2008 Nonresidential Standards Lighting Change Proposals

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PIER Research

- Lighting Research Program (LRP)
- High Performance Commercial Building Systems (HPCBS)
- Change proposals limited to:
  - Nonresidential
  - High-rise Residential
  - Hotel / Motel

Lighting Measure Templates

- LED Exterior Lighting
- Load Shedding Ballasts
- LED Night Lighting in Bathrooms
- Integrated Classroom Lighting
- Bi-level Stairwell Lighting

LED Exterior Lighting

Normal operation both the LED and conventional lamp operate.

During periods of non-occupancy, only the LED operates.

LED Exterior Lighting

Common Features

- Conventional Incandescent or Fluorescent Lamp
- LED Arrays
- Photocell Control
- Activated by occupancy sensor
- Integrated System

LED Exterior Lighting

- The fixtures save energy by switching on the incandescent or fluorescent lamp only when motion is detected.
- The fixtures provide pleasant, ambient LED background light, eliminating dark spots commonly associated with motion sensor systems.
- When the primary lamp burns out, the LED will still yield functional light from the fixture.
- The use of incandescent or fluorescent lamps eliminates the need for higher lumen output, (more) expensive LED arrays.
- The use of colored LEDs provides a ‘color changing’ feature as an added security benefit.

LED Exterior Lighting

Features

- LED uses 5 watts continuous all night long
- 87% savings over Incandescent
- Can use CFL, but payback increase to 5 years.
- In marketplace since 2004.

LED Exterior Lighting

Proposed Changes

- Add new Power Adjustment Factor (PAF) table for outdoor lighting in Section 147.
- Include 50% PAF credit for Hybrid fixture.
- Should be considered for Residential Applications.

LED Exterior Lighting

Savings Calculation

- CFL Based design with lighting always on:
  - 10 lamps @ 15 watts = **150 watts**.
  - 12 hrs operation X 365 days x 150 watts = **657 kWh/yr**

- LED / Incandescent hybrid based design:
  - 10 lamps @ 60 watts = 600 watts.
  - 10 lamps @ 5 watts = 50 watts. x **0.50** PAF = **325 watts**
  - 12 hrs operation x 365 days x 600 watts x 13% = **342 kWh/yr**.

- If PAF were 0.75, both designs would have equivalency under Title 24, yet the hybrid would still use ½ the power.

LED Exterior Lighting

Eligibility Criteria

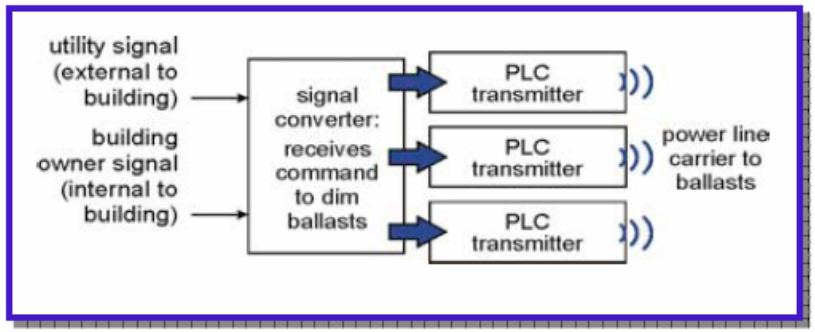
- Primary light source controlled by occupancy sensor.
- Secondary light source is LED.
- Secondary light source is Always On.
- Entire system integrated with Photosensor.
- Limited to Pedestrian Area applications.

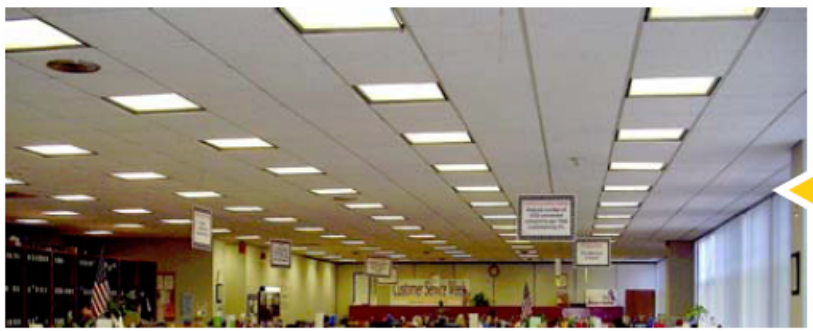
LED Exterior Lighting

Applications

- If limited to Pedestrian Area, changes in Section 132 language not needed. (50% switching)
- If allowed in parking lots, exemption needed since LED is not turned off.
- Comments?

Load Shedding Ballasts





Load Shedding Ballasts

- Switched capacitor circuit
- Lamp current reduced by 35%
- Produces 33% reduction in lamp power.
- Uses power line carrier signaling method.
- $9.00 incremental cost per ballast.
- Payback in less than 3 years.

