

Proposal Information Template for: **Illuminated Street Address Signs**

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Proposal Information Template – Illuminated Address Numbers

2008 Appliance Efficiency Standards

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Purpose

This document is a report template to be used by researchers who are evaluating proposed changes to the California Energy Commission’s (Commission) appliance efficiency regulations (Title 20, Cal. Code Regs., §§ 1601 – 1608). This report specifically covers illuminated address numbers designed for residential applications.

Background

Illuminated address numbers (or illuminated address signs) are devices utilized by homeowners to more readily identify their address numbers for aesthetic reasons and/or for safety and code compliance reasons in some cities and towns. They are small (often less than one square foot), electrically-powered signs that are either internally or externally lit to aid visitors in locating a residence at night. These signs typically employ incandescent, compact fluorescent (CFL), or light emitting diode (LED) technologies. Many are powered through the ac-ac doorbell transformer. Less commonly, they plug into an outlet, run off of replaceable batteries, or use a small, embedded PV panel for power. Additionally, many of these signs have no power switch which means they are continuously in “on” mode even when illumination is not required during the day. Some illuminated address numbers are equipped with photoswitches, which turn the light source off during the day or when the porch is otherwise lit.

Illuminated address numbers are available in a wide variety of styles, retail prices, and materials. Many provide the customer several options for number color, background color, and finish of metal housing that supports the number panel. Some models also provide user-controllable options for operation of the light source.

Several town, city, and neighborhood ordinances in California mandate that homes and businesses utilize illuminated address numbers to aid safety personnel in finding the correct address in the event of a nighttime emergency. Some of these ordinances provide an exception to this requirement if a front porch light is left on all night.

See below for examples of the models and technologies we encountered.

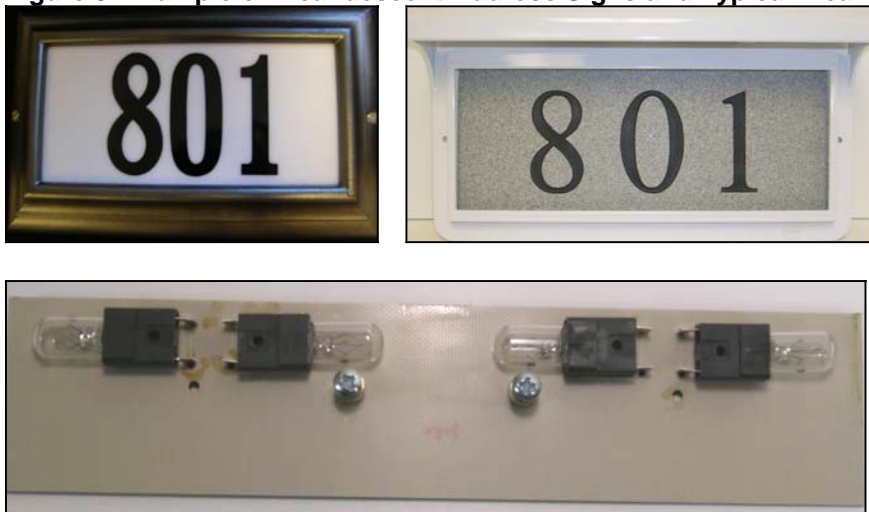
Figure 1. Examples of LED Illuminated Address Signs



Figure 2. Example of a CFL Illuminated Address Sign and CFL Types



Figure 3. Example of Incandescent Address Signs and Typical Incandescent Lamps (14 V Wedge Base)



Overview

Description of Standards Proposal	<p>Illuminated address signs designed for residential use are available with three different light technologies: incandescent, CFL, or LED. The LED models had the least power demand in “on” mode and the lowest annual energy use. Photoswitches that disable address lights during daylight hours or when other light sources like porch lights are turned on can reduce the annual energy use of all illuminated address signs. We therefore recommend that all hard-wired or plug-in illuminated address numbers have an active power limit set at 1.75 W, such that only LED products would qualify at this time. In addition, we recommend requiring that all hard-wired or plug-in illuminated address numbers utilize photoswitches to allow for additional savings by eliminating the unnecessary 24-hour “on” mode. We also recommend a standby power limit of 0.75 W.</p>
California Stock and Sales	<p>We estimate current stock of residential illuminated address signs in California to be between 2.1 million and 2.5 million units, which means that approximately 1 in every 5 homes has an illuminated address sign. These estimates are based on the assumption that between 60% and 80% of newly constructed (post 1997) homes in California have illuminated address numbers, and that 20% of pre-1997 homes have illuminated address numbers.</p> <p>Sales are estimated to be approximately 198,000 per year in California, with an annual growth rate of 7.8%. Sales growth is primarily affected by new construction.</p>
Energy Savings and Demand Reduction	<p>Annual unit energy savings from the proposed standard ranged from 80 – 90% depending on which technology was replaced.</p> <p>We estimate the proposed standard could save California between 62 and 72 GWh per year after the entire stock has been turned over. We estimate peak demand savings of approximately 7 to 8 MW after the entire stock has turned over.</p>

