

Technology Specification Project: LEDs for Refrigerated Display Cases

The U.S. Department of Energy (DOE) and members of a Retailer Energy Alliance (REA) Project Team are focusing on making reliable, energy-efficient refrigerated display case light-emitting diode (LED) luminaires more widely available in the marketplace.

LED technology is advancing into new categories of white light applications, including refrigerated display case lighting. According to a recent study¹, 2.1 TWh of electricity could be saved if all retail refrigerated display cases switched to LED systems. This would equate to the annual electricity consumption of more than 160,000 households. Table 1 on page 2 highlights the numerous benefits of LED lighting in refrigerated display cases.

At present, however, tested products are available from a limited number of suppliers, performance in the later years of the product's lifetime can only be estimated, and LED luminaires are relatively expensive on a first-cost basis.

One of the objectives of the Commercial Building Energy Alliances (CBEAs), which includes REA, is to help cut energy costs for commercial building owners and managers by working on technology specification projects and accelerating the market availability of innovative energy-saving products.



The cold environment in enclosed display cases is optimal for LED luminaires, and some products provide uniform illumination in spite of the close proximity to merchandise.

In May 2010, a REA Project Team, in coordination with DOE and the Pacific Northwest National Laboratory (PNNL), completed a performance specification for LED refrigerated case lighting. To view the performance specification, visit http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/rea_refrig_display_spec.pdf.

The advantage of a project-level (as opposed to luminaire-level) specification, such as this one, is the ability to evaluate system performance relative to specific project requirements. A performance specification serves as a template, providing guidance in a number of areas, some of which can be edited or removed as needed for each project.

The following points detail information about the performance specification:

Efficacy is evaluated in terms of the actual luminaire(s) load imposed on a given power supply. Power supply efficiency is negatively affected by under-loading, which occurs when the total wattage of luminaire(s) fed by a power supply is significantly lower than the power supply's rated wattage. This effect is captured via the power supply schedule, which lists the efficacy of every configuration installed on a given project.

- Useful life is evaluated in terms of warranty period, not on manufacturer projections. Without IES TM-21, which is still in development, there is no standard means of extrapolating rated lifetimes from LM-80 data. Specific warranty requirements allow for objective comparisons of manufacturer claims.
- LED device manufacturers are required to perform industry-standard reliability testing.
- Rather than relying on field measurements, luminaires are tested in a controlled independent lab environment per LM-79 for consistency and slightly understated output.
- To ensure acceptable rendition of saturated colors in product packaging, requirements for special indices R9 through R12 are included as a supplement to the color rendering index (CRI).

1. Energy Savings Estimates of Light Emitting Diodes in Niche Lighting Applications, Navigant Consulting, 2008.

- While a recommendation for minimum light levels is offered, criteria are structured to allow for flexibility in the selection of appropriate light levels on a project-by-project basis.
- Several luminaire types and corresponding case geometries are addressed, as indicated in Figure 1.

Next Step

- Demonstration projects.

DOE Support

DOE provides technical assistance in support of the LED technology specification project for refrigerated display cases, including:

- Product performance testing
- Product demonstration technical support
- Analysis of energy cost savings
- Analysis/quantification of maintenance cost savings
- Investigations into life measurements and other performance indicators
- Development of a REA product performance specification.

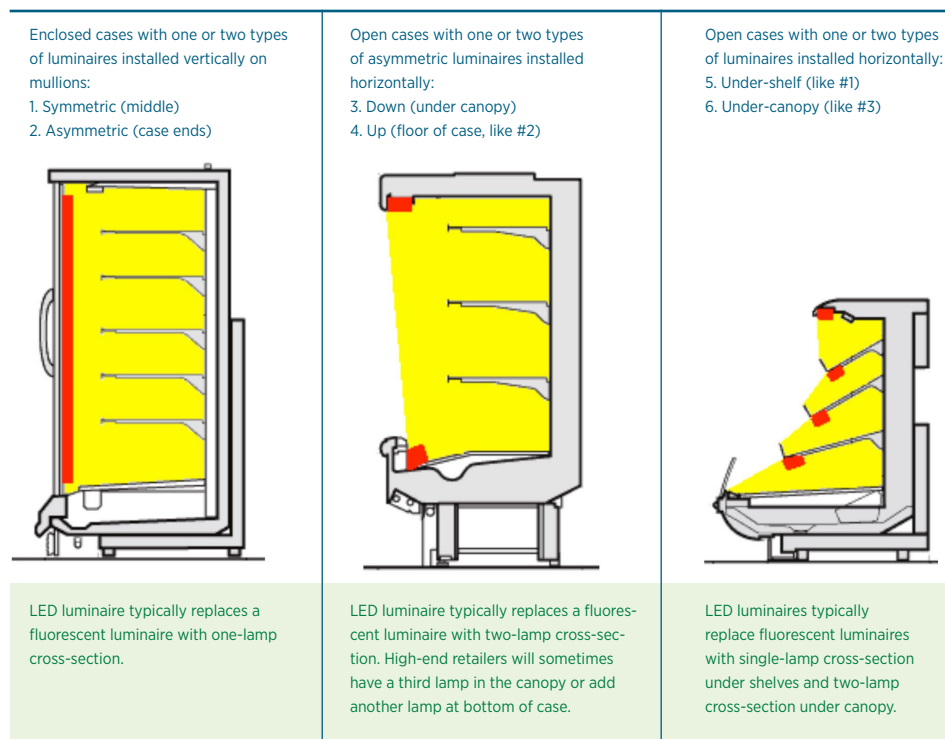
To see the performance specification, visit http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/rea_refrig_display_spec.pdf.

DOE actively supports research and commercialization of LED lighting through its Solid-State Lighting (SSL) Program, which focuses on research and development, product testing, technical information development, product demonstrations, and outreach to energy-efficiency program administrators. Visit ssl.energy.gov for more information on DOE's SSL portfolio.

Table 1

Product Feature	LED
Uniformity	Smaller sources allow for improved beam control and even illumination
Visual Comfort & Focus	Stray light and glare are reduced, allowing focus on merchandise
System Efficacy	Inherent directionality of LEDs reduces internal losses • More light is able to exit the luminaire • LED efficacy improves at lower temperatures • Fluorescent efficacy worsens at lower temperatures • Light is not wasted in non-uniform "hot spots"
Dimmability	Wide dimming range allows for increased energy savings • Light output can be smoothly controlled by occupancy sensors for minimal customer distraction • Light levels can be fine-tuned to balance appearance and energy savings
Maintenance	Very low maintenance expected due to long life and durability
Disposal	Contains no mercury

Figure 1



A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.