

# LED Exit Signs

## Introduction

Exit signs are used to show occupants within a facility the locations within a building where they can exit in case of a fire or other emergency. Exit signs are a perfect application for the use of Light Emitting Diodes (LED's), which are excellent for exit sign illumination. LED's are made of a semiconductor material in which light is produced when an electron within the semiconductor material travels from a high-energy state to a low-energy state. This process will release a photon at the appropriate frequency to produce visible light. This process of light production produces relatively low amounts of heat and the majority of that energy goes into producing visible light. In many lighting applications, LED's are not adequate devices in all the applications to which they are used, however, the low amount of light emitted from LED's suits exit sign applications very well. LED exit signs can be found with low input wattages of two watts or less, compared to 40 watts for an incandescent exit sign. Although the savings in energy consumption seems rather miniscule compared to other lighting sources, it is important to realize that exit signs run constantly.

## Background

Although exit signs do not seem like a major power consumption device, they could actually contribute a large portion of wasted energy due to the fact that they are required to be "on" for twenty four hours per day and seven days a week. Any type of electronic equipment which is operating this often could have the potential for energy savings, which is great incentive for both businesses and facilities that still use expensive incandescent or fluorescent light bulbs. LED exit signs provide numerous benefits over their more wasteful counterparts in the form of energy savings, financial savings, lifespan of bulb, and ease of replacement. Table 1 shows the potential savings along with the presumed payback period associated with switching from either a fluorescent or incandescent exit sign to an LED exit sign (Note: initial cost for fluorescent and incandescent lighting consists of the replacement bulb only and assumed that the fixture is already in place):

**Table 1: Exit Sign Technology Comparison and Payback**

<u>Lighting Technology</u>	<u>Annual Energy Use</u>	<u>Annual Energy Cost</u>	<u>Lamp Lifetime</u>	<u>Annual CO2 Pollution</u>	<u>Initial Cost</u>
LED	44 kWh	\$4.00	10+ years	72 pounds	\$15.00
Fluorescent	140 kWh	\$11.00	10.8 months	230 pounds	\$5.00
Incandescent	350 kWh	\$28.00	2.8 months	574 pounds	\$1.00
	Fluorescent to LED:	<b>1.43</b>	<b>years</b>		
Payback:	Incandescent to LED:	<b>0.54</b>	<b>years</b>		

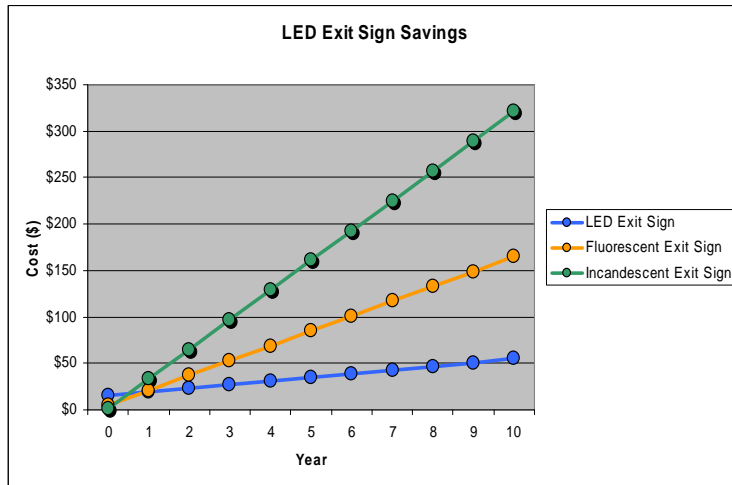
## Case Study

A simple case study was completed to show both the energy savings and payback period associated with changing preexisting incandescent or fluorescent exit signs with more efficient LED exit signs. An administration building was audited and it was found that there are a total of 18 incandescent exit signs currently used at the location. If all of these incandescent exit signs are replaced it would require an initial cost of:  $\$15 * 18 = \$270$  which is a fairly inexpensive change but may also require some cost of labor as well which is going to be assumed to be approximately equal to the labor saved through not having to change the bulbs nearly as often. Thus, the net labor for this case study is assumed equal and because of this negligible. The savings in energy in a given year would be:  $(350kWh - 44kWh) * 18 = 5508kWh / yr$ , if you then take these energy savings at 10 cents per kWh you would see that the annual savings would be:  $\$.10 / kWh * 5508kWh / yr = \$550.80 / yr$ . In order to obtain the simple payback of this problem you would divide the savings per year by the initial costs:  $\$270 / \$550.80 = .49 years$  or that the installation of LED exit signs to replace the current incandescent ones would pay for itself within six months. As this example shows, the savings in energy costs make the installation of LED exit signs well worth the initial investment. Also, the bulbs within an LED exit sign will last

approximately 10 years while the bulbs within an incandescent exit sign will last approximately 3 months.

### Economic Summary

Figure 1 shows (in time versus costs) a financial comparison of each different type of bulbs over the lifespan of a typical LED exit sign:



**Figure 1: Financial Savings over the Lifespan of an LED Exit Sign (10 Years)**

Standard LED exit signs are readily available at most major lighting companies and online directories, making them just as easy to purchase as either an incandescent or a fluorescent exit sign.

### Other Advantages

LED exit signs also have other features which would make them preferable to incandescent or fluorescent exit signs. Battery backup for exit signs is required in order to comply with standard building codes. Although a battery backup system would be available for most bulb types, the battery backup for an LED exit sign would be substantially easier to implement. This is due to the low power consumption of LED's, which would allow for lower voltage backup batteries to be used rather than the larger and more expensive backup batteries used for the incandescent and fluorescent bulbs. LED exit signs are also known for being economically safer than their counterparts. This is due to the fact that LED's tend to be brighter than most other bulb types but also

because of the greater contrast with the background from the monochromatic nature of the light emitted from an LED exit sign.

### References

#### Figures and Tables

Table 1: Exit Sign Technology Comparison and Payback.

From Inform (2003)

Figure 1: Financial Savings over the Lifespan of an LED Exit Sign (10 Years From Rowan University Clean Energy Team (2006)

#### Additional Information

US Department of Energy, "How to Buy an Energy Efficient Exit Sign" [Online Document]. 2005 [cited 2006 Oct 17].

Available HTTP:

[http://www.eere.energy.gov/femp/procurement/eep\\_exit\\_sign.cfm#efficiency](http://www.eere.energy.gov/femp/procurement/eep_exit_sign.cfm#efficiency)

H D Lighting, "Standard AC Operation Exit Light" [Online Document] 2004 [cited 2006 Oct 15]. Available HTTP: <http://www.hdlighting.com/ProductInfo.aspx?productid=20-10>

Energy Star, "Save Energy, Money and Prevent Pollution with Light-Emitting Diode (LED) Exit Signs" [Online Document] [cited 2006 Oct 22]. Available HTTP: [http://www.energystar.gov/ia/business/small\\_business/led\\_exitsigns\\_techsheet.pdf](http://www.energystar.gov/ia/business/small_business/led_exitsigns_techsheet.pdf)

Inform, "Purchasing for Pollution Prevention" [Online Document] 2003 Nov [cited 2006 Oct 17]. Available HTTP: [http://www.informinc.org/fs\\_P3exitsigns.pdf](http://www.informinc.org/fs_P3exitsigns.pdf)