ENERGY STAR® Program Requirements
Product Specification for Luminaires (Light Fixtures)

Eligibility Criteria
Version 1.0

Following is the Version 1.0 - ENERGY STAR Product Specification for Luminaires. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

To qualify a luminaire for ENERGY STAR, first determine which requirements in this document are applicable to the specific luminaire. ENERGY STAR requirements are specific to luminaires categorized by the Program as directional or non-directional.

Luminaires which do not fall into the specific directional scope default to non-directional categorization.

- Directional luminaires (**evaluated with luminaire photometry**):
  - **specific scope** itemized in the Specification Scope & Luminaire Classification section
  - evaluated with luminaire photometry (lumens delivered from luminaire per input watt), accounting for luminaire optical performance
  - shall also meet specified minimum light output and zonal lumen density requirements
  - residential grade solid state (LED) luminaire types featuring inseparable components (no user replaceable/upgradeable LED light engine or GU24 based integrated LED lamp) and not otherwise itemized in the directional scope shall be considered inseparable SSL luminaires, and thus evaluated as directional luminaires requiring luminaire photometry.
  - outdoor post-mounted luminaires are categorized as directional, requiring luminaire photometry to test for uplight
  - luminaire types not meeting the above default to non-directional, below

- Non-directional luminaires (**evaluated by source photometry**):
  - **examples** provided in the above Specification Scope & Luminaire Classification section
  - evaluated by source photometry (lumens delivered from the light source per input watt), including system performance of lamp and ballast, LED light engine or GU24 based integrated LED lamp
  - luminaires not categorized above as directional are evaluated as non-directional

This specification is not organized by indoor or outdoor, or by light source technology. Performance requirements comprise each section of this document, thus the first section summarizes efficacy requirements, the second color performance, etc. Partners are advised to review each section, and take note of exceptions where specific performance criteria need not be evaluated; for instance, some exceptions are in place for outdoor luminaires.

Partners may elect to use GU24 based lamps that meet all light source and ballast/driver requirements in this specification.

Note: With the exception of halogen incandescent outdoor luminaires and some high intensity discharge luminaires, luminaires employing screw base lampholders (i.e. ANSI E26, E26d E12, E17, E39, E39d) without dedicated ballasts are not eligible to earn the ENERGY STAR.

Specification Scope & Luminaire Classification

The ENERGY STAR Luminaires specification ("this specification") covers luminaire types outlined in this section. Qualification is limited to luminaires below a total input power of 250 watts. With the exception of halogen incandescent outdoor luminaires and some high intensity discharge luminaires, luminaires employing screw base lampholders (i.e. ANSI E26, E26d E12, E17, E39, E39d) without dedicated ballasts are not eligible to earn the ENERGY STAR.

Refer to the Definitions section on page 4 for definitions of each directional luminaire type detailed below. **Luminaires not classified as directional default to non-directional classification for purposes of meeting performance requirements outlined in this specification.**

DIRECTIONAL for purposes of this specification (requiring luminaire photometry)

- RESIDENTIAL grade luminaires, **specifically**:
  - accent lights
    - includes line-voltage directional track lights
    - includes directional ceiling fan light kits
  - cove mounts
  - downlights: recessed, pendant, surface mount
    - includes SSL downlight retrofits
    - includes type IC, type Non-IC, AT and non-AT recessed downlights
  - outdoor post-mounted luminaires
  - under cabinet luminaires
  - all inseparable SSL luminaires

- COMMERCIAL grade luminaires, **specifically**:
  - accent lights
    - includes line-voltage directional track lights
  - downlights: recessed, pendant, surface mount
    - includes SSL downlight retrofits
    - excludes troffers or linear forms
  - under cabinet shelf-mounted task lighting
  - portable desk task lights

NON-DIRECTIONAL for purposes of this specification (requiring source photometry)

RESIDENTIAL grade luminaires only, including but not limited to the following **examples**:

- Indoor:
  - bath vanity
  - ceiling and close-to-ceiling mount
    - includes non-directional ceiling fan light kits
  - chandeliers
  - decorative pendants
  - linear strips
  - wall sconces
  - wrapped lens
  - ventilation fan lights
  - portable luminaires
    - includes portable desk task lights
    - includes portable floor task lights
    - includes "table lamps" and "floor lamps"
    - includes torchieres

- Outdoor:
  - ceiling and close-to-ceiling mount
  - porch (wall-mounted)
  - pendant
  - security

Effective Date

The ENERGY STAR Luminaires Version 1.0 specification shall take effect on October 1, 2011. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on its date of manufacture. The date of manufacture is specific to each unit and is the exact date on which a unit is considered to be completely assembled.

Future Specification Revisions

EPA reserves the right to change this specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that ENERGY STAR qualification is not automatically granted for the life of a product model.

While this document currently refers to industry standards and test procedures for fluorescent, high intensity discharge and solid state sources, as new technologies emerge that have equal or better performance to the levels proposed here, consistent with a technology neutral approach, EPA may amend the program requirements by adding additional requirements, standards, and test procedures.

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Definitions

Accent Light (Luminaire): A directional luminaire employed to emphasize a particular object or surface feature, or to draw attention to a part of the field of view (adapted from IES RP-16-10: "Accent Lighting"). Includes line-voltage directional track lights.
ANSI: American National Standards Institute.
Aperture Size (downlights): The maximum distance between the points inside the luminaire where light escapes the luminaire**.**
ASTM: American Society for Testing of Materials.
Ballast: A device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current, and waveform) for starting and operating. (IES RP-16-10)
Ballast Frequency: The number of waves or cycles of electromagnetic radiation per second, usually measured in Hz. (Lighting Fundamentals Handbook, Electric Power Research Institute, 1992)
Bath Vanity Luminaire: Wall-mounted luminaires located adjacent to a mirror.
Ceiling / Close-to-Ceiling Mount Luminaire: Ceiling-mounted luminaires that direct less than 90% of light downward and are not intended to accent an object or an area within a space.
CFL: A compact fluorescent lamp (pin based or self-ballasted screw base). See Compact Fluorescent Lamp.
Chandeliers: Decorative, often branched, luminaires suspended from the ceiling incorporating multiple light sources.
CIE: Commission Internationale de l'Eclairage (International Commission on Illumination).
Color Rendering: A general expression for the effect of a light source on the color appearance of objects in conscious or subconscious comparison with their color appearance under a reference light source. (IES Handbook 9th Edition)
Color Rendering Index of a Light Source (CRI): A measure of the degree of color shift objects undergo when illuminated by the light source as compared with those same objects when illuminated by a reference source of comparable color temperature. (IES RP-16-10)
Commercial Luminaire: A luminaire marketed and intended to be used in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home. (adapted from FCC 47 CFR parts 15 and 18)
Compact Fluorescent Lamp (CFL): A fluorescent lamp with a small diameter glass tube (T5 or less) that is folded, bent, or bridged to create a long discharge path in a small volume. The lamp design generally includes an amalgam and a cold chamber, or a cold spot to control the mercury vapor pressure and light output. (IES RP-16-10)
Correlated Color Temperature of a Light Source (CCT): The absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source. (IES RP-16-10).
Cove Mount (Luminaire): Lighting comprising light sources shielded by a ledge or horizontal recess, and distributing light over the ceiling and upper wall. For purposes of this specification, cove mount luminaires feature luminaire optics over the lamps, LED packages, arrays or modules, LED light engines or GU24 based integrated LED lamps. (adapted from IES RP-16-10)
Covered Lamp: A lamp with an integral ballast and a translucent cover over the bare fluorescent glass tube.
CSA: Canadian Standards Association.
Decorative Pendant (Luminaire): Suspended luminaires that are not intended to accent an object or an area within a space, and typically employ blown glass, or colorful glass elements.
Direct Lighting: Lighting involving luminaires that distribute 90 to 100 percent of the emitted light in the general direction of the surface to be illuminated. This term usually refers to light emitted in a downward direction. (IES RP-16-10)
Directional Applications: See Direct Lighting.
Directional Luminaires: See Direct Lighting.
Down Light or Downlight (Luminaire): A small direct lighting unit that directs the light downward and can be recessed, surface mounted, or suspended (IES RP-16-10). See definition of Direct Lighting for additional information. For purposes of this specification, this definition includes down light luminaire SSL retrofits but does not include linear fluorescent troffers or linear luminaire forms such as linear fluorescent pendants, typically used to illuminate office spaces.
Electronic Ballast: A device which operates at a supply frequency of 50 or 60 Hz and operates the lamp at frequencies greater than 10 kHz. (ANSI standard C82.13-2002)
Floor Lamp (Luminaire): a portable luminaire on a high stand suitable for standing on the floor. (IES RP-16-10)
GU24 Based Integrated Lamp: A lamp unit that integrates the lamp and its ballast. It does not include any replaceable or interchangeable parts, and utilizes the ANSI standardized GU24 base type.
GU24 Based Two-Piece Lamp: A term for a lamp-ballast unit that includes a ballast with the ANSI standardized GU24 base type paired with a standard pin based lamp. The ballast and lamp are separable, with the ballast designed to accept replacement pin based lamps.
High Frequency (Electronic) Ballast: see Electronic Ballast.
IEC: International Electrotechnical Commission.
IES: Illuminating Engineering Society.
Initial Performance Values: The photometric and electrical characteristics at the end of the 100-hour aging period in a 25°C test environment.
Input Power: The power consumption in watts of a ballast or driver and a light source system operating in a normal mode, as determined in accordance with the test procedure (ANSI Standard 82.2-2002)
Inseparable SSL Luminaire: A luminaire featuring solid state lighting components (i.e. LEDs and driver components) which cannot be easily removed or replaced by the end user, thus requiring replacement of the entire luminaire. Removal of solid state lighting components would require (for instance) the cutting of wires, use of a soldering iron, or damage to or destruction of the luminaire. This definition does not encompass luminaires which feature LED light engines or GU24 based integrated LED lamps which are user replaceable / upgradeable without the cutting of wires or the use of solder, or the specific residential luminaire types designated "directional" in the scope of this document.

