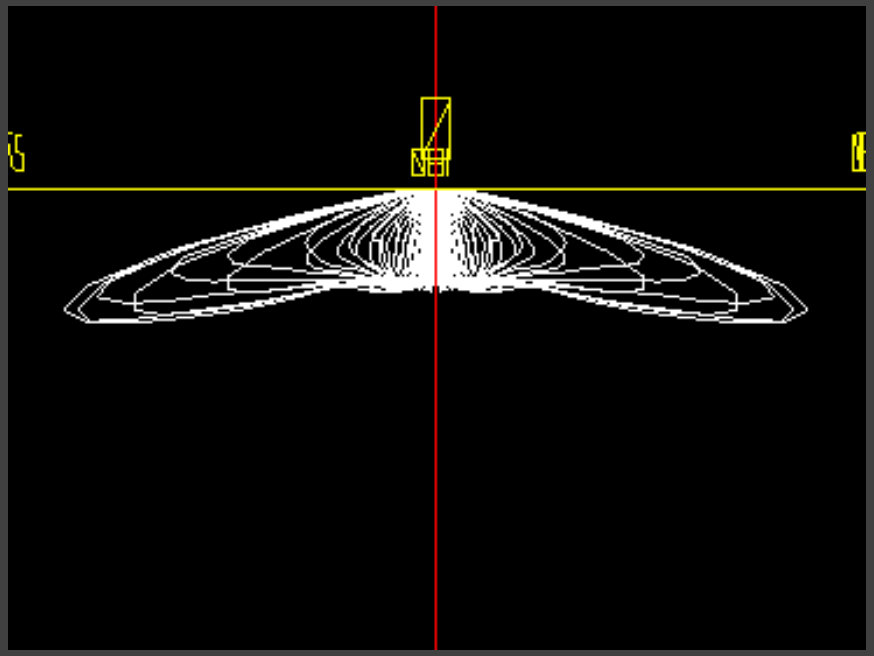

Kenall Introduces TopDek™
Advanced Parking Deck Lighting
Next Generation
LUMINAIRE
WINNER
With the tremendous acceptance of TekDek LED with SmartSense controls, Kenall has developed a top of deck/surface
king applications. Its robust
at sink for effective thermal
or ease of maintenance
ht and occupancy controls for
gy savings
e entire parking structure including
nfident you'll find TopDek's
none in the industry.
A New Benchmark in Visual Comfort
WaveStream™ LED
Taking Control of Light.

Glare

Cobra Head



Good



Bad

Glare

- Manufacturers:
  - Provide optical systems that control glare
- Specifiers:
  - Avoid fixtures with peak candela above 70
  - Avoid fixtures with intense “spikes”
  - Look for IES “short” distribution

Glare

- Mockups and Visual Evaluation are Critical!

SPD & Color Temperature

- Apparent Brightness?
- Off-axis Detection?
- Color Contrast?
- Color Preference?
- Circadian Disruption?
- Skyglow?
  http://agi32.com/blog/2015/07/07/color-temperature-and-outdoor-lighting/

