IFC/GEF Efficient Lighting Initiative Voluntary Technical Specification

Lamp-ballast Circuits for Outdoor Residential Luminaires

Background

Developing countries often share common market barriers to the use of energy-efficient lighting. Barriers include inadequate information about the energy, economic and environmental benefits of efficient lighting, and a lack of credible sources of such information.

To address these barriers, ELI develops and promotes voluntary technical specifications that include rigorous technical and quality criteria. ELI has a labeling system that helps consumers identify energy efficient lighting products that meet the ELI specifications. ELI programs include marketing, educational, market building, and financing activities. Each participating country tailors its activities to meet the needs of the local market. These activities are supported by US$15 million in Global Environment Facility funding, and by additional local and international funding. Lighting manufacturers whose products meet the ELI specifications are invited to launch product promotions and advertising campaigns in cooperation with ELI's local marketing programs.

Manufacturers interested in ELI should review the ELI voluntary technical specifications to determine whether or not their products could comply. They should then review the ELI qualification protocol for guidance on how their lighting products could receive the ELI label.

Outdoor Residential Luminaires

Energy efficient outdoor residential luminaires are promoted through ELI. These luminaires are now available in a wide variety of styles, with various wattages, lumen outputs, efficiency levels and prices. This voluntary technical specification will serve to identify outdoor luminaires that save energy and meet customer expectations for quality and performance, with the specific goal of encouraging penetration into residential lighting markets.

Unlike the ELI specification for indoor CFL luminaires, this outdoor residential luminaire specification does not require that manufacturers use a specific lighting technology to comply. Manufacturers may choose between using energy efficient lighting technology, or using photo and motion sensor controls to turn the light source off when it is not needed.

Definitions

Ballast

For the purposes of this specification, ballast shall refer to an electrical device used with a discharge lamp to obtain the necessary circuit conditions (voltage, current and waveform) for starting and operating of the lamp.

Lamp

For the purposes of this specification, lamp shall refer to any of a range of light sources that operate through fluorescence, incandescence, or other means when attached to an appropriately modulated supply of electricity. The self-ballasted lamp, or CFL, is considered in IFC/GEF Efficient Lighting Initiative, Voluntary Technical Specifications, Compact Fluorescent Lamps.

Controls

Electrical or electronic devices used to switch a light source on or off in response to motion or to dim the light due to changes in ambient light levels.

Outdoor Residential Luminaire

A complete lighting unit intended for outdoor use in residential settings. The types referred to are typically applied next to doors, along the driveways, or underneath roof overhangs. Outdoor residential luminaires consist

of a lamp and associated electrical components such as ballast (or controls, when applicable) together with the optical parts designed to distribute the light, and parts to position and protect the light source and to connect them to the power supply. Outdoor residential luminaires shall be sold with lamp(s), and permit users to replace lamp(s) when they expire or fail without also requiring the replacement of still functional electrical or optical components. Manufacturers shall provide information indicating appropriate lamps. Outdoor residential luminaires are hard-wired into the electrical supply mains. Outdoor residential luminaires that utilize controls shall have the controls permanently wired to or connected to the luminaire.

Efficiency

The total efficiency of any luminaire is a function of both the electrical efficiency of the lamp and associated electrical devices in converting electricity to visible light, and the optical efficiency with which the reflectors, lenses and other components of the luminaire direct that light to its intended use. Unfortunately, it can be quite expensive to gather optical efficiency data and manufacturers generally do not provide it for residential luminaires (unlike more expensive luminaires intended for commercial applications). Therefore, this specification considers only the efficiency of the lamp-ballast circuit, of the outdoor residential luminaire, and disregards the effects of the other luminaire components.

For the purposes of Table 2A of this specification, lamp-ballast efficiency shall be the total rated luminous flux generated by all lamps in an outdoor residential luminaire as published by the lamp manufacturer, multiplied by the ballast factor, as published by the ballast manufacturer, divided by the Input Power for the luminaire. Lamp-ballast system efficiency is measured in lm/W.

Normal Operation

All performance parameters assume that measurements are taken from outdoor residential luminaires operating at rated voltage and within the rated range of operating temperatures. Measurements shall be taken from outdoor residential luminaires after an initial burn-in period of 100 hours, with stable light output and power draw unless otherwise noted.

Luminous flux

Luminous flux is the light generated by the lamp(s) used in the outdoor residential luminaire in stable operation after an initial burn-in period of 100 hours. Luminous flux shall be the lumens generated by the lamp(s) used under stable operation at maximum power consumption.

Input Power

Power drawn by the outdoor residential luminaire in stable operation after an initial burn-in period of 100 hours. Input Power shall be the power drawn measured in watts (W) by the specific lamp -ballast circuit used under stable operation at maximum power.

Standard References

- IEC - International Electrotechnical Commission
- EN - European Norm (European Union Standard)
- IES - Illuminating Engineering Society
- CIE - Commission International d'Eclairage (International Illumination Commission)
- ANSI - American National Standards Institute
- ISO - International Standards Organization

Lamp-ballast circuits for Outdoor Residential Luminaires: Lamp-ballast circuits intended for luminaires for outdoor use in residential applications should be qualified under Table 1 A-C and also under either Table 2A: Light Source or Table 2B: Operating Time.