Integrated LED Lamp: An integrated assembly comprised of LED packages (components) or LED arrays (modules), LED driver, ANSI standard base and other optical, thermal, mechanical and electrical components. The device is intended to connect directly to the branch circuit through a corresponding ANSI standard lamp-holder (socket). (IES RP-16-10) For purposes of this specification, only GU24 based integrated LED lamps are permitted for qualification of luminaires.
Lamp: A generic term for a man-made source created to produce optical radiation. By extension, the term is also used to denote sources that radiate in regions of the spectrum adjacent to the visible." (IES Handbook 9th Edition)
Lamp-Ballast Platform: A pairing of one ballast with one or more lamps that can operate simultaneously on that ballast. A unique platform is defined by the manufacturer and model number of the ballast and lamp(s) and the quantity of lamps that operate on the ballast. A lamp-ballast platform also may refer to a lamp with an integral ballast, such as a GU24 based integrated lamp.
Lamp Current Crest Factor: For 60Hz operation, the ratio of peak lamp current to the root mean square (RMS) lamp current. For high-frequency (HF) operation, the highest peak lamp current of the modulation envelope (when evaluated over a full line voltage cycle) to the root mean square (RMS) of the lamp current.
Lampholder: A component of a luminaire which supplies power to the lamp and also holds the lamp in place.
LED: See Light Emitting Diode.
LED Array or Module: An assembly of LED packages (components) or dies on a printed circuit board or substrate, possibly with optical elements and additional thermal, mechanical, and electrical interfaces that are intended to connect to the load side of a LED driver. Power source and ANSI standard base are not incorporated into the device. The device cannot be connected directly to the branch circuit. (IES RP-16-10)
LED Control Circuitry: Electronic components designed to control a power source by adjusting output voltage, current or duty cycle to switch or otherwise control the amount and characteristics of the electrical energy delivered to a LED package (component) or an LED array (module). LED control circuitry does include power source. (IES RP-16-10)
LED Driver: A device comprised of a power source and LED control circuitry designed to operate a LED package (component), or an LED array (module) or an LED lamp. (IES RP-16-10)
LED Driver Case Temperature Measurement Point (TMP_C): A location on an LED driver case, designated by its manufacturer, which will have the highest temperature of any point on the driver case during normal operation.
LED Driver Class II: An LED driver that operates within Class II limits as defined by the latest version of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC). (IES RP-16-10)
LED Light Engine: An integrated assembly comprised of LED packages (components) or LED arrays (modules), LED driver, and other optical, thermal, mechanical and electrical components. The device is intended to connect directly to the branch circuit through a custom connector compatible with the LED luminaire for which it was designed and does not use an ANSI standard base. (IES RP-16-10) For purposes of this specification, ("non-integrated") assemblies featuring remote-mounted drivers shall also be considered LED light engines, so long as interconnecting conductors of appropriate gauge and length are employed between the driver(s) and LED package(s), array(s) or module(s), and electrical interconnects are employed at both ends of the conductors.
LED Luminaire: A complete lighting unit consisting of LED-based light emitting elements and a matched driver together with parts to distribute light, to position and protect the light emitting elements, and to connect the unit to a branch circuit. The LED-based light emitting elements may take the form of LED packages (components), LED arrays (modules), LED Light Engine, or LED lamps. The LED luminaire is intended to connect directly to a branch circuit. (IES RP-16-10)
LED Module: See LED Array or Module.
LED Package: An assembly of one or more LED dies that includes wire bond or other type of electrical connections,, possibly with an optical element and thermal, mechanical, and electrical interfaces. Power source and ANSI standardized base are not incorporated into the device. The device cannot be connected directly to the branch circuit. (IES RP-16-10)
LED Platform: See LED Light Engine or Integrated LED Lamp.
LED Temperature Measurement Point (TMP_{LED}): A location on an LED package/module/array, designated by its manufacturer, which provides a surrogate temperature measurement location for the actual LED junction. The TMP_{LED} may be a solder joint at the board attachment site, a point on the LED package case, or a location on the board of an LED module or array.
Light Emitting Diode (LED): A pn junction semiconductor device that emits incoherent optical radiation when forward biased. The optical emission may be in the ultraviolet, visible, or infrared wavelength regions. (IES RP-16-10)
Linear Strip Luminaire: Surface mounted luminaires with an elongated aspect ratio and either no optics over the light source(s) or individual optics over each light source.
Line-Voltage Track Light (Luminaire): See Accent Light definition. Includes luminaires interoperable with line-voltage track installed without a transformer or power supply.
Linear Fluorescent Lamp: Commonly made with straight, tubular bulbs varying in diameter from approximately 6 mm (0.25 in. T-2) to 54 mm (2.125 in. T-17) and in overall length from a nominal 100 to 2440 mm (4 to 96 in.), this light source is a low-pressure gas discharge source, in which light is produced predominantly by fluorescent powders activated by UV energy generated by a mercury arc. (adapted from IES Handbook 9th Edition)
Lumen Maintenance: The luminous flux output remaining (typically expressed as a percentage of the initial output) at any selected elapsed operating time. Lumen maintenance is the converse of lumen depreciation. (adapted from IES LM-80-08)
Lumens per Watt (lm/W): The quotient of the total luminous flux emitted by the total light source power input. It is expressed in lm/W. (adapted from IES RP-16-10: "Luminous Efficacy of a Source of Light")
Luminaire (Light Fixture): A complete lighting unit consisting of lamp(s) and ballast(s) (when applicable) together with the parts designed to distribute the light, position and protect the lamps, and to connect the lamp(s) to the power supply (IES RP-16-10)
Luminaire Efficacy: The luminous flux delivered by a luminaire, divided by its input power.
MacAdam Color Ellipse: A series of ellipses around the chromaticity coordinates of a number of different colors. Each ellipse sets the boundary at which a given percentage of people are able to determine that two colors, one with the chromaticity coordinates at the center of the ellipse, and one with chromaticity coordinates on the ellipse, are just noticeably different. (IES Handbook 9th Edition)
Magnetic Ballast: A magnetic device used to control the starting and operation of discharge lamps. (IES Handbook 9th Edition)
Nadir: The angle pointing directly downward from the luminaire, or zero degrees.