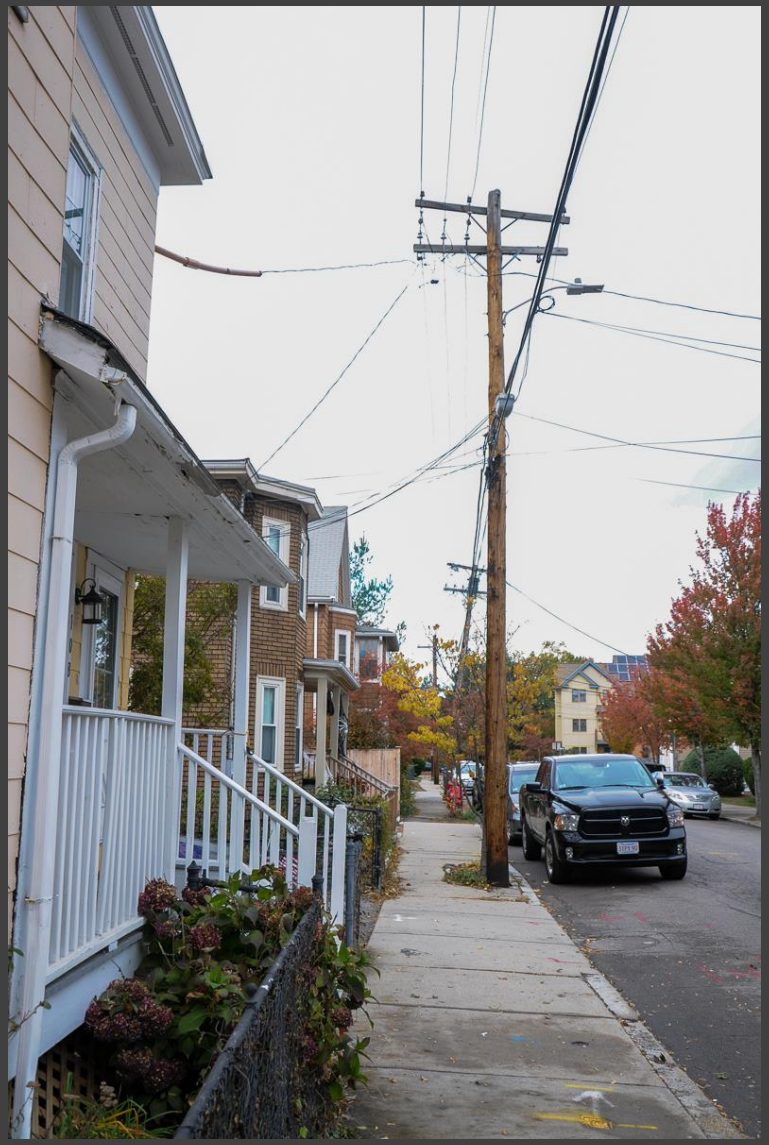
SPD & Color Temperature

- Manufacturers:
  - 3000K fixtures with better efficacy
  - Late night SPD adjustment? (no “blue”)
- Specifiers:
  - Educate yourself
  - Solicit community input if appropriate

Light Trespass

Light Trespass

Light Trespass



Light Trespass

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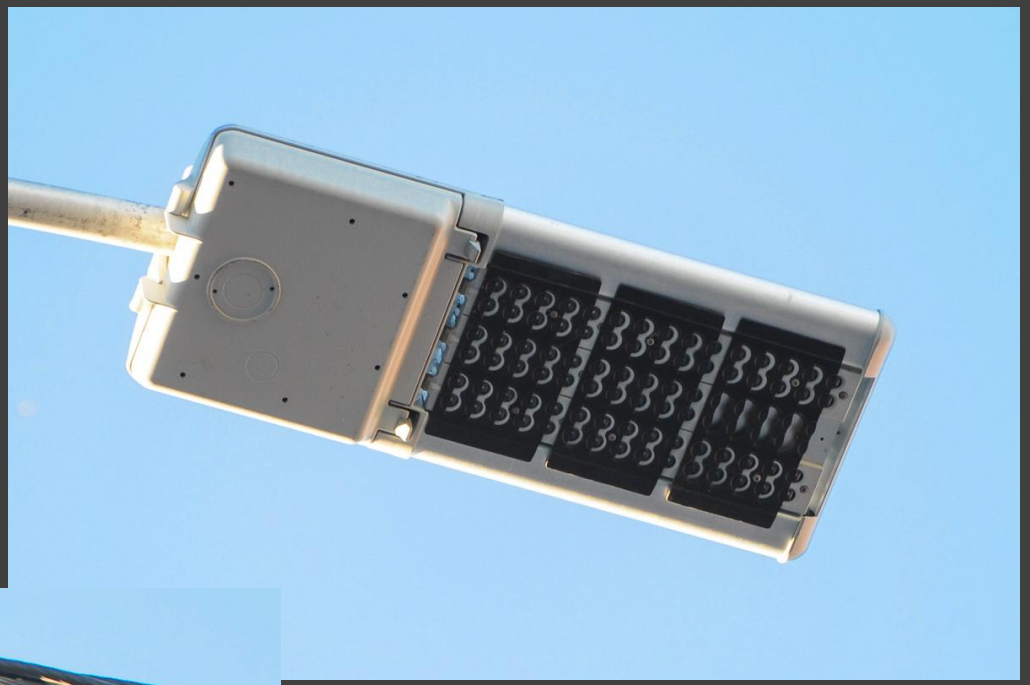



VERSALIFT


VERSALIFT

Light Trespass

- Manufacturers:
  - Easy to install and inexpensive shielding, with options for amount of cutoff both "house" *and* "street" side
  - Optical distributions for narrow streets.