Table 1A

Operating Characteristics	Performance Specifications
Electromagnetic and Radio Frequency Interference	Outdoor residential luminaires must comply with CISPR 15 or relevant local regulations.
Power Factor	Outdoor residential luminaires to be included in ELI programs in Latvia, Hungary and the Czech Republic must comply with power quality limits set by IEC 61000-3-2. Outdoor residential luminaires to be included in ELI programs in other ELI countries must have a power factor of 0.5 or greater at maximum power as defined by IEC 61000.
Tolerance of Voltage Variation	Outdoor residential luminaires must perform within specified parameters at a range of nominal voltages ± 10% of rated operating voltage without reduction in the rated life of electrical or electronic circuits.
Transient Protection	Outdoor residential luminaires must comply with IEC 61547 and all equivalent local requirements.
Lumen Maintenance	After 2000 hours of operation the luminous flux should be not less than 80% of the initial luminous flux. (Measured in accordance with IEC 60901)

Table 1B

Other	Performance Specifications
Light Source Information	Outdoor residential luminaires shall include information stating appropriate generic lamp descriptors, including: lamp diameter, length, wattage, and base type both on the exterior packaging *and* in either installation instructions or application information sent to specifiers.
Longevity (ballasts and controls)	Ballasts and controls used in outdoor residential luminaires shall be rated by the manufacturer at a minimum life of 20,000 hours until 50% failure of a sample of ≥ 20 units of a product.
Warranty for defects in materials and manufacturing	Repair or replacement of defective parts of the outdoor residential luminaire (except lamps) for 2 years from the date of purchase. Written warranty in at least one applicable local language must be included with luminaire when purchased. Manufacturer shall provide a local (in-country) mailing address for customer warranty concerns and product returns.
Labeling	In addition, manufacturers of outdoor residential luminaires must indicate anticipated degradation of light output ≥ 10% of rated luminous flux due to: • Operation outside of rated temperature range or, • Location or position of installation or, • Any other environmental or installation factors.
Safety	Outdoor residential luminaires must meet all relevant local safety regulations and the requirements IEC 60598 Part 1, and IEC 60598-2-3, IEC 60598-2-5 or IEC 60589-2-7 where applicable.

Table 2A - Outdoor residential luminaires: Efficient Light Source Option

Energy Efficiency Characteristics	**Performance Specifications**
Maximum input power	150 W
Efficiency (lm/W) At input power < 71 W At input power 71 - 150 W	 $\geq$ 40 lm/W $\geq$ 50 lm/W
Mechanical	Lamp holder used in outdoor residential luminaires shall only accept lamps that perform to the rated input power range of the luminaire.
Operating Characteristics	
Lamp Replacement	An appropriate lamp must be included with the luminaire at time of sale. Outdoor residential luminaire must allow replacement of lamps without also requiring replacement of other components.
Controls	Outdoor residential luminaire must include a photosensor that automatically shuts off the lamp during daylight hours.

Table 2B - Outdoor residential luminaires: Controls Option

Energy Efficiency Characteristics	**Performance Specifications**
Maximum controllable input power	250 W
Controls	Outdoor residential luminaires must include a photosensor that automatically shuts off the light source during daylight hours. Luminaire must also include a motion sensor that shuts off the light source within a maximum of 15 minutes of either receiving a manual "on" signal, or detecting no motion in the sensor's field of view.
Operating Characteristics	
Control Re-set	Photo sensor and motion sensor must automatically reset to automatic mode within 24 hours of a manual override or testing operation.
Lamp start	Lamp must continuously illuminate within 1.0 second of being switched on.

Notes:

*** Power Factor:** European Union requirements for harmonics injected by electricity using consumer goods drawing ≤ 25 Watts will become quite strict in 2001. These requirements will impose costs on manufacturers and consumers and possibly have a negative impact on the reliability of outdoor residential luminaires. Therefore, only in ELI participant countries that are candidates for EU integration (Latvia, Hungary and the Czech Republic) will outdoor residential luminaires be required to comply with IEC 61000-3-2 in order to qualify for participation in ELI. Outdoor residential luminaires in the remaining four ELI countries may qualify if they meet the stated power factor requirements.

Reference Specifications

- IEC – 60598 Safety requirements of luminaires (series of standards)
- IEC – 61199 Single-capped fluorescent lamps: Safety requirements
- IEC – 60901 Single-capped fluorescent lamps: Performance Requirements
- IEC - 61000-3-2 Electromagnetic Compatibility - Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
- IEC - 61547 Equipment for general lighting purposes - EMC immunity requirements
- US EPA/DOE ENERGY STAR® Residential Light Fixture Memorandum of Understanding. USA 1997
- Minimum Specifications for Promotional CFLs: IFC/GEF Poland Efficient Lighting Project, Poland 1997

Inquiries

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