NEMA: National Electrical Manufacturers Association.
Non-Directional Application: For purposes of this ENERGY STAR specification, luminaire types which are not designated directional. See Direct Lighting definition.
Non-Directional Luminaire: See Non-Directional Application.
NRTL: Nationally Recognized Testing Laboratory as recognized by OSHA's NRTL Program, which is a part of OSHA's Directorate of Technical Support.
Optics: Include reflectors, baffles, lenses and/or diffusers, all of which control the light distribution and the appearance of the lighted luminaire.
OSHA: Occupational Safety & Health Administration.
Outdoor Pendant Luminaire: An outdoor suspended luminaire.
Outdoor Porch Luminaire: An outdoor ceiling, surface or wall-mounted luminaire.
Outdoor Post-Mounted Luminaire: An outdoor luminaire supported by a post inserted into the ground and mounted between 4 feet and 10.5 feet above grade.
Outdoor Security Luminaire: Wall mounted luminaires intended to light areas immediately adjacent to a building's perimeter.
Photo Control or Light Activated Switch: A photoelectric switch that controls lighting by the level of daylight luminance (IES RP-16-10)
Photosensor: See Photo Control.
Platform: See Lamp-Ballast Platform.
Portable Desk Task Light (Luminaire): A light fixture resting on a desk that directs light to a specific surface or area to provide illumination for visual tasks such as reading and writing, and employs a NEMA 1-15P or 5-15P plug for its electrical connection.
Portable Floor Task Light (Luminaire): A light fixture resting on the floor that directs light to a specific surface or area to provide illumination for visual tasks such as reading and writing, and employs a NEMA 1-15P or 5-15P plug for its electrical connection.
Portable Luminaire: A lighting unit that is not permanently fixed in place. (IES RP-16-10)
Power Factor: The power input in watts divided by the product of ballast input voltage and input current of a fluorescent lamp ballast, as measured under test conditions (ANSI Standard C82.2–2002).
Power Source: A transformer, power supply, battery, or other device capable of providing current, voltage, or power within its design limits. This device contains no additional control capabilities (IES RP-16-10)
Rated Lumen Maintenance Life (L_P): The elapsed operating time over which the LED light source will maintain the percentage, p, of its initial light output, e.g. L_{70} (hours): Time to 70% lumen maintenance. (IES LM-80-08)
Residential Luminaire: A luminaire marketed and intended to be used in a residential environment notwithstanding use in commercial, business and industrial environments. (adapted from FCC 47 CFR parts 15 and 18)
RLF: Residential light fixture.
Run-up Time: The time needed after switching on the supply for the lamp to reach 80.0% of its stabilized luminous flux. (ANSI C78.5-2003)
Solid State Lighting (SSL): The term "solid state" refers to the fact that the light is emitted from a solid object – a block of semiconductor – rather than from a vacuum or gas tube, as in the case of a incandescent and fluorescent lighting. There are two types of solid-state light emitters: inorganic light-emitting diodes (LEDs) or organic light-emitting diodes (OLEDs). (Sandia National Laboratories)
SSL Downlight Retrofits: A type of solid state luminaire intended to install into an existing downlight, replacing the existing light source and related electrical components.
Standardized Color Ellipse: A MacAdam color ellipse defined by center chromaticity coordinates (CIE x, y) and a measure of certainty for detecting a color difference specified in standard deviation units called steps. (ANSI C78.376-2001)
Table Lamp (Luminaire): A portable luminaire with a short stand suitable for standing on furniture. (IES RP-16-10)
Torchiere (Luminaire): An indirect floor lamp that sends all or nearly all of its light upward. (IES RP-16-10)
TMP_C: see LED Driver Case Temperature Measurement Point.
TMP_{LED}: see LED Temperature Measurement Point.
Trim: Trim is the part of a downlight that covers the ragged edge of the ceiling cut-out. The trim may be a separate ring, or trim ring, or it may be integrated with the optics (i.e., a self-flanged reflector). A trim can be airtight or non-airtight.
UL: Underwriters Laboratories.
Under-Cabinet Luminaire: Luminaires installed below an upper cabinet to direct light down to the work surface of a countertop or desk for task lighting.
Wall Sconce (Luminaire): Wall mounted luminaires not intended to accent an object or a task area within a space.
Wrapped Lens Luminaire: Surface mounted luminaires with an elongated aspect ratio and a single optic covering the light source that direct less than 90% of light downward.

Test Criteria

When testing luminaires, the test methods identified for each performance characteristic in the "Methods of Measurement and/or Reference Standards" column of the performance requirements tables presented within this specification shall be used to determine ENERGY STAR qualification.

Product Qualification

A. Product Families: grouped product submissions for ENERGY STAR qualification shall meet the following requirements:

Qualified products within a product family shall be identical to the tested, representative model with the exception of allowed variations listed in Table 1, below. The representative model shall be the variation expected to have the greatest difficulty meeting the performance criteria outlined in this specification.

Table 1: Allowable Variations Within Product Families

Housing / Chassis	Allowed so long as the light source or lampholder, ballast or driver, and heat sink (as applicable) are integrated into housing / chassis variations in such a way that the thermal performance of the luminaire is not degraded by changes to the housing / chassis. Thermal measurements of each variation may be required (e.g. ballast case temperature, TMP_{LED}, or TMP_C).
Heat Sink / Thermal Management Components	Not allowed.
Finish	Allowed.
Mounting	
Reflector / Trim	Allowed so long as luminaire light output is not reduced.
Shade / Diffuser	Allowed so long as neither luminaire light output nor air flow are reduced.
Light Source (refers to the make and/or model of the source; also review CCT below)	Allowed so long as variations will not negatively impact luminaire's compliance with any performance criteria in this specification.
Correlated Color Temperature (CCT) (also review Light Source above)	Allowed so long as the lamp series or LED package/module/array series (and associated drive current), ballast or driver, and thermal management components are identical, and so long as variations will not negatively impact luminaire's compliance with any performance criteria in this specification. The representative model shall be the version within the product family with the lowest CCT. Partner shall use different luminaire model numbers to distinguish between models shipped with light sources of varying CCTs.
Ballast / Driver	Allowed so long as variations will not negatively impact luminaire's compliance with any performance criteria in this specification. Thermal measurements of each variation may be required (e.g. ballast case temperature or TMP_C).

Partners may not retroactively add variations to a product family unless requirements in Table 1 are still met. For example, if the representative model tested is 3000 Kelvin, partner may not retroactively add a 2700 Kelvin model, as this was not the lowest CCT initially tested.

B. Significant Digits and Rounding

a. All calculations shall be carried out with directly measured (unrounded) values.
b. Unless otherwise specified, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.
c. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

Reference Standards and Test Procedures

Organization	Identifier	Description
ANSI	C78.376-2001	Specifications for the Chromaticity of Fluorescent Lamps
ANSI/NEMA/ANSLG	C78.377-2008	Specifications for the Chromaticity of Solid State Lighting Products
ANSI	C78.389-2004 (R2009)	High-Intensity Discharge (HID)—Methods of Measuring Characteristics
ANSI/ANSLG	C78.42-2009	High-Pressure Sodium (HPS) Lamps
ANSI/ANSLG	C78.43-2007	Single-Ended Metal Halide Lamps
ANSI	C78.5-2003	Specifications for Performance of Self-ballasted Compact Fluorescent Lamps
ANSI/ANSLG	C78.81-2010	Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics
ANSI/IEC	C78.901-2005	Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics
ANSI/ANSLG	C81.61-2009	Specifications for Bases (Caps) for Electric Lamps
ANSI/ANSLG	C81.62-2009	Lampholders for Electric Lamps
ANSI	C82.11 Consolidated-2002	High-Frequency Fluorescent Lamp Ballasts—Supplements
ANSI/ANSLG	C82.14-2006	Low-Frequency Square Wave Electronic Ballasts—for Metal Halide Lamps
ANSI	C82.2-2002	Method of Measurement of Fluorescent Lamp Ballasts
ANSI	C82.4-2002	Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple Supply Types)
ANSI	C82.6-2005	Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement
ANSI	C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
ANSI/IEEE	C62.41-1991	Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
ANSI/UL	153-2002	Standard for Safety of Portable Electric Luminaires
ANSI/UL	935-2001	Standard for Safety of Fluorescent-Lamp Ballasts
ANSI/UL	1029-2010	Standard for Safety of High-Intensity-Discharge Lamp Ballasts
ANSI/UL	1310-2005	Standard for Safety of Class 2 Power Units
ANSI/UL	1574-2004	Standard for Safety of Track Lighting Systems
ANSI/UL	1598-2008	Standard for Safety of Luminaires
ANSI/UL	1598B-2010	Standard for Supplemental Requirements for Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires
ANSI/UL	1993-2009	Standard for Safety of Self-Ballasted Lamps and Lamp Adapters
ANSI/UL	2108-2004	Standard for Low-Voltage Lighting Systems
ANSI/UL	8750-2009	Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
ASTM	E283-04	Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
CAN/CSA	C22.2 NO. 74-96 (R2010)	Equipment for Use With Electric Discharge Lamps
CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE	Pub. No. 15:2004	Colorimetry
EU	Directive 2002/95/EC	Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the Use of Certain Hazardous Substances In Electrical and Electronic Equipment
FCC	CFR Title 47 Part 15	Radio Frequency Devices
FCC	CFR Title 47 Part 18	Industrial, Scientific, and Medical Equipment
IEC	60061-1	Lamp Caps and Holders Together with Gauges for the Control of Interchangeability and Safety – Part 1: Lamp Caps
IEC	60081 Amend 4 Ed 5.0	Double-capped Fluorescent Lamps - Performance Specifications
IEC	60901	Single-capped Fluorescent Lamps - Performance Specifications
IEC	61347-2-3-am2 ed1.0 b.2006	Amendment 2 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. Supplied Electronic Ballasts for Fluorescent Lamps
IEC	62321 Ed. 1.0	Electrotechnical Products - Determination Of Levels Of Six Regulated Substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)
IES	LM-9-09	Electric and Photometric Measurements of Fluorescent Lamps
IES	LM-10-11	Photometric Testing of Outdoor Fluorescent Luminaires (renewal anticipated in spring 2011)
IES	LM-15-03	Guide for Reporting General Lighting Equipment Engineering Data for Indoor Luminaires
IES	LM-31-11	Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps (renewal anticipated in spring 2011)
IES	LM-35-02	Photometric Testing of Floodlights Using High Intensity Discharge or Incandescent Filament Lamps
IES	LM-40-01	Life Testing of Fluorescent Lamps
IES	LM-41-11	Approved Method for Photometric Testing of Indoor Fluorescent Luminaries (renewal anticipated in spring 2011)
IES	LM-46-04	Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps
IES	LM 47-11	Life Testing of High Intensity Discharge (HID) Lamps
IES	LM-49-11	Life Testing of Incandescent Filament Lamps
IES	LM-51-00	Electrical and Photometric Measurements of High Intensity Discharge Lamps
IES	LM-58-11	Guide to Spectroradiometric Measurements (renewal anticipated in summer 2011)
IES	LM-65-01	Life Testing of Compact Fluorescent Lamps
IES	LM-66-00	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps.
IES	LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products

