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THIS WAY TO EXIT

Exit Signs Can Be a Glowing Factor in New Building Designs



BY MICHAEL O'CONNELL, LEED AP

NEARLY EVERY BUILDING EXCEPT SINGLE-FAMILY DWELLINGS IS REQUIRED BY PUBLIC SAFETY CODES TO MARK EGRESS PATHWAYS WITH EXIT SIGNS. As a result, there are more than 100 million exit signs in the United States alone. Possibly because they are such a commodity, exit signs rarely are a design priority for architects. Many architects consider them a necessary evil that can compromise area aesthetics and add costs to engineering, construction and operational activities.

Until the late 1990s, exit signs with incandescent and compact-fluorescent lamps were the standard. Now, these power-hungry fixtures have been replaced by low- or no-electricity technologies, including light-emitting diodes; nuclear, or tritium; and photo-luminescent products. To accelerate the retirement of high-wattage exit signs in existing facilities, many utilities sponsor generous incentive programs that nearly pay for the cost of a low-power replacement fixture. In new construction, codes and standards, such as ASHRAE, Energy Star and LEED, mandate exit signs that use no more than 5 watts. Accordingly, prudent building designers need to understand the basics of different exit-sign technologies to better promote public safety, reduce costs and minimize environmental impact.

LED EXIT SIGNS

The LED exit sign is the most popular technology with today's architects and engineers. Not only are LED exit signs a well-understood technology, they are promoted by LEED, Energy Star and the Federal Energy Management Program. The signs use 5 watts of power or less, which equates to a few dollars per year, and their lamps last up to 10 years. Economy models cost less than \$30. Specification-grade metal diecast and clear acrylic edge-lit designs have an architectural look that complements upscale office, condo, educational and medical buildings. In addition, lamp and battery replacement frequency has been greatly improved compared with other electrically powered exit signs.

However, LED exit signs have safety, cost and sustainability issues that can marginalize their benefits in many applications. From a safety standpoint, when there is a lights-out emergency, LED exit signs do not work if lamps are burnt out, battery packs are dead or the emergency generator (when there is one) fails.

From a cost standpoint, LED exit signs are the most expensive to install and maintain, even if you buy a less expensive model. (See "Exit-sign Comparison," on next page.) By code, electrically powered exit signs must be illuminated 24/7. Accordingly, they usually need to be connected to a special circuit that is engineered, procured and installed separately from normal lighting circuits.



TO ACCELERATE THE RETIREMENT OF HIGH-WATTAGE EXIT SIGNS IN EXISTING FACILITIES, MANY UTILITIES SPONSOR GENEROUS INCENTIVE PROGRAMS THAT NEARLY PAY FOR THE COST OF A LOW-POWER REPLACEMENT FIXTURE.



Therefore, even a low-end LED exit sign is going to cost \$100 to \$300 to install. You should plan to spend another \$20 per year per sign to operate and properly maintain each LED exit sign. Overall, the 20-year total cost of ownership for an average-priced LED exit sign is \$600 to \$800.

From a sustainability standpoint, LED exit signs have greenhouse-gas and hazardous-material issues. The Washington, D.C.-based U.S. Environmental Protection Agency’s regulation 40CFR, Part 273, now considers back-up batteries and circuit boards inside LED exit signs to be “universal wastes”

because they contain various heavy metals, including lead, mercury, nickel, cadmium and chromium. Universal wastes are not permitted inside municipal landfills and must be directed to a recycler. Recycling of batteries and circuit boards is becoming increasingly controversial because of worker and environmental exposure concerns.

NUCLEAR EXIT SIGNS

Nuclear, or tritium, exit signs do not use electricity. The easy-to-install signs are typically used in applications where high-visibility exit signs are not desirable, such as theaters and

concert halls. The signs require minimal maintenance, which includes cleaning the sign face and monitoring the expiration date.

