



## EXIT SIGN TECHNOLOGY COMPARISON

Exit signs are an integral component of any building's life safety system. Stairwells and exit doors, as well as the pathways to them, must clearly be marked at all times.

Exit signs must meet a variety of criteria: attractiveness, cost-effectiveness, reliability, durability and vandalism resistance. Below is a brief analysis of the competing exit sign technologies, including incandescence, compact fluorescence, LED, tritium, and photoluminescence.

### Electrically Powered

According to the EPA, "There are more than 100 million exit signs in use throughout the U.S. Typically lit by incandescent bulbs, these signs consume 30-35 billion kilowatt hours (kWh) hours of energy each year." This equates to approximately \$2.8 billion in electricity each year as well as significant environmental impact.

However the issues with electrically powering an exit sign go beyond cost and pollution: the dependability of the electrical supply and the real world reliability of the electrical device itself must be examined. Electrical signs rely on generator or battery backup systems to work in the case of a power failure. Generators are far from 100% reliable and battery backups are typically rated for only 90 minutes. Since inspection and maintenance on both the signs and backup systems are expensive, building owners often fail to keep their systems properly maintained, resulting in failures during emergencies which puts human life at risk. The electrical devices themselves also fail regularly due to burned out bulbs, shock such as an earthquake or explosion, or vandalism.

### Incandescent

The brightly lit exit signs with red letters which we are so familiar with have generally been incandescent. Incandescent signs can be highly attractive and are very bright. This comes at a significant cost, however. Incandescent exit signs, especially those not Energy Star approved, are the most expensive exit signs, with high installation costs and regular maintenance and inspection costs; they also have the highest annual electricity consumption, at least \$21 per sign. Costs over ten years range from \$285 to \$790 per incandescent exit sign. Unfortunately, this expense does not relate to safety for occupants, as they place a heavy load on battery backups and are the most prone to shock and vandalism damage.

### Compact Fluorescent

Compact fluorescent signs share a similar profile to incandescent signs, and so are highly attractive. Being electrically based, they share the same ongoing costs of regular maintenance and inspection, although electricity consumption is generally lower; the ten year cost of ownership for compact fluorescent exit signs ranges from \$320 to \$432. Compact fluorescent signs share the other problems of incandescent signs – they are not 100% reliable in emergencies, are prone to vandalism, and are apt to be poorly maintained. Worse, however, is that mercury, a potent neurotoxin, is a component of each compact fluorescent bulb, creating health and safety problems as well as costly waste management issues since bulbs must be properly disposed of by following hazardous materials guidelines.

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<sup>1</sup> [http://www.energystar.gov/index.cfm?c=exit\\_signs.pr\\_exit\\_signs](http://www.energystar.gov/index.cfm?c=exit_signs.pr_exit_signs)

## **LED**

LED signs tend to be quite attractive as well, although they do not luminesce as brightly as do the preceding technologies. They too require electricity, although electrical usage of LED signs is significantly lower than either incandescent or compact fluorescent. They also have regular maintenance and inspection issues. Ten-year cost of ownership on LED signs is significantly lower, ranging from \$52 to \$331. LED exit signs themselves require less maintenance than other electrically powered exit signs, although the costs for maintaining a backup power system remain the same. They remain vulnerable to vandalism, poor maintenance, and failure in emergencies.

## **Self Powered**

### **Tritium**

Tritium exit signs self-luminate through the slow-decay of tritium, a radioactive isotope. They are not as bright as electrically powered technologies. Tritium signs are not electrically powered and so are both more cost effective and more reliable in emergencies, although they do require regular inspection. Ten year cost of ownership for a tritium sign ranges from \$180 to \$300. However, due to tritium's radioactive nature, vandalism or other shocks to the sign could release the radiation and pose a health hazard. Tritium signs also have a significant hidden cost of safe disposal since tritium must be properly disposed of in a radioactive waste repository.

## **Externally Powered**

### **Photoluminescent**

Photoluminescent exit signs are non-radioactive and require no electricity, absorbing light during normal conditions and immediately becoming visible in the darkness. Photoluminescent signs are not as bright as electrically powered signs but are clearly visible for many hours in complete darkness. Also, the thin profile of photoluminescent materials allows them to cater to almost any application, many of which are impossible for competing technologies. Specialized printing procedures produce unique and elegant effects. Combining this flexibility with innovative architecturally-based design produces a line of life safety products that meet any aesthetic requirement. Since they are not prone to failure, photoluminescent signs do not require maintenance; ten-year cost of ownership for a photoluminescent sign is \$90. They are extremely durable and vandal-resistant – a shock that would destroy a competing exit sign will not harm a photoluminescent sign. Photoluminescent materials work under all conditions and are immune to catastrophic events such as earthquakes. Photoluminescent exit signs are the only signs approved for low-location installation at knee-height on an exit door since other signs would quickly be destroyed at that level, making photoluminescent exit signs the only type of exit sign approved for low-location installation in New York City and other municipalities.