IES	LM-80-08	Measuring Lumen Maintenance of LED Light Sources
IES	LM-82-11	IES Approved Method for the Characterization of LED Light Engines and Integrated LED Lamps for Electrical and Photometric Properties as a Function of Temperature (in draft as of February 2011)
IES	RP-16-10	Nomenclature and Definitions for Illuminating Engineering
IES	TM-21-11	Projecting Long Term Lumen Maintenance of LED Packages (in draft as of February 2011)
LRC	ACTV Test 2007	Testing Guideline for the Accelerated Cycling, Thermal, and Voltage (ACTV) Stress Test
NEMA	LL 9-2009	Dimming of T8 Fluorescent Lighting Systems
NEMA	LSD 45-2009	Recommendations for Solid State Lighting Sub-Assembly Interfaces for Luminaires

Photometric Performance Requirements

Luminous Efficacy and Output Requirements: NON-DIRECTIONAL RESIDENTIAL Luminaires

Note: Luminaire types not denoted as directional in the Scope section of this specification shall be evaluated as non-directional, based on source photometric performance. The performance values in this section pertain to the performance of the source (system including ballast or driver) within a luminaire.

Source Type	ENERGY STAR Requirements		Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
	Source Efficacy (initial)	**Source Minimum Light Output (initial)**		
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	**Until September 1, 2013:** ≥ 65 lm/W per lamp-ballast platform **After September 1, 2013:** ≥ 70 lm/W per lamp-ballast platform All lamp and ballast permutations (makes and models) employed in a given luminaire model shall meet this requirement. Exception: Covered and dimmable versions of GU24 based self-ballasted lamps are required to meet reduced efficacy requirements as outlined in qualification requirements for those lamps.	Lamp-ballast platform shall provide a minimum of 800 lumens. Exception: chandeliers and bath vanity luminaires featuring ≥ 3 heads shall provide a minimum of 450 lumens per head.	Linear & circline: IES LM-9-09 Compact & self ballasted compact: IES LM-66-00 ANSI/ANSLG C78.81-2010 (for T8) IEC 60081 data sheets (for T5)	Laboratory test results shall be produced using the specific models of lamp and ballast that will be used in production. Linear fluorescent luminaires which do not ship with lamps shall be tested using a lamp model compliant with ANSI/ANSLG C78.81-2010 (for T8) or IEC 60081 data sheets (for T5). Luminaires with ballast(s) capable of operating multiple fluorescent lamp types shall be tested either with the lamp model shipped with the luminaire, or if a lamp is not supplied, with the highest power lamp type detailed on the packaging. **Sample Size**: ≥ 3 samples of each lamp-ballast model combination. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			IES LM-51-00	Laboratory test results shall be produced using the specific models of lamp and ballast that will be used in production. Luminaires with ballast(s) capable of operating multiple lamp types shall be tested with the lamp model shipped with the luminaire. **Sample Size**: ≥ 3 samples of each lamp-ballast model combination. **Passing Test**: all samples shall pass.
Solid State: • **LED light engine** • **integrated LED lamp (GU24)**	Replaceable LED light engine or GU24 based integrated LED lamp ("source") efficacy shall meet or exceed the values detailed below, as determined by comparing the *in situ* (installed in the luminaire) T_b value to the source's LM-82 test report. **Until September 1, 2013:** ≥ 65 lm/W per source **After September 1, 2013:** ≥ 70 lm/W per source	Installed in the luminaire, each LED light engine or GU24 based integrated LED lamp *in situ* shall provide a minimum of 800 lumens. Exception: chandeliers and bath vanity luminaires featuring ≥ 3 heads shall provide a minimum of 450 lumens per head.	IES LM-82-11 (in draft as of February 2011) *In situ* measurements: ANSI/UL 153-2002 ANSI/UL 1574-2004 ANSI/UL 1598-2008 ANSI/UL 1993-2009	Laboratory test results shall be produced using the specific models of LED package, LED module or LED array and LED driver (i.e. LED light engine or GU24 based integrated LED lamp) that will be used in production. LM-82 test reports shall detail luminous efficacy, luminous flux, chromaticity coordinates, CCT and CRI values at all tested temperatures. Linear interpolation shall be employed to determine LED light engine or GU24 based integrated LED lamp ("source") photometric performance at temperatures between the LM-82 reported temperatures higher and lower than the *in situ* temperature. Luminaires incorporating more than one source shall have all sources installed and operational during *in situ* temperature testing. **Sample Size**: • 1 complete luminaire (source installed); and • 2 additional sources external to luminaire; and • Any components and/or materials required to install additional sources in luminaire. **Passing Test**: all source samples, tested *in situ* (installed in luminaire), shall pass.

Halogen Incandescent (outdoor only)	Qualification using halogen incandescent lamps is available for outdoor luminaires employing the following lampholders: E11, E26, G4, GX5.3, GY6.35, GY8.6 and R7S. Improved product efficiency is achieved through minimized operating time. Qualifying luminaire shall operate with an integral in-line motion sensor device that meets the following criteria: • ensures automatic shut-off of the lamp(s) within 15 minutes of being manually activated by a switch or automatically activated by the sensor; and, • automatically resets to sensing mode within 6 hours of a manual override or testing operation; and, • has an indicator that visibly or audibly informs the device operator that the motion sensor is operating properly, or that it has failed or malfunctioned; and, • meets Off-State Power Consumption Requirements in this specification With the exception of manual override or testing operation, luminaires may not continuously operate the lamps. Luminaires may not offer any form of permanent motion sensor defeat. Additionally, instructions provided with luminaire may not detail permanent methods of defeat.	Lampholder: ANSI/ANSLG C81.62-2009	None.

Luminous Efficacy, Output and Zonal Lumen Density Requirements: DIRECTIONAL RESIDENTIAL Luminaires

Note: Luminaire types denoted as directional on the first page of this specification shall be evaluated based on luminaire photometry. The performance values in this section pertain to the performance of the entire luminaire, including optics.