Economic Analysis	<p>Lifecycle costs of illuminated address numbers are derived from retail price, lamp replacement costs (if any), and energy consumed. While the average price for LED products with photoswitches in our dataset is higher than average prices for the incandescent and fluorescent products in our dataset, some of the higher-end incandescent products were actually more expensive than the higher-end LED products. We did not encounter low-end, low-priced LED address signs. Product quality, design and retail prices varied widely, especially within the incandescent products. Given this price and quality variation, the benefit-to-cost ratio was 0.95 when we compared the average lifecycle costs of products that meet the proposed standard to the weighted average of all products that do not meet the proposed standard.</p> <p>Net present value of lifetime energy savings from the proposed standard ranged from \$40 to \$100 per unit. Retail price for products that meet the proposed standard ranged from \$41 to \$78 more than products that do not meet the standard. Products that do not meet the proposed standard had additional lamp replacement costs that ranged from \$0.70 to \$5.00. Because many illuminated address signs are installed by builders during new construction, this purchase price variance is unlikely to impact homeowners, while the energy and maintenance costs are likely to impact them.</p>
Non-Energy Benefits	Long design lives of LEDs means homeowners will not have to purchase and install replacement incandescent or fluorescent lamps. Photoswitches will further extend product life.
Environmental Impacts	No negative environmental impacts are anticipated.
Acceptance Issues	<p>LED illuminated address signs are available in several styles. Currently, LED models tend to be equivalent in price to higher-end incandescent products, but cost more than lower-end incandescent models. Often illuminated address signs are installed during construction and should have an imperceptible impact on home price. We anticipate few acceptance issues, especially as consumers become more and more familiar with LEDs.</p> <p>Time permitting, a future task of this analysis will be to hold a focus group to assess consumer opinions about conspicuity of LED address signs, compared to incandescent and fluorescent models.</p>
AB 1109 (California Lighting Efficiency and Toxics Reduction Act)	<p>By replacing an incandescent illuminated address number with an LED model, a consumer can expect to save 54 of the 64 kWh (average incandescent annual energy use). This is an 84% reduction in energy use.</p> <p>Annual unit energy savings from the proposed standard range from 80 – 90% depending on the technology being replaced.</p>

Federal Preemption or other Regulatory or Legislative Considerations	<p>No federal preemption issues anticipated.</p> <p>Illuminated address numbers are currently required by several city, town, and neighborhood ordinances; however, these specifications typically do not include technical language. Requirements often use general language such as “must be visible from the road.”</p>
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Methodology

To date, we have measured active and standby (if applicable) power in more than 20 models of illuminated address signs and their associated power supplies, if housed separately from the sign.

For stock estimates, we surveyed several California neighborhoods and counted all illuminated address numbers encountered. We then gathered average home sales price and structure age for all surveyed neighborhoods in order to develop reasonable estimates for product penetration.

Based on our in-person surveys of neighborhoods in California, we assumed a range of 60%-80% for the penetration rate of illuminated address signs in homes built since 1997, and a 20% penetration rate for pre-1997 houses.

Our most conservative current estimates for technology distribution are as follows:

Table 1. Technology Distribution Estimates

Light and Switch Technology Type	% of Total in Product Market
Incandescent, No Switch	39%
Incandescent, Photocell	0%
Fluorescent, No Switch (always on)	5%
Fluorescent, Photocell	9%
Neon Tube	0%
LED, No Switch (always on)	14%
LED, Photocell	14%
Battery Operated	5%
Solar Powered	14%
Total	100%

Analysis and Results

Analysis is currently in process, but illuminated address numbers appear to be a logical and relatively straightforward product to target for efficiency regulations—especially given the goals of AB 1109.

See Table 2 for a summary of our power measurements and annual energy estimates to date.

Table 2. Power Measurements and Annual Energy Use Estimates

Technology	Average “on” mode power (W)	Average “standby” power (if applicable) (W)	Estimated Annual Energy Use (kWh)
Incandescent (always on)	7.4	NA	64.5
Fluorescent (always on)	12.8	NA	112
Fluorescent (photoswitch)	13	0.6	50
LED (always on)	1.2	NA	10.4
LED (photoswitch)	1.5	0.9*	10.0

* “Standby” power for LED models ranged from 0.75 W to 1.1 W

Recommendations

We recommend that all hard-wired or plug-in illuminated address numbers have a maximum power limit set at 1.75 W, such that only LED products (or future products that would draw equal or less power than LED products) would qualify to meet the standard. In addition, we recommend requiring that all hard-wired or plug-in illuminated address numbers utilize photoswitches to create additional savings by eliminating the unnecessary 24-hour “on” mode. We also recommend a “standby” power limit of 0.75 W.

Bibliography and Other Research

To date, we have been unable to locate published data regarding sales and stock of illuminated address numbers, although national import statistics exist for illuminated signs. In addition to power demand testing in our lab and our surveys of California neighborhoods, we have contacted several manufacturers and retailers of illuminated address signs for assistance in assessing the market. We have also queried staff at LBNL and Energy Solutions for leads on ongoing or existing research activities on this topic.

Appendices

To be available upon completion of study.