- Specifiers:
  - Use fixtures with good shielding options and be prepared to use them.

Don’t repeat previous mistakes

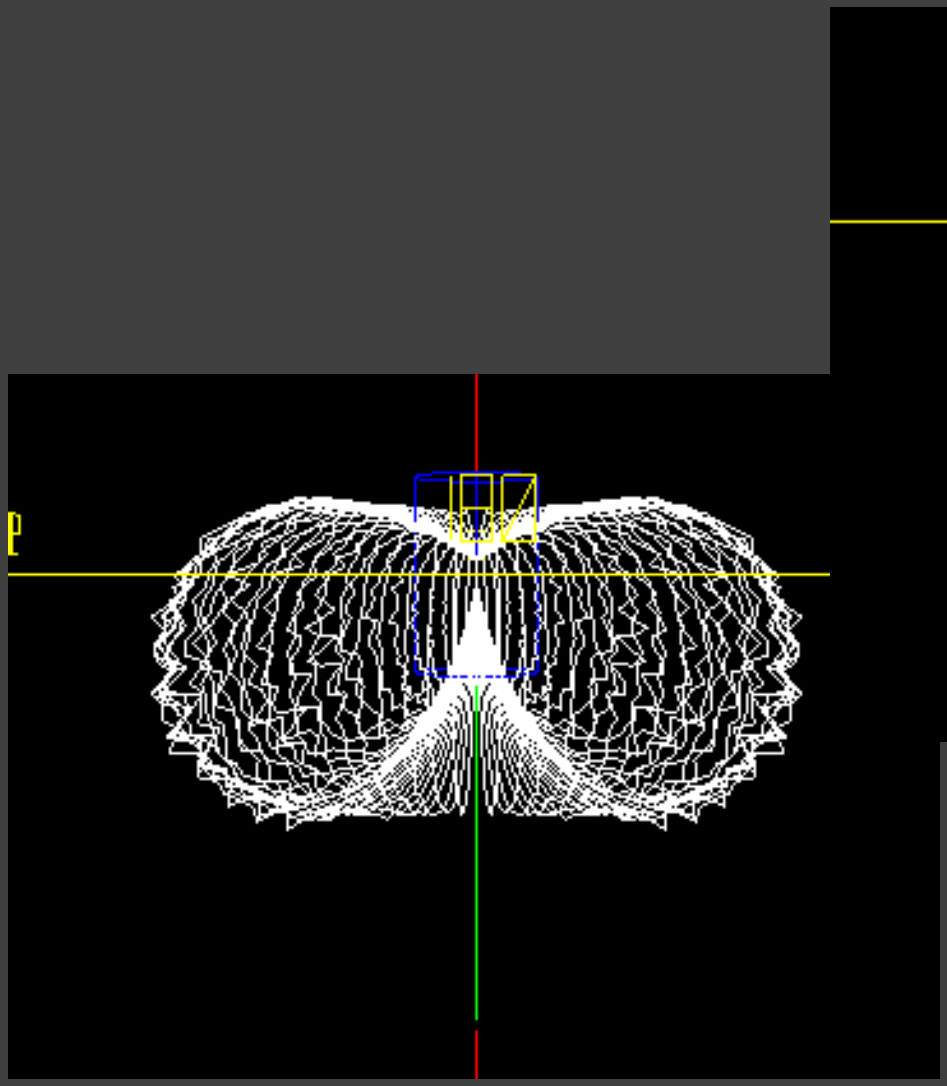
- Eliminate overlighting
  – do not exceed RP-8 criteria
- By eliminating excessive light levels, Cambridge reduced total lumens by about 40%
- Don’t just replace “one-for-one” lumens
- Reduce glare
- Reduce light trespass