Luminaire Type	ENERGY STAR Requirements			Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
	Luminaire Efficacy (initial)	Luminaire Minimum Light Output (initial)	Luminaire Zonal Lumen Density Requirement		
Cove Mount	45 lm/W	Luminaire shall deliver a minimum of 200 lumens per lineal foot. The minimum required light output (in lumens) is calculated by dividing the measured luminaire length in inches by 12, then multiplying the result by 200. Note: The equation applies to all luminaire configurations. For rectangular geometries the "measured luminaire length" is the longest dimension of the luminaire. For circular geometries the "measured luminaire length" is the diameter.	Asymmetrically, luminaire shall deliver a minimum of 35% of total lumens within the zone 30° to 60° from the zenith.	Fluorescent: IES LM-41-11 Solid State: IES LM-79-08 High Intensity Discharge: IES LM-46-04 ANSI/ANSLG C78.81-2010 (for T8) IEC 60081 data sheets (for T5)	Laboratory test results shall be produced using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver that will be used in production. Linear fluorescent luminaires which do not ship with lamps shall be tested using a lamp model compliant with ANSI/ANSLG C78.81-2010 (for T8) or IEC 60081 data sheets (for T5). Fluorescent luminaires with ballast(s) capable of operating multiple fluorescent lamp types shall be tested either with the lamp model shipped with the luminaire, or if a lamp is not supplied, with the highest power lamp type detailed on the packaging. High intensity discharge luminaires with ballast(s) capable of operating multiple lamp types shall be tested with the lamp model shipped with the luminaire. For downlights, one trim ring and one reflector may be used with the three luminaire samples. **Sample Size**: ≥ 3 complete luminaires. **Passing Test**: all luminaires shall pass.
Downlights: • **recessed** • **surface** • **pendant** • **SSL downlight retrofits**	42 lm/W	≤ 4.5" aperture: 345 lumens > 4.5" aperture: 575 lumens	Luminaire shall deliver a minimum of 75% of total initial lumens within the 0-60° zone (axially symmetric about the nadir)		
Accent Lights • **includes line voltage track heads** • **includes directional ceiling fan light kits**	35 lm/W	Luminaire shall deliver a minimum of 200 lumens per head.	Luminaire shall deliver a minimum of 80% of total initial lumens within the 0-40° zone (axially symmetric about the center of the beam).		

Under Cabinet	29 lm/W	Luminaire shall deliver a minimum of 125 lumens per lineal foot. The minimum required light output (in lumens) is calculated by dividing the measured luminaire length in inches by 12, then multiplying the result by 125. Note: The equation applies to all luminaire configurations. For rectangular geometries the "measured luminaire length" is the longest dimension of the luminaire. For circular geometries the "measured luminaire length" is the diameter.	Referring to the plane perpendicular to the length of the luminaire, the luminaire shall deliver a minimum of 60% of total initial lumens within the 0-60° zone (symmetric about the nadir) and a minimum of 12.5% of total initial lumens within the 60-90° zone aimed toward the backsplash. Partner shall provide instructions with the luminaire noting which direction to install the luminaire to ensure this performance.		
Outdoor Post-Mounted Luminaires (Note: for mounting between 4 feet and 10.5 feet above grade)	35 lm/W	Luminaire shall deliver a minimum of 300 lumens.	Luminaire shall deliver 95% of total lumens within the 0°- 85° zone (symmetric about the nadir). Luminaire shall not emit light above 90°.	Fluorescent: IES LM-10-11 Solid State: IES LM-79-08 High Intensity Discharge: IES LM-31-11	
Inseparable SSL Luminaire (SSL luminaire types not otherwise noted in this table)	70 lm/W	None.	None.	IES LM-79-08	

Luminous Efficacy, Output and Zonal Lumen Density Requirements: DIRECTIONAL COMMERCIAL Luminaires

Note: Luminaire types denoted as directional on the first page of this specification shall be evaluated based on luminaire photometry. The performance values in this section pertain to the performance of the entire luminaire, including optics.

Note: ENERGY STAR qualification is available for only the following commercial luminaire types. Other commercial luminaire types will not be reviewed for qualification.

Luminaire Type	ENERGY STAR Requirements			Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
	Luminaire Efficacy (initial)	Luminaire Minimum Light Output (initial)	Luminaire Zonal Lumen Density Requirement		
Portable Desk Task	29 lm/W	Luminaire shall deliver a minimum of 200 lumens.	Luminaire shall deliver a minimum of 85% of total lumens (initial) within the 0-60° zone (symmetric about the center of the beam).	Fluorescent: IES LM-41-11 Solid State: IES LM-79-08 High Intensity Discharge: IES LM-46-04 ANSI/ANSLG C78.81-2010 (for T8) IEC 60081 data sheets (for T5)	Laboratory test results shall be produced using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver that will be used in production. Linear fluorescent luminaires which do not ship with lamps shall be tested using a lamp model compliant with ANSI/ANSLG C78.81-2010 (for T8) or IEC 60081 data sheets (for T5). Fluorescent luminaires with ballast(s) capable of operating multiple fluorescent lamp types shall be tested either with the lamp model shipped with the luminaire, or if a lamp is not supplied, with the highest power lamp type detailed on the packaging. High intensity discharge luminaires with ballast(s) capable of operating multiple lamp types shall be tested with the lamp model shipped with the luminaire. For downlights, one trim ring and one reflector may be used with the three luminaire samples. **Sample Size**: ≥ 3 complete luminaires. **Passing Test**: all luminaires shall pass.
Downlights: • **recessed** • **surface** • **pendant** • **SSL downlight retrofits**	42 lm/W	≤ 4.5" aperture: 345 lumens > 4.5" aperture: 575 lumens	Luminaire shall deliver a minimum of 75% of total lumens (initial) within the 0-60° zone (axially symmetric about the nadir).		
Under Cabinet	29 lm/W	Luminaire shall deliver a minimum of 125 lumens per lineal foot. The minimum required light output (in lumens) is calculated by dividing the measured luminaire length in inches by 12, then multiplying the result by 125. Note: The equation applies to all luminaire configurations. For rectangular geometries the "measured luminaire length" is the longest dimension of the luminaire. For circular geometries the "measured luminaire length" is the diameter.	Referring to the plane perpendicular to the length of the luminaire, the luminaire shall deliver a minimum of 60% of total lumens (initial) within the 0-60° zone (symmetric about the nadir) and a minimum of 12.5% of total lumens (initial) within the 60-90° zone aimed towards the backsplash. Partner shall provide instructions with the luminaire noting which direction to install the luminaire to ensure this performance.		
Accent Lights • **includes line voltage track heads** • **includes directional ceiling fan light kits**	35 lm/W	Luminaire shall deliver a minimum of 200 lumens per head.	Luminaire shall deliver a minimum of 80% within the 0-40° zone (axially symmetric about the center of the beam).		

Light Source Life Requirements: All Luminaires

<table>
<tr><th>Source Type</th><th>ENERGY STAR Requirements</th><th>Methods of Measurement and/or Reference Standards</th><th>Supplemental Testing Guidance</th></tr>
<tr><td>Fluorescent
• linear
• compact
• self ballasted compact (GU24)
• circline</td><td rowspan="2">For lamps shipped with luminaires, the average rated life of the source shall be ≥ 10,000 hours.

If the lamp is not shipped with the luminaire, product packaging shall meet the requirements set forth in the “Product Labeling & Packaging Requirements section of this specification.

<u>Exception</u>:
Covered and dimmable versions of GU24 based self-ballasted lamps are required to meet reduced life requirements as outlined in qualification requirements for those lamps.

Conditional qualification may be granted if both of the following are met:
1. Testing has been completed for at least 40% of rated life.
2. A date for testing completion has been established by the test laboratory.

Conditional qualification shall be immediately withdrawn if final testing results do not meet the above requirement.</td><td>Linear & circline:
IES LM-40-01

Compact & self ballasted compact:
IES LM-65-01</td><td rowspan="2">Laboratory test results shall be produced using the specific lamp model that will operate in the luminaire and either the ballast model that will operate in the luminaire or a commercially-available ballast model that meets the applicable ANSI ballast requirements, if applicable, for the light source being tested.

Sample Size: ≥ 10 samples of each lamp model shall be tested.

Passing Test: ≥ 50% of the sample set shall be functioning at the lifetime requirement.</td></tr>
<tr><td>High Intensity Discharge
• metal halide
• ceramic metal halide
• high pressure sodium</td><td>IES LM-47-11</td></tr>
<tr><td>Halogen Incandescent (outdoor only)</td><td>Lamps shipped with luminaires shall feature a rated life of ≥ 2,500 hours.</td><td>IES LM-49-11</td><td>Laboratory test results shall be produced using the specific lamp model that will operate in the luminaire (as applicable).

Sample Size: ≥ 10 samples of each lamp model shall be tested.

