

LEED and Photoluminescent Exit Signs- Glow in the Dark goes Green

By installing Photoluminescent [Glow-in-the-Dark] Exit Signs instead of LED or Tritium Exit Signs, LEED Building Projects may be able to gain points in the Energy and Atmosphere, Materials and Resources or Innovation in Design credits, and benefit from a safer, less expensive and truly sustainable technology. Here's a quick overview.



LEED Certification for Building Projects is Gathering Industry Momentum

Owners, developers, architects and engineers involved in new office, residential, educational, hotel, retail and other projects are giving higher priority to a “Green” approach. Green building practices focus on improving the environmental impacts of building construction and operations as well as reducing facility ownership costs and enhancing occupant productivity, health and safety.

LEED [Leadership in Energy and Environmental Design] is becoming the standard for green building design. Consequently, numerous organizations are now mandating LEED in their building projects, i.e. State of California, City of Salt Lake, Bank of America, Ford and the World Trade Center.

The LEED Green Building Rating System evaluates a building's environmental performance over its life cycle – providing a definitive standard for what truly constitutes a “green” building.

The rating system is organized into 5 credit categories:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design Process

Points in each credit category are earned for satisfying criterion targeted to address specific environmental impacts inherent in the design, construction and operation/maintenance of buildings.

To earn LEED certification, an applicant project must incorporate basic green building prerequisites and, per the following schedule, capture points awarded for satisfying additional performance standards.

Certified	26-32 points
Silver	33-38 points
Gold	39-51 points
Platinum	52-69 points

Common Exit Sign Technologies in Building Facilities

Nearly every building type, except single family dwellings, requires exit signs to mark emergency egress routes. Building owners, architects and engineers typically choose between three different exit sign technologies:

- LED [light emitting diode]
- Tritium [radioactive]
- Photoluminescent [glow-in-the-dark]

Increasingly, green building projects are installing Photo-luminescent Exit Signs because they do not have the environmental drawbacks of LED and Tritium exit signs.

Electrically powered LED exit signs are by far the most popular exit sign technology used in today's building industry due to their low energy draw [2 – 5 watts] and stylish looks. However, LED exit signs contain battery and circuit/light board components that must be periodically replaced and are considered hazardous wastes due to heavy metals. Additionally, the fabrication process of most LED exit signs involves toxic chemicals associated with plastics, printed circuit boards and transistors. LED exit signs also use electricity which, depending upon the generation source, can contribute to greenhouse gas emissions, acid rain and radioactive wastes.

Tritium exit signs are lit from the radioactive decay of a hydrogen isotope to helium. This process emits electrons which energize a phosphorus coating inside the tubes that form the symbols on the signs. Although the amount of radioactivity associated with each exit sign is small, these signs must still be handled as regulated by the Nuclear Regulatory Agency. Because of their inherent environmental liability and short lifespan [most tritium exit signs have a 10 year life], Tritium exit signs are banned in many locations, including all US Department of Defense facilities, most schools and many corporation buildings.

NFPA compliant, UL and Energy Star listed, and rated "Best Available Technology" for an exit sign by the US Department of Energy, non-electrical Photo-luminescent Exit Signs are typically a metal faceplate with letters and symbols stenciled in a non-toxic, non-radioactive compound of strontium oxide aluminate. The strontium compound letters and symbols store ambient light energy during normal conditions, and then when the light is extinguished [i.e. in an emergency], the letters glow brightly as the compound releases the stored energy as an intense green-yellow color. 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.

Photo-luminescent exit signs need to be engineered into a building's lighting plan so that they are properly illuminated when the building is occupied. Therefore Photo-luminescent exit signs may not be the best option for all exit sign locations in a building, however most locations in a building requiring an exit sign can usually employ a photo-luminescent exit sign if adjacent lighting fixture type and location are designed accordingly. Suitably installed, photo-luminescent exit signs are a safer, less expensive and more sustainable alternative to LED and tritium exit signs.

Photoluminescent Exit Signs and LEED Credits

From a green perspective, Photoluminescent Exit Signs are a highly sustainable product that can directly contribute toward securing points in the following LEED Credits:

- EA Credit #1 – Energy and Atmosphere: Optimizing Energy Performance.
- MR Credit #4 – Materials and Resources: Recycled Content.
- ID Credit #1.1 – Innovation in Design: Exceptional Performance

LEED will not award an Innovation in Design Credit point for the use of a particular product if the technology aids in achievement of another LEED credit, so the facility design team needs to make a decision on where the most impact is, and subsequently pursue the appropriate credit(s).

Here is a summary on how Photoluminescent Exit signs can assist toward obtaining points in these credits:

EA Credit #1 – Energy and Atmosphere: Optimizing Energy Performance.

To qualify for this LEED V2.2 Credit [worth up to 10 points] a building project must demonstrate improvement in the proposed building energy performance compared to a baseline criteria specified in ASHRAE/IESNA Standard 90.1, or comply with prescriptive measures of ASHRAE 'Advanced Energy Design Guide for Small Office Buildings', or comply with the 'Basis Criteria and Prescriptive Measures' of the Advanced Buildings Benchmark.

More points are awarded to building projects using less energy than "baseline" guidelines prescribed by ASHRAE or the Advanced Buildings Benchmark.

With respect to exit signs, these guidelines are formulated on the basis of installing modern LED exit signs which pull about 5 watts of power. Although the impact of a few exit signs using 5 watts is not significant, larger facilities can employ thousands of exit signs in high and low applications. Recognizing that electrically powered exit signs must be energized 24 hours/day x 365 days/year, a typical large building project with 500 LED exit signs, each using 5 watts of power, burns nearly 22,000 kwh of electricity annually, costing about \$3000 at \$.14/kwh.

