

NEW CODES FOR STAIRWELL

LIGHTING

New Technology To Reduce Energy Cost Impacts

by G. Kimball Hart

Facility managers, owners, or developers of proposed multi-story buildings need to be aware that a new standard for lighting exit stairways has been approved by the American National Standards Institute (ANSI), the Uniform Fire Code® (NFPA 1) and the Life Safety Code® (NFPA 101). Concerning the “illumination of paths of egress,” the new code requires that “during conditions of stair use, the minimum illumination for new stairs shall be at least 108 lux (10 ft-candles), measured at the walking surfaces.” This is a significant increase from the old code that was only one foot-candle.

Recognizing that this new standard could significantly increase lighting energy costs—because stairwell lights are on 24/7—the code writers have allowed for the use of new technology to help keep energy costs down. For example, section 7.8.1.2.2 of the Life Safety Code® says, “automatic, motion sensor-type lighting switches shall be permitted within the means of egress, provided that the switch controllers are equipped for fail-safe operation, the illumination timers are set for a minimum of 15-minute duration, and the motion sensor is activated by any occupant movement in the area served by the lighting units.”

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When Does the New Code Take Effect?

It is up to each local jurisdiction to decide when a new code takes effect. Most large cities and counties have highly routine processes for updating codes. The new code for exit stair lighting is contained in the 2003 Editions of the two NFPA codes. Many jurisdictions will be adopting these editions from now through 2005 or 2006. Note that the new code applies only to new stairs—either in new construction or in renovations significant enough that they must be brought up to current codes.

Stairwell safety has been a public health issue, a building code issue, and a fire code issue for decades, especially in emergency situations. Recently, however, because of the 1993 and 2001 attacks on the World Trade Center in New York City and a disastrous fire in a nightclub in Rhode Island, public attention has again been focused on the importance of stairwells that are typically out of sight and out of mind.

What is Motion Sensor Controlled Stairwell Lighting?

Recognizing the value of better-lighted stairwells but not wanting to increase energy demand more than necessary, both the New York State Energy Research and Development Authority (NYSERDA) and the California Public Interest Energy Research (PIER) Program have been sponsoring the development of new “bi-level” fluorescent fixtures that can be used in stairwells to meet the new code. The fixtures, which come in both 120V and 277V options, maintain a low level of light sufficient to meet the IFC code requirement for unoccupied

periods. However, when an occupancy sensor detects motion in the stairwell, the fixture switches to full output in order to meet the 10FC requirement. The length of the fixture and number of lamps needed to meet the lighting requirement are a function of stairwell geometry and color.

In addition to the normal parameters, such as U.L. listing, warranty, and first cost, that any facility manager would consider, special features of this new technology to compare carefully include:

- *Motion sensor design and construction:* a motion sensor that is internally mounted is less subject to vandalism than an external one. Also, ultra-sonic sensors do a better job of detecting motion in the stairwell and on the landings above and below the one being entered.
- *Lamp conditioning circuit:* It significantly improves lamp life if the fluorescent lamps in the bi-level fixture can be “burned in” for 100 hours or so before they start dimming cycles. Note that in some bi-level fixtures, lamps are dimmed but not actually turned off. Keeping lamps on, though dimmed, instead of turning them off and on may actually extend lamp life over conventional fixtures.
- *Adjustable Dwell Time (On-Time):* Controllers should be adjustable to meet both occupant desires and to be sure that the unit meets the 15-minute on-time required by code.
- *Optional emergency Lighting:* Bi-level fixtures that can be fitted with battery packs and are U.L. certified as

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“emergency lighting and power equipment” can do double duty as emergency lighting and eliminate the need for additional “headlamp” battery packs.

How Do Dimming and Stairwell Use Affect Energy Costs?

Both NYSERDA and PIER have spent significant research time looking into this issue. One of the monitoring sites testing the new bi-level fixtures is Evans Hall at the University of California, Berkeley. Here are some initial estimates from the

two research organizations:

- 2-Lamp fixture with no dimming: If the facility manager used a standard 2-lamp fluorescent fixture (2F32T8S) to meet the new 10FC code, the fixture would use an average of 58 watts per hour 8760 hours per year (24x365). At 14 cents per kWh and no dimming, that would work out to an energy cost of about \$71 per year per fixture.
- 2-Lamp fixture with 95 percent dimming: If the stairwell is secured with only an occasional occupant exiting all the way out (no inter-floor traffic), the fixture would be in dim mode about 95 percent of the time. Using a fixture in the dim mode (10% light), energy use would be 13 Watts for 8322 hours and full-on at 62 Watts for 438 hours. At 14 cents per kWh, this fixture would cost the facility only about \$19 per year per fixture to meet code.
- 2-Lamp fixture with 60 percent dimming: It is still early in the monitoring process at Evans Hall, but preliminary indications are that in the case where exit stairs are used for inter-floor traffic, stairwell lights may be full-on about 40 percent of the time (they are dimmed most of the time during nights and weekends). Revising the calculations above to account for 40 percent time at 62

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Watts and 60 percent time at 13 Watts, the annual cost of using this fixture to meet the 10FC code would be

about \$40 per year—clearly more than in the case of the secured stairwell but still significantly less than the standard fixture on all the time.

There is no doubt that bi-level fixtures are more expensive than standard fluorescent fixtures. It costs more to have a fixture with an occupancy sensor and a step-dimming ballast. Costs of these new fixtures vary widely so it pays to shop for them. But even at a significant incremental cost over standard commercial fixtures (as much as \$150 or more), based on the savings described above, simple paybacks can be in the three-to-five-year range depending on electricity costs and the amount of stairwell use. Clearly this new technology is designed to take the sting out of applying new stairwell lighting codes. 🏢

Websites of Interest

- Access Board
—www.access-board.gov
- American National Standards Institute (ANSI)
—www.ansi.org
- California Building Standards Commission (BSC)
—www.bsc.ca.gov
- International Code Council (ICC)
—www.iccsafe.org
- National Fire Protection Association (NFPA)
—www.nfpa.org
- U.S. Department of Justice (for ADA)
—www.usdoj.gov/crt/ada
- Western Fire Chiefs Association (WFCA)
—www.wfca.org

Manufacturers

At least three manufacturers are currently making bi-level fixtures suitable for exit stair applications:

- Occu-Smart® by LaMar Lighting
(www.occusmart.com)
- StairLite System by Cooper Lighting
(www.cooperlighting.com)
- Stairwell Luminaire by Day-Brite® Lighting
(www.daybritelighting.com)

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