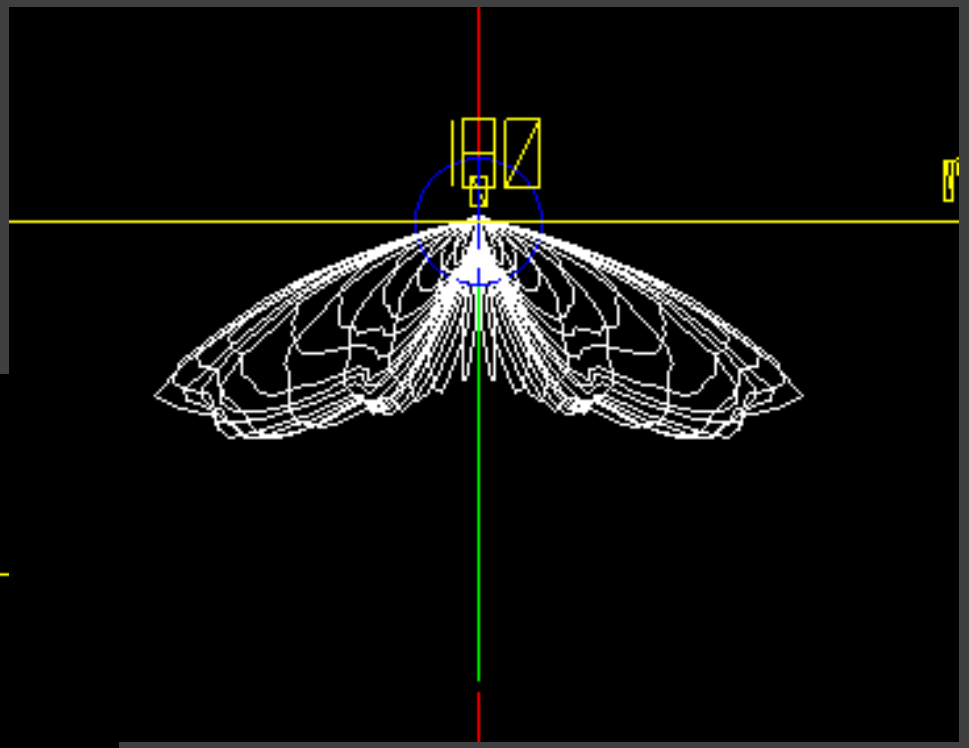
Don’t repeat previous mistakes

- Manufacturers:
  - Please stop defining fixtures with HID wattage equivalents
- Specifiers:
  - Carefully design the conversion.
  - Don’t just replace “one-for-one”

Decorative Fixtures

Decorative Fixtures





Decorative Fixtures

Decorative Fixtures

- Manufacturers:
  - Pay attention to glare control – it's a market opportunity
- Specifiers:
  - Carefully evaluate the fixtures (Warning! – this is hard work)

Pilot Testing

SundayReview | OPINION

Ruining That Moody Urban Glow

By LIONEL SHRIVER OCT. 17, 2015

AT 13, I covered multiple lamps in my bedroom with variously colored theatrical gels, the better to create a luminary ambience to suit my mood. When I felt sunny, I chose the yellow; when glum, the blue. And hey, I was a teenager. The blue got a lot of use.

In my repellently contented middle age, I don't seek blue light. Like most sane people, I spurn restaurants whose lighting glares. I recoil from mirrors under fluorescent tubes. I switch on an overhead only to track down a water bug while wield
Marc
wher
overl

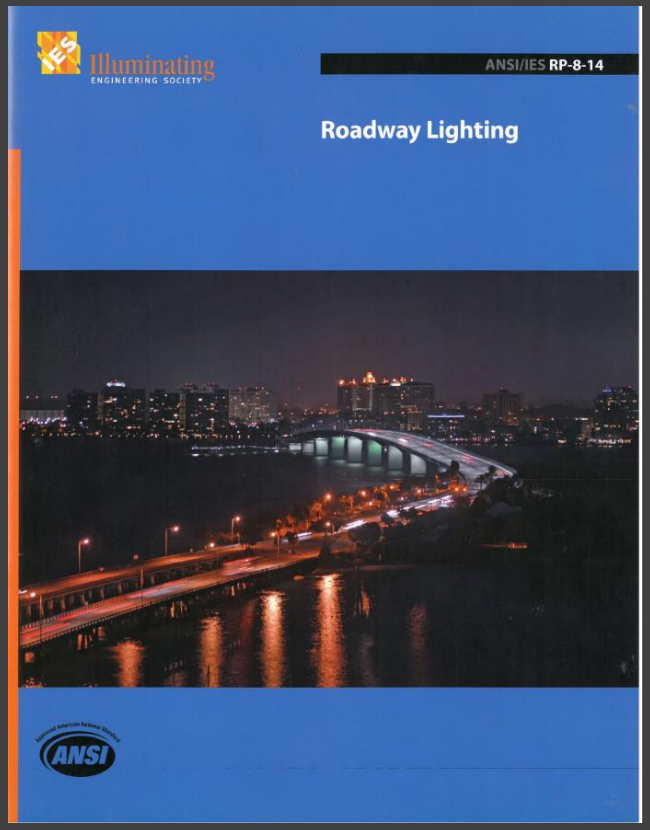
...my fellow experimental subjects have compared the nighttime environment under the new streetlights to a film set, a prison yard, "a strip mall in outer space" and "the mother ship coming in for a landing"...

