



Standards Development Increases Market Confidence in SSL Performance

Like traditional lighting products, LED-based luminaires sold in the United States rely on industry-developed standards and test methods to characterize their performance and safety. The use of national standards and test methods is critical to user design and bolsters consumer confidence in the performance capabilities of the products. However, the unique attributes of LEDs, or light-emitting diodes, necessitate the development of new standards to effectively measure and characterize this technology.

Until recently, the lack of sufficient standards for solid-state lighting (SSL) generated a great deal of confusion and frustration in the market. Variations in testing methods and terminology from one manufacturer to another made it difficult to compare new LED products to other light sources as well as to other LED products.

The U.S. Department of Energy (DOE) has been working closely with a network of standards-setting organizations to accelerate the development and implementation of needed SSL standards. DOE provides standards development support to the process, which includes hosting ongoing workshops to foster coordination and collaboration on related efforts. These workshops are attended by representatives and committee members from the major standards groups: American National Standards Institute (ANSI), Illuminating Engineering Society of North America (IES), National Electrical Manufacturers Association (NEMA), National Institute of Standards and Technology (NIST), Underwriters Laboratories Inc. (UL), Commission Internationale de l'Eclairage (CIE), CSA International, and International Electrotechnical Commission (IEC).



New Standards for SSL

Four new standards for LEDs were released in 2008, reflecting the hard work of these organizations and their commitment to SSL market growth:

- **IES LM-79-2008, Approved Method for the Electrical and Photometric Testing of Solid-State Lighting Devices**, enables the calculation of LED luminaire efficacy (net light output from the luminaire divided by the input power and measured in lumens per watt). Luminaire efficacy is the most reliable way to measure LED product performance, measuring luminaire performance as a whole instead of relying on traditional methods that separate lamp ratings and fixture efficiency. LM-79 helps establish a foundation for accurate comparisons of luminaire performance, not only for solid-state lighting, but for all sources.¹

¹ Electronic copies of LM-79, LM-80, and RP-16(a) may be purchased online through the Illuminating Engineering Society store at www.ies.org/store.

- **IES LM-80-2008, Approved Method for Measuring Lumen Depreciation of LED Light Sources**, supports an assessment of expected LED lifetime by defining a method of testing lamp depreciation. Unlike traditional filament-based sources, which usually fail completely, LEDs typically don't fail; they simply fade over time, which is referred to as lumen depreciation. LM-80 establishes a standard method for testing lumen depreciation.
- **ANSI C78.377-2008, Specifications for the Chromaticity of Solid-State Lighting Products**, specifies recommended color ranges for white LEDs with various correlated color temperatures. Color range and color temperature are metrics of critical importance to lighting designers.²
- **IES RP-16 Addendum a, Nomenclature and Definitions for Illuminating Engineering**, provides industry-standard definitions for terminology related to solid-state lighting.

All of these standards are integral to or referenced by the DOE ENERGY STAR[®] criteria for solid-state lighting; products qualifying³ for the ENERGY STAR label must be tested to these standards. They are also fundamental to DOE's CALiPER testing and evaluation of products for GATEWAY demonstrations.

Future SSL Standards

The releases of LM-79, LM-80, C78.377-2008, and RP-16(a) are the first tangible results of an accelerated, collaborative standards development process. There also have been significant developments on additional standards:

- **ANSI C82.04**, "Driver Performance Standard," will specify operational characteristics of power supplies and drivers for solid-state lighting products.
- **UL 8750**, "LED Safety," will specify minimum safety requirements for solid-state lighting components, including LEDs and LED arrays, power supplies, and control circuitry.⁴
- **TM-21**, "Method for Estimation of LED Life," will provide one method of applying LM-80-type test data to extrapolate an expected life of an LED product.
- **LM-XX1**, "Methods for the Measurements of High Power LEDs," will provide a procedure for the measurement of individual high-power LED modules separate from the luminaire.

Over time, these and other standards will remove the guesswork about comparative product performance, making it easier for lighting manufacturers, designers, and specifiers to select the best product for an application. As industry experts continue the painstaking work of standards development, they are contributing to a growing body of information that will help support solid-state lighting innovation, as well as market adoption and growth.

² The C78.377 standard is available for hard copy purchase or as a free download from NEMA at www.nema.org/stds/ANSI-ANSLG-C78-377.cfm#download. Hard copies can also be purchased from ANSI at www.webstore.ansi.org.

³ To learn more about the ENERGY STAR qualification process, visit www.ssl.energy.gov/energy_star.html.

⁴ UL customers can obtain the outline for free (with login) at www.ulstandards.com. Others can purchase the outline at www.comm-2000.com.

For more information on SSL standards, see www.ssl.energy.gov/standards.html.