Specifier Reports Abstract: Exit Signs

by Robert Davis
The Lighting Research Center

This abstract summarizes Specifier Reports: Exit Signs, *published by the National Lighting Product Information Program (NLPIP) in November 1994 (a revision of the January 1994 publication). The report discusses the different technologies used in energy efficient internally illuminated exit signs and retrofit kits and provides manufacturer-specific performance data for 57 signs and kits from 26 manufacturers.*

ABOUT THE AUTHOR: Robert Davis is Technology Group Leader and Director of the National Lighting Product Information Program of the Lighting Research Center at Rennsselaer Polytechnic Institute, Troy, New York. His current research interests are lighting product testing and evaluation, lighting systems research, lighting codes and standards, and interaction effects. He teaches technology courses in the Institute's Master of Science in Lighting program. He holds B.A.E. and M.S. degrees in architectural engineering from Pennsylvania State University.

Purpose

Most internally illuminated exit signs use incandescent lamps, which consume approximately 24 to 40 watts (W) per sign, or up to 350 kilowatt-hours (kWh) of electricity per year. Exit signs that use more energy-efficient light sources and retrofit kits for converting signs offer the potential for energy savings. However, signs using energy-efficient light sources can vary widely in power characteristics, visibility, and readability. NLPIP produced *Specifier Reports: Exit Signs* to identify performance concerns and help specifiers select products that save energy and can be seen in clear-air and smoke conditions.

Technology overview

Light source technologies. The alternatives to standard incandescent lamps for exit signs include low-wattage incandescent lamps, fluorescent lamps, light emitting diodes (LEDs), electroluminescent panels, and radioluminescent tubes.

Exit sign formats. The method that is used to illuminate the lettering and background of an exit sign determines its format: matrix panel, stencil, or edge-lit. Matrix signs use arrays of small light sources, usually LED's, to form the lettering. In the panel format, a translucent panel diffuses a light source; both the lettering and background are luminous. A stencil sign has an opaque panel that conceals the source; the translucent lettering is luminous. Edge-lit signs feature lettering etched into a glass or plastic panel illuminated through its edge; both the lettering and background are luminous.

Factors affecting visibility and readability. An exit sign may be easily visible, but still not be easily read if, for example, its letters are not uniformly luminous. Factors affecting a sign's visibility include its total luminance, its mounting location, its color scheme, and obstructions and visual distractions, other signs, and glare from other light sources or windows.

A sign's readability is affected by the size and shape of its letters and chevrons (directional indicators pointing to the exit), the uniformity of their luminances, and the contrast in luminances between lettering and the background. The sizes and proportions of lettering are fairly uniform among exit signs because standards are well established; however, the luminances of the letters vary widely among signs.

Luminance contrast between letters and backgrounds also varies widely among signs, and a sign may have a different luminance contrast in a lighted environment than in a dark one. Matrix signs and stencil signs usually have better luminance contrast in dark environments than the other formats because only the lettering of these signs (and not the backgrounds) are luminous.

Methods

NLPIP sent data collection sheets to exit sign and retrofit kit manufacturers, requesting that they submit completed sheets and a product sample for their energy-efficient exit signs and retrofit kits. NLPIP performed three series of evaluations on all the signs and kits received: photometric and electrical performance on line voltage and battery supply; assessments of readability using human subjects; and assessments of visibility in smoke using computer simulations. For testing, NLPIP installed all the retrofit kits in the same model "host", a stencil-format exit sign with a white background that uses incandescent lamps.

NLPIP conducted photometric and electrical testing using a power supply that maintained voltage within 1% of 120 volts. An imaging photometer measured luminances of the sign faces for all the products except the radioluminescent signs,

continued on page 22

Used with permission of Lighting Management and Maintenance.
Copyright 1995, International Association of Lighting Management Companies.

Specifier report,
continued from page 20

which produced luminances too low to measure accurately. For these signs, NLPIP used a spot luminance meter that has much greater sensitivity.

For readability testing, NLPIP placed the signs in a special apparatus that uses mirrors to present the signs as either normal, inverted, reversed, or inverted and reversed. NLPIP measured readability by having 14 human subjects attempt to recognize the orientation of each sign from a distance of 165 ft (50 m). Subjects moved closer to each sign in a dark and a lighted hallway until they could correctly identify the sign's orientation.

NLPIP calculated visibility in smoke using Smoke-SIM™, a computer software package developed by the Lighting Research Center.

Results

Luminance. Of the retrofit kits, all the compact fluorescent and one LED kit had letter luminances greater than the luminance of the host sign. The electroluminance, incandescent, and two LED kits had lower letter luminances than the host sign.

Luminance contrast. For all but two of the 57 signs and kits, the luminance contrast between the background and the lettering was greater than or equal to 0.90.

Readability. In *Specifier Reports: Exit Signs* readability is reported as the number of subjects unable to discern the orientation of the sign from 150 ft (46 m) in a dark corridor. Readability was poorest for the radioluminescent signs.

Visibility in smoke. In *Specifier Reports: Exit Signs* visibility in smoke is reported as the distance in feet at which the luminance of a sign would drop below 0.21 candelas per square meter in uniform, medium gray smoke in a room with no other light. Visibility for the fluorescent products ranged from 21 to 26 ft (6 to 9 m); for LED products visibility ranged from 22 to 33 ft (7 to 10 m); and for electroluminescent products visibility ranged from 11 to 22 ft (3 to 7 m). The luminances of the radioluminescent products were too low for NLPIP to accurately apply the computer calculations. The results should be taken as indicative of relative visibility, rather than absolute visibility, because different types of smoke and different smoke densities will change the critical distances.

For more information about *Specifier Reports: Exit Signs,* and other NLPIP publications, call 518-276-8716. ◆

Performance data are presented for exit signs and retrofit kits from the following manufacturers:

- Beghelli Inc.
- Brownlee Lighting
- Computer Power Inc.
- Dual-Lite
- Energy-Wise Lighting, Inc.
- Enersave Co.
- Flex-Lite, Inc.
- Hetherington Industries, Inc.
- Incon Industries Inc.
- Janmar Lighting
- Kenall
- Lithonia Lighting
- Loctite Luminescent Systems
- Marktek Industries, Inc.
- Mule Emergency Lighting
- OSRAM SYLVANIA
- ProLight
- Radient Illumination, Inc.
- SPL, Inc.
- SRB Technologies
- Standard Enterprises, Inc.
- Teron Lighting Co.
- TLS Mfg., Inc.
- Trace Lite Corporation
- USI Prescolite