Load Shedding Ballasts

Proposed Changes

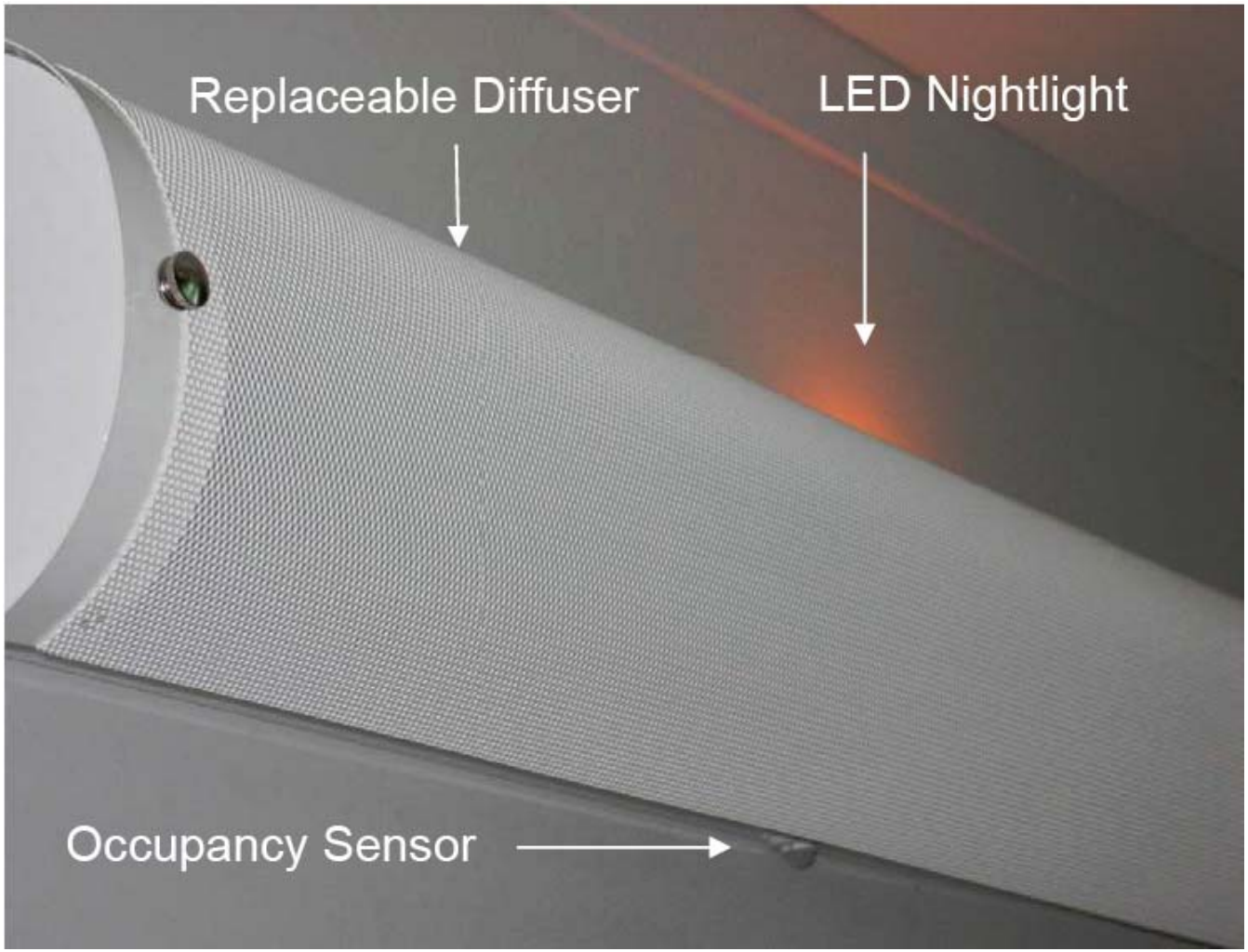
- New entry in Table 146-A Power Adjustment Factors (PAF) for Indoor Lighting.
- Entries currently cover Automatic Load Control with Dimming – Credit given is 25%
- No user controlled dimming available, apply 15% PAF.

Load Shedding Ballasts

Eligibility Criteria

- Minimum Ballast Efficacy Factor (BEF) = 1.48
- Must have a control system that is ready to respond to a load curtailment or real time pricing signal.
- All lights receiving the control credit must be controlled.
- Each light that qualifies for this credit must be equipped with a load shedding ballast that will respond to the signal to dim the lights.
- Each light must provide a minimum 30% reduction in lighting input power upon receiving the signal.

LED Night Lighting in Bathrooms



LED Night Lighting in Bathrooms

Features

- Conventional luminaire
- Occupancy Sensor
- Low power LED (less than 1 watt)

LED Night Lighting in Bathrooms

Benefits

- Occupancy sensor reduces lights left on.
- LED serves as nightlight.
- LED can be used as safety light during power outages.
- 50-75% energy savings.
- 2-6 year simple payback.

