

Internally Illuminated Street-Name Signs:



Embracing the Benefits of Light-Emitting Diode (LED) Technology

By Dr. David Green

Although only 25 percent of driving occurs at night, this time is when more than half of traffic fatalities happen – with “inadequate and poorly maintained signs” often cited as a contributing factor.

As a measure to improve night road safety, appearance and convenience, various traffic agencies have used internally illuminated street-name signs for almost three decades. This illuminated signage has been most common in areas with a large winter resident population where there is a significant older demographic that is unfamiliar with the roadways, such as cities in California and Florida.

Now, more and more traffic agencies are considering, or already beginning to use, illuminated street-name signs. It is not hard to understand why. Illuminated street-name signs improve sign visibility and legibility at all distances and in all conditions, reducing the attention required to find street names and giving drivers more time to plan their actions at intersections.

These benefits are especially valuable at wide, high-volume intersections and in tourist areas with a large proportion of visiting drivers. Illuminated street-name signs are also a highly noticeable improvement to road infrastructure that is popular with the public.

Significantly, several demographic and technological trends are also strengthening the case for illuminating overhead street-name signs in the future.

The first trend is the aging population. In the U.S., the proportion of the population over 65 will climb from 13 percent today to over 20 percent by 2020. As we age, the amount of light required to locate an overhead sign and then read it increases dramatically, doubling every 13 years after the age of 20. A person aged 59 needs eight times the amount of light as a 20-year-old. Older drivers also require more time to process information and react appropriately.

In recent years, advancements in retro-reflective sign materials have greatly improved the visibility of roadside signage. With overhead signs, however, very little light from vehicle headlamps is cast upwards; a sign mounted overhead receives approximately 10 percent of the light that a roadside sign receives.

Upcoming revisions to headlamp standards will further reduce the already limited amount of light reaching overhead signs. Historically, U.S. headlamps have cast substantially more light above the horizon than European and Japanese standards. New harmonized standards, which are a compromise between maximizing visibility (U.S. approach) versus minimizing glare (European approach), will reduce overhead illumination by 33 percent.

Anticipating these changes, the 2003 MUTCD Section 2A.08 states “all overhead sign installations should be illuminated unless an engineering study shows that retro-reflection will perform effectively without illumination.”

Fortunately, another trend — new light emitting diode (LED) sign technologies — is making illuminated street-name signs much more practical and affordable than before.

Until very recently, the light source for most internally illuminated street-name signs has been fluorescent tubes. The problem with these older signs is maintenance. Fluorescent tubes are prone to failure and require replacing every one to two years. Fluorescent tubes and ballasts also do not perform in colder climates. Unscheduled maintenance calls to replace light tubes are extremely expensive. As the signs are typically mounted overhead and at larger signalized intersections, it is one of the more dangerous work environments on the roadway.

Despite the compelling safety benefits and the popularity of illuminated signs with the public, many traffic agencies using this older technology find illuminated signs a burden because of their maintenance. Some have gone so far as to remove illuminated street-name signs.

LED technology, however, eliminates these maintenance issues and is rapidly becoming the preferred light source for illuminated signs. LEDs provide maintenance intervals at least 10 times that of fluorescent tubes. White LEDs currently have a lifespan of 50,000 hours, with a mean time between failure far beyond this, so unscheduled maintenance is very seldom needed. They perform well in hot and cold climates (–40°F). Additionally, LEDs are extremely energy efficient and require only a fraction of the power of fluorescent tubes.

The advantages of LED technology have been proven with the widespread use of LED traffic signals. Energy savings of 90 percent, a maintenance interval extended by at least 500 percent, and lower accident risk due to signal failure have made LED traffic signals standard technology in many regions of North America.

There are two types of LED illumination technologies used for internally illuminated street-name signs. One type consists of strips of LEDs that are inserted in place of fluorescent bulbs. This technology uses the same housings that are designed for fluorescent bulbs, so retrofit LED kits can be installed into existing housings in the field, for electricity savings of about 50 percent over fluorescent.

The second LED sign illumination method uses LED edge-lit technology. With LED edge-lit technology, light is emitted in a plane parallel to the sign face from LEDs embedded in the sign

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edge. Light is refracted outwards through the sign material. The latest edge-lit signs, utilizing ultra-bright LEDs and advanced illumination technology, provide exceptionally crisp, uniform illumination of the entire sign surface.

Edge-lit technology has been used in commercial and architectural signage for several years and is well suited for traffic applications. One advantage is the narrow construction. Single-sided or double-sided signs are less than two inches thick, including a built-in power supply. Their slim, low profile construction enables single-sided signs to be attached directly to a traffic signal mast arm—like reflective signs are. Fixing the sign directly to the mast-arm eliminates any moving parts, and does not reduce over height clearances. Double-sided edge-lit signs can be installed using the same hardware as fluorescent signs.

LED edge-lit signs can be constructed utilizing transparent retro-reflective sheeting on the outer panel. Coloured film (green, blue, etc.) is applied to the outside of the sheeting, with the letters cut out to create the sign legend. Using this technique, both the legend and background are illuminated. Both are also retro-reflective, so that in the event of a power failure, the sign will retain its retro-reflective characteristics.

LED edge-lit illumination is extremely energy efficient, about 90 percent better than fluorescents. A six-foot, single-sided LED edge-lit sign can require as little as 15 watts, where a fluorescent sign would typically be about 192 watts and an LED retrofit about 88 watts. Such significant energy savings may qualify for energy grants. As with LED traffic signals, the low wattage also facilitates the option of battery backup power.

Given the increasing need for overhead sign illumination, and the vast improvements in maintenance intervals, energy consumption, and improved ease of mounting, LED edge-lit illuminated signs are poised to become standard hardware for overhead street-name signs.



LED edge-lit sign manufactured by Carmanah Technologies Inc. and installed in the City of Broomfield, CO. Top photo shot during daylight and bottom photo taken at night.

About the Author

Dr. David Green is the Founder of Carmanah Technologies Inc. and currently serves as the company's Manager of Research and Chairman of the Board. Dr. Green is a professional engineer and an acknowledged expert in light emitting diode (LED) technologies.

About Carmanah Technologies Inc.

Carmanah is an award-winning manufacturer of LED (light emitting diode) edge-lit signs and solar-powered LED lighting. The company currently has in excess of 100,000 units installed in 110 countries. For more information, visit www.roadlights.com.

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