Passing Test: ≥ 50% of the sample set shall be functioning at the lifetime requirement.</td></tr>
<tr><td>Solid State</td><td colspan="3">The LED package(s) / LED module(s) / LED array(s), including those incorporated into LED light engines or GU24 based integrated LED lamps, shall meet the following L_{70} lumen maintenance life values (refer to Lumen Maintenance Requirements in the next section):

• 25,000 hours for residential grade indoor luminaires
• 35,000 hours for residential grade outdoor luminaires
• 35,000 hours for commercial grade luminaires

Lumen maintenance life projection claims in excess of the above requirements shall be substantiated with a TM-21 lumen maintenance life projection report.</td></tr>
</table>

Lumen Maintenance Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	For lamps indicated on the luminaire packaging or shipped with the luminaire, the lamp shall have an average rated lumen maintenance of at least 80% of initial lamp lumens at 40% (4,000 hours minimum) rated lamp life.	Linear & circline: IES LM-40-01 IES LM-09-99 Compact & self ballasted compact: IES LM-65-01 IES LM-66-00	Laboratory test results shall be produced using the specific lamp model that will operate in the luminaire and either the ballast model that will operate in the luminaire or a commercially-available ballast model that meets the applicable ANSI ballast requirements, if applicable, for the light source being tested. **Sample Size**: ≥ 10 samples of each lamp model shall be tested. **Passing Test**: ≥ 80% of the samples shall achieve the required lumen maintenance value.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**		IES LM-47-01	
Solid State Option 1: LED Package, Module or Array Performance (select either option 1 or option 2, below)	The LED package(s) / module(s) / array(s), including those incorporated into LED light engines or GU24 based integrated LED lamps, shall meet the following L_{70}(6k) rated lumen maintenance life values, *in situ*: • L_{70}(6k) ≥ 25,000 hours for residential indoor • L_{70}(6k) ≥ 35,000 hours for residential outdoor, or commercial Compliance with the above shall be documented with a TM-21 lumen maintenance life projection report. The report shall be generated using data from the LM-80 test report for the employed LED package/module/array model ("device"), the forward drive current applied to each device, and the *in situ* TMP_{LED} temperature of the hottest LED in the luminaire. In addition to LM-80 reporting requirements, the following information shall be reported: • sampling method and sample size (per LM-80 section 4.3) • test results for each T_S and drive current combination • description of device including model number and whether device is an LED package, module or array (see Definitions) • ANSI target, and calculated CCT value(s) for each device in sample set • Δ u'v' chromaticity shift value on the CIE 1976 diagram for each device in sample set • a detailed rationale, with supporting data, for application of results to other devices (e.g. LED packages with other CCTs) Access to the TMP_{LED} for the hottest LED may be accomplished via a minimally sized hole in the luminaire housing, tightly resealed with a suitable sealant if created for purposes of testing. All thermocouple attachments and intrusions to luminaire housing shall be photographed.	Lumen maintenance measurement: IES LM-80-08 Lumen maintenance projection: IES TM-21-11 (in draft as of February 2011) Chromaticity specifications: ANSI/NEMA/ANSLG C78.377-2008 CCT calculation: CIE 15.2004	For downlights, one trim ring and one reflector may be used with the three luminaire samples. **Luminaire Sample Size**: 3 complete luminaires. **LM-80 Sample Size:** minimum sample size of 20 units for LED packages, modules or arrays, for each T_S and drive current combination. Each sample set may be composed entirely of one target CCT, or may be split between no more than two adjacent target CCT values as outlined in ANSI C78.377 (e.g. 2700 and 3000K, or 3000K and 3500K). **Passing Test**: all of the conditions below shall be met. If any of the conditions are not met, the component performance option may not be used and the applicant shall use Option 2, below, for compliance. 1. In each sample luminaire, the *in situ* TMP_{LED} temperature is less than or equal to the temperature specified in the LM-80 test report for the corresponding or higher drive current, within the manufacturer's specified operating current range. 2. The drive current measured in the luminaire is less than or equal to the drive current specified in the LM-80 test report at the corresponding temperature or higher. 3. The TM-21 lumen maintenance life projection report projects an L_{70} meeting or exceeding requirements.

Solid State Option 2: Luminaire, LED Light Engine or GU24 Based Integrated LED Lamp Performance (select either option 2 or option 1, above)	Directional luminaires: using data collected at zero and 6,000 hours, the luminaire shall deliver at 6,000 hours the fraction of initial lumens specified below: Non-directional luminaires: using data collected at zero and 6,000 hours, each LED light engine or GU24 based integrated LED lamp shall deliver at 6,000 hours the fraction of initial lumens specified below: • indoor luminaires: ≥ 91.8% • outdoor luminaires: ≥ 94.1% • commercial luminaires: ≥ 94.1% These percentages are based on exponential decay functions for 25,000 hours and 35,000 hours to determine the 6,000 hour lumen maintenance necessary to achieve those rated lumen maintenance life values.	Directional luminaires: IES LM-79-08 Non-directional luminaires: IES LM-82-11 (in draft as of February 2011) Interim operation: ANSI/UL 153-2002 ANSI/UL 1574-2004 ANSI/UL 1598-2008	For downlights, one trim ring and one reflector may be used with the three luminaire samples. Directional: luminaire shall be operated continuously in accordance with ANSI/UL 1598-2008, ANSI/UL 1574-2004 or ANSI/UL 153-2002 during the interim 6,000 hours; any deviations from this shall be reported. Non-directional: LED light engines or GU24 based integrated LED lamps ("source") shall be operated continuously *in situ* (installed in the luminaire), with the luminaire operating in accordance with ANSI/UL 153-2002, ANSI/UL 1574-2004 or ANSI/UL 1598-2008 during the interim 6,000 hours. Luminaires incorporating more than one source shall have all sources installed and operational during the interim 6,000 hours. During initial and final LM-82 measurements, T_b temperature shall be controlled to match T_b temperature measured when source is operated *in situ*. LM-82 test reports shall detail efficacy, luminous flux, chromaticity coordinates, CCT and CRI values at all tested temperatures. **Sample Size**: Directional: 3 complete luminaires. Non-directional: 3 sources and the necessary number of luminaires required to operate the sources continuously *in situ*. **Passing Test**: all luminaires or sources shall pass.
Halogen Incandescent (outdoor only)	Exempt.		

Correlated Color Temperature (CCT) Requirements: All Indoor Luminaires (Exemption: Outdoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Lamps shipped with luminaires shall have one of the following nominal correlated color temperatures (CCT): • 2700 Kelvin • 3000 Kelvin • 3500 Kelvin • 4000 / 4100 Kelvin • 5000 Kelvin (commercial only) Lamps shipped with luminaire shall consistently meet the above requirement, as verified by consistency data provided by the lamp vendor to the luminaire manufacturing partner. If the lamp is not shipped with the luminaire, product packaging shall meet the requirements set forth in Product Labeling & Packaging Requirements.	Measurement (linear & circline): IES LM-9-09 Measurement (compact & self ballasted compact): IES LM-66-00 Calculation: CIE 15.2004 Chromaticity tolerance: ANSI C78.376-2001	Laboratory test results shall be produced using the specific lamp model that will operate in the luminaire and either the ballast model that will operate in the luminaire or a commercially-available ballast model that meets the applicable ANSI ballast requirements, if applicable, for the light source being tested. **Sample Size**: ≥ 10 samples of each lamp model shall be tested. **Passing Test**: ≥ 90% of the lamps tested shall fall within a 7-step MacAdam ellipse for the designated CCT, with ellipses constructed using the Objective Chromaticities detailed in Table 1 of ANSI C78.376-2001, and the referenced MacAdam publication.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**		Measurement: IES LM-51-00 Calculation: CIE 15.2004 Chromaticity tolerance: ANSI C78.376-2001	
Solid State	The luminaire (directional luminaires), or replaceable LED light engine or GU24 based integrated LED lamp (non-directional luminaires) shall have one of the following nominal correlated color temperatures (CCTs): • 2700 Kelvin • 3000 Kelvin • 3500 Kelvin • 4000 Kelvin • 5000 Kelvin (commercial only) The luminaire, LED light engine or GU24 based integrated LED lamp shall also fall within the corresponding 7-step chromaticity quadrangles as defined in ANSI/NEMA/ANSLG C78.377-2008.	Chromaticity tolerance: ANSI/NEMA/ANSLG C78.377-2008 Measurement (directional): IES LM-79-08 Measurement (non-directional): IES LM-82-11 (in draft as of February 2011) *In situ* (installed in the luminaire) measurements (non-directional): ANSI/UL 153-2002 ANSI/UL 1574-2004 ANSI/UL 1598-2008 Calculation: CIE 15.2004	For downlights, one trim ring and one reflector may be used with the three luminaire samples. Non-directional: LED light engine or GU24 based integrated lamp ("source") CCT shall meet the requirement as determined by comparing the *in situ* (installed in the luminaire) T_b value to the LM-82 test report. LM-82 test reports shall detail luminous efficacy, luminous flux, chromaticity coordinates, CCT and CRI values for all tested temperatures. Linear interpolation shall be employed to determine source photometric performance at temperatures between the LM-82 reported temperatures higher and lower than the *in situ* temperature. Luminaires incorporating more than one source shall have all sources installed and operational during *in situ* temperature testing. **Sample Size**: 3 complete luminaires, or 3 sources and 1 luminaire. **Passing Test**: all luminaires or sources (installed in the luminaire) shall pass.
Halogen Incandescent (outdoor only)	Exempt.		

