

Simple Retrofits for Energy-Efficient Office Lighting

Many offices are illuminated at levels much higher than necessary for today's office tasks. Lowering ambient light levels and adding task lighting can save energy without significantly affecting visual performance for most typical office work. But how do you keep workers from complaining of dreariness and gloom? The LRC studied simple retrofit solutions that save energy in open-plan offices while providing the perception of brightness.

Field study

The LRC studied office workers' responses to lower ambient light levels and two techniques designed to enhance brightness perception: lamps with higher correlated color temperatures (CCT) and sparkle elements. In varying combinations, LRC researchers:

- Reduced light levels nearly 40% to 340 lux by removing one fluorescent lamp from most luminaires
- Replaced existing 3500 K CCT fluorescent lamps with 6500 K lamps
- Added high-reflectance, diffused reflectors as sparkle elements



The LRC added sparkle elements to each luminaire seven months after lowering the ambient light levels. Pyramid-shaped diffused reflectors made of white, powder-coated aluminum created the "sparkle" effect.

Sponsors

Project: The Connecticut Light and Power Company

Site: State of Connecticut Dept. of Public Safety



The LRC reduced ambient light levels by removing the center lamp from most luminaires in the open-office plan. To improve appearance, the dark center was covered with a panel similar in color to the ceiling, so that the luminaire looked like two single-lamp luminaires spaced close together.

Results

Surveys showed that after an initial adjustment period, office workers were generally satisfied with the lower level of ambient lighting, regardless of the color temperature of the lamps (3500 K or 6500 K). They increased their use of task lighting at their desks under both color temperatures, which had little impact on energy consumption. The brightness-enhancing techniques, however, garnered mixed results:

- The 6500 K lamp was effective at increasing perceptions of brightness in offices with the lower ambient light level. In offices where light levels remained high, however, the occupants noted that the higher color temperature lamps created a cold appearance.
- Initially, some workers found that the sparkle elements enhanced the lighting, while others thought they were too bright. Over a longer period, sparkle elements did not significantly change workers' perceptions of brightness or gloom, although they did lead to positive opinions in terms of preference and visual clarity.