Usually specified as self-luminous exit signs on lighting schedules, the signs are energized from the radioactive decay of a hydrogen isotope to helium. This process emits beta particles that energize a phosphorus coating inside the tubes that form the letter and arrow symbols. Although the amount of radioactivity associated with each exit sign is small, these signs still must be handled as prescribed by the U.S. Nuclear Regulatory Commission, Washington. Because these exit signs require

EXIT - SIGN COMPARISON

	LIGHT-EMITTING DIODE	NUCLEAR, OR TRITIUM	PHOTO-LUMINESCENT
TECHNOLOGY	<ul style="list-style-type: none"> ▶ “Semiconductor” ▶ Silicon 	<ul style="list-style-type: none"> ▶ “Radioactive” ▶ Hydrogen Isotope 	<ul style="list-style-type: none"> ▶ “Glow in the Dark” ▶ Strontium Oxide Aluminate
SIGN COST RANGE (SINGLE SIDED)	\$30 - \$290	\$175 - \$225	\$50 - \$100
SIGN LIFE	20-25 years	10-20 years	25 years plus
AVERAGE 20-YEAR TOTAL COST OF OWNERSHIP	\$400	\$367	\$216
LEED CREDIT POTENTIAL	Yes	Yes	Yes
SAFETY ISSUES	Operability may be compromised by maintenance requirements	Radioactive material liability during operation and disposal	Failsafe with proper illumination
SUSTAINABILITY ISSUES	<ul style="list-style-type: none"> ▶ Long life ▶ Low energy use ▶ Associated greenhouse gases ▶ Hazardous wastes ▶ High maintenance 	<ul style="list-style-type: none"> ▶ Minimal resource installation ▶ Minimal maintenance ▶ Radioactive ▶ Disposal regulated 	<ul style="list-style-type: none"> ▶ Long life ▶ Nonelectrical ▶ Nontoxic materials ▶ Minimal maintenance ▶ Recyclable

monitoring and disposal procedures, it usually is a good idea to use a 20-year sign though the cost will be \$200 to \$300, depending on single- or double-sided configuration.

At the end of their useful life nuclear exit signs can be recycled in facilities licensed by NRC. Recycling consists mainly of recovering radioactive material for reuse or disposal. The plastic housings and internals of nuclear exit signs typically are not recycled.

PHOTO-LUMINESCENT EXIT SIGNS

Photo-luminescent exit signs have symbols made of a compound of strontium oxide aluminate, a substance regarded as a "nonirritating nuisance dust" by the EPA. Strontium oxide aluminate can store ambient light energy and release the energy as an intense green-yellow glow. It's the same glow-in-the-dark technology used in toys but is brighter and longer lasting.

Photo-luminescent technology can be used in high- and low-level exit signage in lobbies, corridors, hallways, stairwells and parking garages of many buildings. However, as with



other exit-sign technologies, there are important guidelines as specified by the National Fire Protection Association, Quincy, Mass., and other codes. For example, the face of a photo-luminescent exit sign must be illuminated by a suitable charging light source. That charging light source must be energized when the building is occupied. And photo-luminescent exit signs must be located in accordance with their viewing distance, typically 50 or 75 feet (15 or 23 m). Although photo-luminescent exit signs may not be the best option for all exit signs in a building, locations that have at least 5 footcandles of light usually can employ a photo-luminescent exit sign.

Specification-grade photo-luminescent exit signs initially can cost somewhat more than low-end LED exit signs but 40 to 60 percent less when considering engineering, installation and circuit-testing costs for LEDs. Operating costs

also are minimal; photo-luminescent exit signs require no power, no batteries or bulbs, and no monthly and annual testing procedures. Additionally, photo-luminescent exit signs have no components that can burn out and are rated by Northbrook, Ill.-based Underwriters Laboratories Inc. for 25-year life spans.

Finally, many photo-luminescent exit signs are made of recycled aluminum or steel that can be recycled again at decommissioning/disposal. Strontium oxide aluminate can be removed and has no disposal restrictions though currently it's not reusable.

CHECK THE EXITS

Exit signs can be some of the most important life-safety equipment in a building. The next time you are reviewing a project's schedule of lighting fixtures, check out the exit-sign specifications to ensure your project is getting a cost-effective, sustainable exit-sign technology. ♻️

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