LED Night Lighting in Bathrooms

- Section 150 in current Title 24 considers LED as low efficacy light source.
- Low efficacy light sources in bathrooms must be on Occupancy Sensor.
- Products currently made not able to be installed in California, new construction or retrofit.

LED Night Lighting in Bathrooms

Change Proposal

- Modify Table 150-C in Section 150.
- Include entry that permits the lower efficacy LEDs for low wattage applications.
- Will still exclude incandescent.

Standards Table 150-C

Lamp Power Rating	Minimum Lamp Efficacy
5 watts or less	30 lumens per watt
Over 5 watts to 15 watts	40 lumens per watt
Over 15 watts to 40 watts	50 lumens per watt
Over 40 watts	60 lumens per watt

Integrated Classroom Lighting

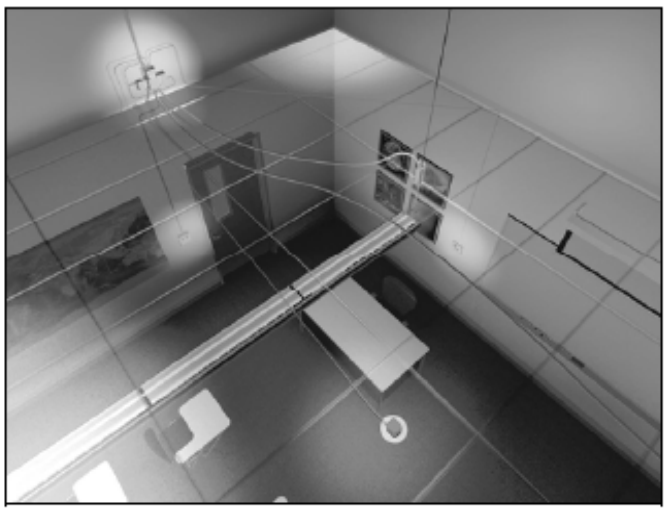
Integrated Classroom Lighting

- High performance lighting system.
- Products currently in marketplace.
- Direct/Indirect luminaries.
- 96% reflective material.

Integrated Classroom Lighting

- Teacher control features
  - General Lighting
  - A/V Mode w/dimming
- Occupancy Sensors
- Plug and Play configuration

Teacher Control Center w/ Quiet Time



Low Voltage Plug together wiring

Dual Technology Occupancy Sensor

Integrated Classroom Lighting

- Installed in 6 schools in California, 19 classrooms.
- 40 – 70 fc on student desks.
- Resulting LPD = 0.95 w/sqft.
- With Occupancy Sensors – 0.76 w/sqft.
- Current Title 24 = 1.2 w/sqft.
- 36% better than code.

Integrated Classroom Lighting

- Positive responses from teachers on quality of light.
- Higher cost per fixture than conventional lighting.
- Lower installed system cost due to high quality luminaires, reduced number of fixtures, plug and play design.
- $3.31/s.f. - $4.31/s.f. cost (Good - Best)

Integrated Classroom Lighting

Change Proposal

- Revise Allowed LPD Tables
  - Table 146-B Complete Building Method
  - Table 146-C Area Category

- Lower school allowed LPD from 1.2 w/sqft to 1.1 w/sqft.
- Lower classroom allowed LPD from 1.2 w/sqft to 1.1 w/sqft.

Integrated Classroom Lighting

- Should it be reduced to 1.0 w/sqft??
- Adding occupancy sensors to the ICLS system reduces the effective LPD to 0.76 w/sqft (20% PAF)
- Would still beat Title 24 by 24%!

Bi-Level Stairwell Lighting

Bi-Level Stairwell Lighting

- Stairwells typically lit 24/7 for egress purposes.
- Low occupancy (0.7 - 3.3 percent)
- Reduces light level to code minimums when unoccupied.
- Returns lighting to 100% upon occupancy detection.
- Uses 1/3 or less power most of the time.

Bi-Level Stairwell Lighting

- Lighting Research Center (Rensselaer Polytechnic Institute)
  - High-rise residential applications
  - High-rise office applications
  - 53 to 60 percent savings
  - 2.5 year payback

Bi-Level Stairwell Lighting

- LBNL Study
  - 3 Office buildings
  - University building
  - 40 – 60 percent energy savings
  - 5 year payback or less

Bi-Level Stairwell Lighting

Proposed Changes

- New entry in Table 146-A Power Adjustment Factors (PAF) for Indoor Lighting.
- Entries currently cover
  - Hallways of hotel/motels
  - Commercial & industrial storage stacks
  - Library stacks
- Apply 25% PAF (same as hallways).

Bi-Level Stairwell Lighting

Eligibility Criteria

- Applicable only to stairwells.
- Controlled by occupant sensing device.
- Multi-level switch or dimming system.
- Reduces the lighting power at least 50% during periods of non-occupancy.
- Minimum ballast efficacy factor (BEF) = 1.48