Color Rendering Requirements: All Indoor Luminaires
(Exemption: Outdoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Lamps shipped with luminaires shall meet or exceed $R_a \geq 80$.	Measurement (linear & circline): IES LM-9-09 Measurement (compact and self ballasted compact): IES LM-66-00 Calculation: CIE 13.3-1995	Laboratory test results shall be produced using the specific lamp model that will operate in the luminaire and either the ballast model that will operate in the luminaire or a commercially-available ballast model that meets the applicable ANSI ballast requirements, if applicable, for the light source being tested. **Sample Size**: ≥ 10 samples of each lamp model shall be tested. **Passing Test**: ≥ 80% of the samples shall achieve the required color rendering index value.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**		Measurement (high intensity discharge): IES LM-51-00 Calculation: CIE 13.3-1995	
Solid State	The luminaire (directional luminaires), or replaceable LED light engine or GU24 based integrated LED lamp (non-directional luminaires) shall meet or exceed $R_a \geq 80$.	Directional measurement: IES LM-79-08 Non-directional measurement: IES LM-82-11 (in draft as of February 2011) *In situ* (installed in the luminaire) temperature measurements (non-directional): ANSI/UL 153-2002 ANSI/UL 1574-2004 ANSI/UL 1598-2008 Calculation: CIE 13.3-1995	For downlights, one trim ring and one reflector may be used with the three luminaire samples. Non-directional: LED light engine or GU24 based integrated LED lamp ("source") CRI shall meet the requirement as determined by comparing the *in situ* (installed in the luminaire) T_b value to the LM-82 test report. LM-82 test reports shall detail luminous efficacy, luminous flux, chromaticity coordinates, CCT and CRI values for all tested temperatures. Linear interpolation shall be employed to determine source photometric performance at temperatures between the LM-82 reported temperatures higher and lower than the *in situ* temperature. Luminaires incorporating more than one source shall have all sources installed and operational during *in situ* temperature testing. **Sample Size**: 3 complete luminaires, or 3 sources and 1 luminaire. **Passing Test**: all luminaires or sources (installed in the luminaire) shall pass.
Halogen Incandescent (outdoor only)	Exempt.		

Color Angular Uniformity Requirements: Directional Solid State Indoor Luminaires Only (Exemption: Outdoor Luminaires)

ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Throughout the zonal lumen density angles detailed on pages 13 to 16, and five degrees beyond, the variation of chromaticity shall be within 0.004 from the weighted average point on the CIE 1976 (u',v') diagram.	Measurement: IES LM-79-08 IES LM-58-11 Calculations: CIE 15: 2004	Vertical angular scanning resolution shall be 1 degree on the 0 and 90 degree vertical planes, and Δ u',v' distance shall be reported for each vertical angle measured. **Sample Size**: 1 complete luminaire. **Passing Test**: the luminaire shall pass.

Color Maintenance Requirements: Solid State Indoor Luminaires Only (Exemption: Outdoor Luminaires)

ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
The change of chromaticity over the first 6,000 hours of luminaire operation shall be within 0.007 on the CIE 1976 (u',v') diagram, as demonstrated by either: • the IES LM-80 test report for the employed LED package/array/module model, or • as demonstrated by a comparison of luminaire chromaticity data in LM-79 reports at zero and 6,000 hours, or • as demonstrated by a comparison of LED light engine or GU24 based integrated LED lamp chromaticity data in LM-82 reports at zero and 6,000 hours	IES LM-80-08 IES LM-79-08 IES LM-82-11 (in draft as of February 2011) Interim operation: ANSI/UL 153-2002 ANSI/UL 1574-2004 ANSI/UL 1598-2008	Laboratory test results shall be produced using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver that will be used in production. For the LM-79 option, luminaire shall be operated continuously in accordance with ANSI/UL 1598-2008, ANSI/UL 1574-2004 or ANSI/UL 153-2002 during the interim 6,000 hours; any deviations from this shall be reported. For the LM-82 option, LED light engines or GU24 based integrated LED lamps ("source") shall be operated continuously *in situ* (installed in the luminaire) and in accordance with ANSI/UL 153-2002, ANSI/UL 1574-2004 or ANSI/UL 1598-2008 during the interim 6,000 hours. During initial and final LM-82 measurements, T_b value shall be controlled to match T_b value measured when source is operated *in situ*. Luminaires incorporating more than one source shall have all sources installed and operational during *in situ* temperature testing and during the interim 6,000 hours. LM-82 test reports shall detail luminous efficacy, luminous flux, chromaticity coordinates, CCT and CRI values for all tested temperatures. **Sample Size (LM-80 option)**: same as Lumen Maintenance, Option 1. **Sample Size (LM-79 option)**: 3 complete luminaires. **Sample Size (LM-82 option)**: • 1 complete luminaire sample (source installed); and • 2 additional source samples external to luminaire; and • Any components and/or materials required to install additional sources in luminaire. **Passing Test (LM-80 option)**: for all LM-80 samples, at any measurement point from zero through 6,000 hours, the distance of the chromaticity coordinates from the initial (zero-hour) chromaticity coordinates shall not exceed 0.007 at the temperature(s) adjacent to the measured *in situ* TMP_{LED} temperature, and at the corresponding drive current. Example 1: an LM-80 test report provides data at T_S= 55°C, 85°C and 105°C, and the measured *in situ* TMP_{LED} temperature value is 89°C. Neither the 85°C nor the 105°C LM-80 data may show chromaticity shift exceeding 0.007 at any measurement point from zero through 6,000 hours, for the corresponding drive current. The LM-80 chromaticity data at 55°C is disregarded. Example 2: an LM-80 test report provides data at T_S= 58°C, 87°C and 106°C, and the measured *in situ* TMP_{LED} temperature value is 53°C. The LM-80 data at 58°C may not show chromaticity shift exceeding 0.007 at any measurement point from zero through 6,000 hours, for the corresponding drive current. The LM-80 chromaticity data at 87°C and 106°C is disregarded. **Passing Test (LM-79 option)**: at 6,000 hours the distance of the chromaticity coordinates from the initial chromaticity coordinates shall not exceed 0.007. The output at zero degrees on both vertical planes shall be compared. **Passing Test (LM-82 option)**: at 6,000 hours the distance of the chromaticity coordinates from the initial chromaticity coordinates shall not exceed 0.007.

Light Source Shipment Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **compact** • **self ballasted compact (GU24)** • **circline** **High Intensity Discharge** • **metal halide** • **ceramic metal halide** • **high pressure sodium** **Solid State: Non-Directional** • **integrated LED lamp (GU24)** **Halogen Incandescent (outdoor only)**	All luminaires shall be shipped with a lamp for each lampholder. Partner manufacturers of recessed downlights are strongly encouraged to employ a packaging method ensuring that shipped lamps remain with the luminaire during drywall installation and painting (e.g. taping the lamp carton to the inside of the canister, employing shrink wrapping of the canister aperture to enclose the lamp carton within, employing a compression-fitted cardboard insert to enclose the lamp carton within the canister). Exceptions: 1. Linear fluorescent luminaires. 2. Outdoor luminaires employing ANSI E26 lampholder(s). 3. Downlights incorporating multi-wattage ballast(s) and lampholder(s) accepting lamps of all wattages supported by the ballast. Lamps shall utilize an ANSI/IEC standardized lamp base configuration. Fluorescent, high intensity discharge and GU24 based integrated LED lamps or lamp bases shall include markings which detail the lamp manufacturer name, wattage, correlated color temperature, and color rendering index. Generic NEMA or ANSI lamp descriptions including a color designation are acceptable. Alternatively information may be included on lamp packaging only in instances where a lamp's physical dimensions will not allow lamp or lamp base labeling. In addition, lamp dimensions and electrical parameters shall either: • Meet the requirements of an ANSI/IEC standardized lamp specification sheet if an applicable standard exists; or, • If no ANSI/IEC lamp standard exists (e.g., a spiral compact fluorescent lamp), provide a lamp manufacturer specification sheet that describes the following (use the ANSI lamp data sheets found in ANSI/IEC C78.901-2005 and ANSI/ANSLG C78.81-2010 as a reference for the format and type of information requested): 1. lamp description, including lamp model number, nominal wattage, bulb designation / lamp size (e.g. T4, T5, T8) and lamp base type as defined by ANSI/ANSLG C81.61-2009; or IEC 60061-1(e.g. 2G13, GR10q), starting circuit application (i.e., rapid start, preheat, etc.) 2. Dimensional characteristics, including diagram 3. Lamp operating characteristics, including: approximate wattage (W), voltage(V), current (A)	Lamp base configuration: ANSI/ANSLG C81.61-2009 Lamps compliant with an ANSI-IEC standard (for lamp dimensions and electrical parameters): For compact fluorescent lamps: ANSI/IEC C78.901-2005; IEC 60901 For linear lamps: ANSI/ANSLG C78.81-2010; IEC 60081 Lamps not compliant with an ANSI-IEC standard (for lamp dimensions and electrical parameters): ANSI/IEC C78.901-2005; ANSI C78.81-2010 (used as a reference for the format and type of information required on a custom lamp specification sheet)	None.
Solid State: Non-Directional • **LED light engine**	Complete light source components shall be provided with the luminaire.	Recommendations outlined in NEMA LSD 45-2009 shall be followed.	
Solid State: Directional		No standard available.	