Adaptive Dimming

You can do this!

Adaptive Dimming

- Light level setback based on pedestrian volumes and/or reclassification of street



- The vertical illuminance level that allowed drivers to detect pedestrians at adequate distances was the same for HPS and MH sources; however, MH or other white light sources can provide better facial recognition and comfort for pedestrians.

The report also includes some placement guidance for positioning poles before the crosswalks (see **Figure 14**).

5.4 Adaptive Lighting

Adaptive lighting describes a lighting system that can be adjusted based on time of day use changes. For street and pedestrian lighting there are currently many dimming and step switching systems which are available to control the output of luminaires.

Several international standards now or soon will address adaptive lighting. The Institute of Lighting Engineers in the UK has issued Technical Report 27 Code of Practice for Variable Lighting Levels for Highways. The International Commission on Illumination is currently revising CIE 115 Lighting of Roads for Motor and Pedestrian Traffic to include advice for adaptive lighting. Both of these organizations have taken the approach that if the criteria for use change based on the time of day then the lighting level required also changes.

The AASHTO Lighting Design Guide also addresses this issue and offers excellent guidance for master planning of lighting systems.

For this recommended practice lighting levels are based on the road classification and the pedestrian volumes. For example a Major road will require 1.2 cd/m^2 when pedestrian levels are high but only require 0.6 cd/m^2 when pedestrian volumes are low. Therefore if a lighting system is equipped with dimming equipment, the lighting level can be changed based on the expected pedestrian volumes. This also applies to pedestrian area lighting which is also based on pedestrian volumes.

Lighting levels also vary based on roadway or street classification. If vehicle traffic volumes vary during the night, the local jurisdiction may vary the street classification and thereby allow for additional dimming.

If adaptive lighting is used in an installation all of the lighting criteria shall be met for the operating conditions at that time. If a lighting system is dimmed to meet the low pedestrian volume values, the installation shall continue to meet the required uniformity ratio and veiling luminance ratio given in this recommended practice.

5.5 Transition Lighting

Transition lighting may be appropriate when going from a lighted roadway to an unlighted section. If used, the lighting should be reduced to one half of the fully lighted section for a distance equivalent to 15 seconds of travel time at the posted speed limit. This is generally accomplished by maintaining the pole configuration of the lit roadway section and reducing the lumen output of the luminaires in the transition area.

Roadways with designed luminances equal to or less than 0.6 cd/m^2 do not need transition lighting.

5.6. Grade Intersections

5.6.1 General These intersections may have unrestricted traffic flow on both roadways, restriction by means of stop signs on one or both of the roadways, control by traffic signals, control by police officers or other means. Some are complicated by pedestrians as well as vehicular traffic. The lighting solution is fundamentally the same regardless of the complications identified. It is desirable to provide for

Adaptive Dimming

Adaptive Dimming

- Lumen Maintenance – more savings
- Tune your system to local conditions and preferences
- **Potential for further savings and light pollution reduction if future standards permit lower light levels**

Adaptive Dimming

- Safety Concerns? – Not justified, based on Cambridge experience
- Approach is supported by ANSI/IES RP-8 and Federal Highway Administration guidelines

Adaptive Dimming

- Controls ready!

- Need Tariffs/Rates for Dimming
  - Cambridge paying for about 2X the kwh used ($180K/yr)
  - 4-year payback if there were cost savings
- Need incentives for dimming

Adaptive Dimming

- Manufacturers:
  - Make 7-pin socket and 0-10v dimming driver a standard option
  - Easier commissioning and lower cost
- Specifiers:
  - If you can't afford it now, at least install "controls ready" fixtures.
- Utilities:
  - Rates and incentives to reflect true energy use

And birds like them…..

And they're reliable!

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