Since Photoluminescent Exit Signs are charged from nearby area lighting and require no direct power, there is no related electricity cost. Consequently, Photoluminescent Exit Signs will positively contribute to the calculations that determine the energy efficiency of a building project. Depending upon the number of exit signs in your project, this additional energy savings can be significant in obtaining points toward EA Credit #1.

MR Credit #4 – Materials and Resources

This credit requires that 10% of the dollar value of permanently installed project materials consist of recycled content. The recycled content value of a material is determined by its adjusted recycled weight [=100% post consumer component weight + 50% pre-consumer component weight] multiplied by the total dollar value of the assembly. Since many types of photo-luminescent exit signs are made primarily of metal with a high recycled content, these exit signs will contribute handsomely toward this credit.

As an example, for a typical \$95 aluminum wall mount Photoluminescent Exit Sign that weighs 12.8 ounces:
Post-consumer recycled content component weight = 5.9 ounces
Pre-consumer recycled content component weight = 2.5 ounces
Non-recycled component weight = 4.4 ounces

Recycled content value = [100% x [5.9/12.8 + .5 x 2.5/12.8]] x \$95
Of one exit sign = \$53

ID Credit #1 – Innovation in Design: Significant Environmental Benefits

There are two avenues available to obtain Innovation in Design points. Using Photoluminescent Exit Signs works best with the avenue whereby the project team demonstrates a comprehensive approach toward employing a product or technology that has significant environmental benefits not addressed or credited in other LEED categories.

The comprehensive approach targets optimizing the benefits and tradeoffs of an innovation proposal throughout its lifecycle phases: design, procurement, construction, operational and decommissioning. The advantages of Photoluminescent Exit signs span all the lifecycle phases with the following environmental benefits:

- **Fewer Building Materials Required** – Reducing activities that pollute air and water, destroy natural habitats and deplete natural resources. Photoluminescent Exit Signs are not electrically powered and therefore do not require the associated metal conduit, wiring and switching equipment that LED exit signs need.
- **Energy Efficient** – Reducing Emissions of Global Warming Ingredients. Photoluminescent Exit Signs operate on nearby ambient light and are not direct users of electricity like LED exit signs. Therefore, the project will enjoy energy savings, and depending upon the generation source, a corresponding reduction in greenhouse gas emissions, acid rain and radioactive waste.
- **No Radioactivity**. Photoluminescent Exit Signs do not contain radioactive material like tritium exit signs. This author's opinion is that building products that contain radioactive material have no place in any facility when there are better, sustainable technologies and they sure the heck should not be in LEED certified facilities.

- High Percentage of Recycled and Recyclable Materials. Many Photoluminescent Exit signs are made of recycled aluminum or steel which can be recycled again at decommissioning/disposal. A few components on an LED exit sign can be recycled including batteries, circuit boards and possibly some metal parts. Recycling Tritium exit signs can be done only in facilities licensed by the NRC and consists mainly of recovering radioactive material for reuse or disposal. The plastic housings and internals of tritium exit signs are typically not recycled.
- No Hazardous Materials or Wastes: Photoluminescent Exit Signs contain no toxic or hazardous materials and are not regulated in any way. Both LED and Tritium exit signs contain hazardous materials whose disposal is regulated. Specifically:
 - LED exit signs have printed circuit boards [always] and battery back-up packs [usually]. These are now considered "universal wastes" by the EPA and are not permitted in municipal landfills.
 - Tritium exit signs are radioactive and mandated by the Nuclear Regulatory Agency to be routed to a licensed recycle/disposal facility when they expire
- Longer Lifespan. High quality photo-luminescent exit signs are rated for a minimum 25 year life span. This is considerably longer than most LED and Tritium exit signs. LED exit sign batteries must be replaced every 3-4 years and their light bars are nominally rated for 50,000 – 70,000 hours [6 – 8 years]. Tritium exit signs are rated for 10, 15 and 20 years but few signs over 10 years are used due to their high cost.
- Less Maintenance. Photo-luminescent Exit Signs require far less maintenance attention than LED exit signs. Most building codes require that LED exit signs and their backup power supplies be tested monthly and annually - a manpower intensive activity periodically requiring change-out of parts. Photo-luminescent exit signs have no parts to replace and maintenance consists of dusting and verifying proper operation of nearby charging lights.

To determine if your project may benefit from an ID point for installing Photo-luminescent exit signs, it's a good idea to submit a Credit Interpretation Request [CIR] to LEED. Make sure to detail the engineering approach and to stress lifecycle benefits.

Make Your Building Safer and Less Expensive and Get a LEED Point

Exit Signs are critically important life safety equipment during emergencies. Incidents like the 911 World Trade Center disasters and the 2005 Los Angeles black-out demonstrate that Photoluminescent Exit Signs are the safest, most effective exit sign on the market. This is because, during emergencies, Photoluminescent Exit Signs do not depend on emergency generators, batteries or light bulbs – all of which can, and unfortunately do fail. As long as nearby lighting is on for a few minutes before a black-out emergency, Photoluminescent Exit Signs are failsafe and capably lead building occupants to safety.

Photoluminescent Exit Signs are also less expensive to install, operate and maintain than LED and Tritium Exit Signs – up to 80% less expensive over a 10 year period.

Since 2001, Photoluminescent Exit Signs have been code legal for both high and low applications. Consider them for your next project for a safer, less expensive and sustainable facility and to contribute toward securing LEED points.

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Michael O'Connell is a sales engineer/LEED AP for Active Safety, helping owners, developers, architects and engineers to better understand the benefits and logistics of installing photoluminescent exit signs and egress systems. Contact him at email: moconnell@activesafety.com or by telephone (858) 254 8234.