Take, for example, an existing 10-storey building with two stairwells. This building would have at least six traditional exit signs per floor, one at each stairwell and four to point the direction to the exit stairwell. Annually each incandescent exit sign costs an average of \$28 in electricity, for a total annual electricity cost of \$1680. With a list price of \$80 per Lunaplast Energy Star approved UL924 exit sign, a retrofit of existing traditional exit signs would cost \$4800. In electricity costs alone, not to mention inspection, maintenance and other costs, the entire retrofit using these high quality photoluminescent signs would be paid for in just a little less than three years. Not only is this retrofit extremely cost-effective, but the new system would be completely failsafe and provide safe exit for occupants during emergencies.

Luna Technologies International, Inc. produces a line of high-quality, cost-effective photoluminescent exit signs as a vital component of a complete life safety system.

The chart below indicates the comparative strengths and weaknesses of the different types of exit sign technology.

## Exit Sign Technology Comparison

| Type   | Incandescent  | Compact Fluorescent | LED          | Tritium           | Photoluminescent |
|--|---------------|---------------------|--------------|-------------------|------------------|
| <b>Fixture Cost<sup>1</sup></b>                                    | \$20 - \$100  | \$175 - \$200       | \$30 - \$250 | \$180 - \$300     | \$80             |
| <b>Hourly Wattage per Sign<sup>1</sup></b>                         | 30-50         | 10-16               | 1-3          | 0                 | 0                |
| <b>Annual Electrical Usage<sup>1,2</sup></b>                       | \$21- \$35    | \$7 - \$11          | \$0.70 - \$2 | None              | None             |
| <b>Ten-Year Electrical Usage<sup>1</sup></b>                       | \$210 - \$350 | \$70 - \$112        | \$7 - \$21   | None              | None             |
| <b>Cost of Lamp Replacement over 10 Years<sup>1</sup></b>          | \$40 - \$280  | \$60                | 0            | 0                 | 0                |
| <b>Inspection, maintenance and Labor over 10 years<sup>3</sup></b> | \$15 - \$60   | \$15 - \$60         | \$15 - \$60  | 0                 | 0                |
| <b>Total Cost over 10 Years</b>                                    | \$285 - \$790 | \$320 - \$432       | \$52 - \$331 | \$180 - \$300     | \$80             |
| <b>Durability<sup>4</sup></b>                                      | Low           | Low                 | Low          | Low               | High             |
| <b>Electrical Backup Required<sup>5</sup></b>                      | Yes           | Yes                 | Yes          | No                | No               |
| <b>Special Disposal Costs</b>                                      | None          | High <sup>7</sup>   | None         | High <sup>8</sup> | None             |
| <b>Low-location Installation<sup>6</sup></b>                       | No            | No                  | No           | No                | Yes              |
| <b>Aesthetics</b>  | High          | High                | High         | Medium            | Medium to High   |
| <b>Overall Value</b>   | Low           | Low                 | Medium       | Low               | High             |

1. Data comes from INFORM, an independent research organization focused on the relationship between business practices, environment, and human health ([http://www.informinc.org/fact\\_P3exit\\_signs.php](http://www.informinc.org/fact_P3exit_signs.php)).
2. The average cost per kilowatt hour for commercial and residential properties in the United States for 2002 is \$0.0816. For the purposes of this analysis, an average of \$0.08 per kilowatt hour is assumed. Further details may be found at <http://www.eia.doe.gov/cneaf/electricity/esr/table1.xls>.
3. NFPA 101, the Life Safety Code, mandates monthly inspection of exit signs, as well as a yearly inspection of the exit sign and backup system by taking the exit sign off the main power for at least 90 minutes. Annual costs for these inspections range from \$15 to \$60 per exit sign. For further information see: <http://www.lrc.rpi.edu/researchTopics/applicationsDesign/pdf/exitSR.pdf>
4. Durability is indicated by the product's ability to withstand vandalism and shocks such as earthquakes.
5. Electrical backup is required for the continued use of the sign, a liability in emergencies in blackout and backup batteries or generators also fail or exceed their length of fuel.
6. The sign in question may be installed at a knee-height on an exit door, complying with New York City and other building codes for low-location egress indication.
7. Compact fluorescent bulbs contain high quantities of mercury, a potent neurotoxin, and must be disposed of properly, following hazardous materials regulations.
8. Unregulated exposure to tritium can cause serious health concerns since tritium is a radioactive isotope. Accordingly, Tritium must be disposed of properly in an appropriate radioactive waste depository at high costs.