The Exit-Sign Revolution

Most of the United States' 100 million electrically powered exit signs use between 2 and 40 watts of power, and contain batteries and circuit boards that are now recognized as hazardous universal wastes by the Washington, D.C.-based U.S. Environmental Protection Agency (EPA). An increasing number of new buildings and renovation projects are now incorporating photoluminescent exit signs that are powered from nearby area lighting and constructed of non-hazardous recyclable materials.

Progressive building owners choosing to focus on energy-efficient and sustainable products are paying more attention to the types of exit signs in their facilities when considering their lighting-fixture schedules. From a green perspective, they know that the most popular fixture may not be the best choice.

Today, well over 90 percent of the exit signs being installed in new facilities employ the use of LED (light-emitting diode) technology, using lamps with 2 to 5 watts of power that have an expected service life of 20 to 25 years. Compare these numbers to the popular exit signs of the 1970s and 1980s (they used 20- to 40-watt incandescent and compact-fluorescent lamps with service lives of months, not years) and it's easy to see how the current emphasis on LED exit signs has evolved.

Although they are a giant step forward with respect to energy conservation and lamp life, LED exit signs can have adverse safety, efficiency, and sustainability issues when compared to another evolving technology - the non-electrical, photoluminescent exit sign.

Not to be confused with industrial-looking radioluminescent tritium exit signs that glow from the radioactive decay of hydrogen to helium, photoluminescent (PL) exit signs use a non-toxic, non-radioactive compound of strontium oxide aluminate to store ambient light energy and, when the light is removed, to release the stored energy as an intense green/yellow glow. It's the same "glow-in-the-dark" technology used in toys and other curios, but with a radiance that is much brighter and longer lasting.

Glow Safely

PL exit signs and systems have been marketed since the early 1990s, primarily for low-level exit systems. However, with the advent of more effective glow-in-the-dark compounds, PL exit signs are now UL Listed and accepted by the Quincy, MA-based National Fire Protection Association for both high- and low-level exit sign applications. The UL and NFPA recognize that, as long as

Key Concepts

- Tritium, LED, and photoluminescent exit signs all have pros and cons.
- Photoluminescent technology is an excellent choice for many exit-sign applications, but there are important guidelines that should be followed.
- With escalating construction and operational costs, the savings that photoluminescent technology can provide (even over LED exit signs) are increasingly attractive to building operators.
- LED exit signs and other electrically based technologies rely on emergency generators, battery back-ups, and light bulbs - all of which can fail during an emergency.

nearby lighting is on a few minutes before an emergency occurs, PL exit signs are almost always failsafe.

New York City went a step further last year and passed *Local Law 26*, requiring installation of PL exit signs and marker systems in many new and existing high-rise office buildings. This extraordinary measure is a result of studies about the World Trade Center events of 9/11, which confirmed that building occupants exited faster and safer in areas that were outfitted with PL technology. LEDs and other electrically based technologies rely on emergency generators, battery back-ups, and light bulbs - all of which can (and, unfortunately, do) fail during emergencies.

Glow Wisely
PL technology is an excellent choice for many exit-sign applications, but there are important guidelines that are specified by the NFPA:

1. The face of a PL exit sign is illuminated by a suitable charging light source.
2. The charging light source is controlled by authorized personnel and energized when the building is occupied.
3. Signs are located in accordance with their viewing distance (typically 50 or 75 feet).

Knowledgeable architects and engineers understand these and other guidelines, and know how to design lighting systems to work synergistically with PL exit signs. Typically, PL exit signs need to be within 8 to 10 feet of a charging light fixture. Consequently, PL exit signs are excellent choices for the high- and low-level exit signage in the lobbies, corridors, hallways, stairwells, and parking garages of many buildings.

Glow Efficiently
On a sign-in-the-box basis, architecturally attractive PL exit signs appear to cost more than lower-end LED exit signs; after factoring in the costs of installing and testing the signs, however, PL exit signs are considerably less expensive than nearly all LED exit signs (at least 40-percent less). Since PL exit signs work off of area lighting, there are *no* electrical connections to engineer, install, or test, so the cost of installation is usually the cost of the sign and the cost of a tradesman (usually not an electrician) to spend 5 to 10 minutes affixing the sign to the building wall or ceiling.

The operating costs of a PL exit sign are also significantly less than an LED exit sign since there are no power costs, no batteries or lamps to replace, and no monthly and/or annual testing procedures. PL exit-sign maintenance typically consists of verifying that charging lights are operational and performing periodic wipe-downs with a damp cloth.

With escalating construction and operational costs, these savings are increasingly attractive to building owners and operators. Case in point: One large condominium community in San Diego is realizing savings of $18,500 annually by using PL exit signs instead of LED exit signs in 70 percent of its exit-sign locations.

Glow Green
As sustainable design in the commercial buildings industry becomes more prevalent, PL exit signs can be the clear choice over radioactive tritium signs and electrically powered LED signs. Non-radioactive, non-toxic, non-hazardous, non-electrical, and recyclable, PL exit signs are a “green-dream” product.

The radioactive nature of tritium exit signs increasingly precludes their use in many locations, including grade schools, college campuses, and corporate facilities. The United States Department of Defense's Unified Facilities Criteria specifically prohibits tritium exit signs in military facilities.

Regulated by the U.S. Nuclear Regulatory Commission (NRC), owners of tritium exit signs must notify the NRC if a sign is damaged or goes missing. Expressly prohibited from landfills, tritium exit-sign owners must also notify the NRC when a sign is decommissioned and sent to a nuclear-waste facility. Proper disposal typically costs about $75 per sign.

Despite their long lives, LED exit signs may not be considered as sustainable as photoluminescent exit signs for three reasons:

1. Contribution to greenhouse-gas inventory. Although 3 to 5 watts per sign is low compared to other electrically powered exit signs, it adds up when there are well over 100 million exit signs in the United States that are using about 35 megawatts of electricity, according to the U.S. EPA's ENERGY STAR®. If all of these signs were converted to LED technology tomorrow, it would still take nearly 5 megawatts of electricity to power them. Assuming that this electricity is produced from fossil fuels, over 11,000 metric tons of carbon equivalents in greenhouse gases would continue to be released into the environment annually, according to the Washington, D.C.-based Nuclear Energy Institute.

2. Hazardous chemicals are used during fabrication processes. The housings of many exit signs are PVC, which is associated with chlorinated dioxins and other extremely hazardous and long-lived pollutants. The fabrication of the circuit boards used in LED exit signs also involves environmentally unfriendly chemicals, including methyl ethyl ketone, hydrochloric acid, and sulfuric acid.

3. Circuit boards and batteries are hazardous wastes. Federal regulations *(EPA 40 CFR Part 273)* now consider the back-up batteries inside many LED exit signs to be a universal waste because they contain various heavy metals. In some states (such as California), the circuit boards inside LED exit signs are also a universal waste since they contain lead, chromium, cadmium, and (sometimes) mercury. Universal wastes are not permitted inside municipal landfills and must be directed to a recycler.

Several companies make high-quality photoluminescent exit signs. Make sure that you specify an exit sign that is *UL 924* Listed, and install it per *NFPA 101* and local codes.