Electrical Performance Requirements

Source Start Time Requirements: Directional and Non-Directional Luminaires (Exemption: Outdoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Light source shall remain continuously illuminated within one second of application of electrical power.	ANSI C82.11 Consolidated-2002 Section-5.2	Laboratory test results shall be produced using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver that will be used in production. **Sample Size**: ≥ 3 samples of each lamp-ballast model combination, or LED package/LED module/LED array and LED driver model combination shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**		None referenced. Note: For indoor luminaires EPA does not allow the starting times detailed in ANSI C82.4-2002.	
Solid State		No standard available (as of February 2011).	
Halogen Incandescent (outdoor only)			

Source Run-Up Time Requirements: Directional and Non-Directional Luminaires (Exemption: Outdoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Elapsed time for lamps to reach 90% of stabilized lumen output after application of electrical power shall be: • ≤ 1 minute for non-amalgam lamps • ≤ 3 minutes for amalgam lamps	Linear & circline: No standard available (as of February 2011). Compact & self-ballasted compact: ANSI C78.5-2003, clause 4.8.	Laboratory test results shall be produced using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver that will be used in production. **Sample Size**: ≥ 3 samples of each lamp-ballast model combination, or LED package/LED module/LED array and LED driver model combination shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**	Light source shall reach 90% of stabilized lumen output within one minute of application of electrical power.	None referenced. Note: For indoor luminaires EPA does not allow the warm-up times detailed in ANSI C82.4-2002.	
Solid State		No standard available (as of February 2011).	
Halogen Incandescent (outdoor only)	Exempt		

Light Source Replaceability Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	The luminaire's lampholder(s) shall be designed to accept lamps with ANSI/IEC standardized lamp base configurations for each lamp input power for which the luminaire and packaging is labeled. Factory-installed locking non-removable adapters converting screw base lampholders to accept GU24 based lamps may be employed. Partners shall not include in luminaire packaging adapters converting GU24 lampholders to accept screw base lamps. Note: With the exception of halogen incandescent outdoor luminaires and some high intensity discharge luminaires, luminaires employing screw base lampholders (i.e. ANSI E26, E26d E12, E17, E39, E39d) without dedicated ballasts are not eligible to earn the ENERGY STAR.	Lampholder configuration: ANSI/IEC C81.62-2009	None.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			
Solid State: Non-Directional • **integrated LED lamp (GU24)**			
Halogen Incandescent (outdoor only)			
Solid State: Non-Directional • **LED light engine**	LED light engines shall make use of electrical interconnects which allow for consumer replacement of the engine without the cutting of wires or the use of solder. Luminaires which cannot meet this requirement are to be evaluated as inseparable SSL luminaires (see directional luminaire requirements below and throughout this specification).	No standard available (as of February 2011). Recommendations outlined in NEMA LSD 45-2009 shall be followed.	
Solid State: Directional	Exempt.		

Dimming Requirements: All Luminaires Marketed as Dimmable (Exemption: Non-Dimmable Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear**	The luminaire and its components shall meet the applicable requirements outlined in currently available industry dimming standards. Step dimming, if employed, shall provide at least two discrete light output levels ≥ 35% of total light output and not including 100% output. Luminaires employing linear T8 lamps shall meet dimming requirements outlined in NEMA LL 9-2010. Luminaires employing linear T5 lamps shall meet dimming requirements outlined in the IEC 60081 lamp data sheets. Note: as of February 2011, dimming requirements are pending.	Linear T8: NEMA LL 9-2009 Linear T5: IEC 60081 lamp data sheets (as of February 2011, being updated to include dimming requirements): 6520: 14 watt 6530: 21 watt 6620: 24 watt 6640: 28 watt 6650: 35 watt 6730: 39 watt 6750: 49 watt 6840: 54 watt 6850: 80 watt	Laboratory test results shall be produced using the specific ballast model that will operate in the luminaire. Linear fluorescent luminaires which do not ship with lamps shall be tested using a lamp model detailed on the luminaire and its packaging. **Sample Size**: ≥ 3 samples of each ballast model shall be tested. **Passing Test**: all samples shall pass.
Fluorescent • **compact** • **self ballasted compact (GU24)** • **circline**	The luminaire and its components shall provide continuous dimming from 100% to 35% of total light output. Step dimming, if employed, shall provide at least two discrete light output levels ≥ 35% of total light output and not including 100% output.	No standard available (as of February 2011).	Laboratory test results shall be produced using the specific lamp and ballast models that will be used in production. **Sample Size**: ≥ 3 samples of each lamp-ballast model combination shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**	The luminaire and its components shall provide continuous dimming from 100% to 50% of lamp power. Step dimming, if employed, shall provide at least two discrete light output levels ≥ 50% of total light output and not including 100% output.		
Solid State	The luminaire and its components shall provide continuous dimming from 100% to 35% of total light output. Step dimming, if employed, shall provide at least two discrete light output levels ≥ 35% of total light output and not including 100% output.		Laboratory test results shall be produced using the models of LED package, LED module or LED array and LED driver combination that will be used in production. **Sample Size**: ≥ 3 samples of each model combination, LED light engine or GU24 based integrated LED lamp shall be tested. **Passing Test**: all samples shall pass.
Halogen Incandescent (outdoor only)	Luminaire shall not feature dimming operation.		None.

Photosensor Control Requirement: Halogen Incandescent Outdoor Luminaires Only (Exemption: Indoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Halogen Incandescent (outdoor only)	The luminaire shall contain an integrated photosensor that automatically prevents operation during daylight hours. In addition, the control shall automatically reactivate within 6 hours of a manual override or testing operation.	No standard available.	None.

Power Factor Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Residential : ≥ 0.5 Commercial: ≥ 0.9	Measurement: ANSI C82.2-2002	Laboratory test results shall be produced using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver that will be used in production. **Sample Size**: ≥ 3 samples of each model combination shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**	≥ 0.90	ANSI C82.6-2005	
Solid State	Total luminaire input power less than or equal to watts: PF ≥ 0.5 Total luminaire input power greater than 5 watts: Residential: PF ≥ 0.7 Commercial: PF ≥ 0.9	ANSI C82.77-2002 sections 6 and 7	
Halogen Incandescent (outdoor only)	Exempt.		

Transient Protection Requirements: All Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Ballast or driver shall comply with ANSI/IEEE C62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode.	ANSI/IEEE C62.41-1991	Laboratory test results shall be produced using the specific models of ballast that will be used in production. **Sample Size**: ≥ 3 samples of each ballast model shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			
Solid State			Laboratory test results shall be produced using the specific models of LED package, LED module or LED array and LED driver combination that will be used in production. **Sample Size**: ≥ 3 samples of each LED package, LED module or LED array and LED driver model combination, LED light engine, or GU24 based integrated LED lamp shall be tested. **Passing Test**: all samples shall pass.
Halogen Incandescent (outdoor only)	Whole luminaire, including photosensor and motion sensor, shall comply with ANSI/IEEE C62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode.		Laboratory test results shall be produced using the specific lamp model that will be used in production (if applicable). **Sample Size**: ≥ 3 luminaire samples shall be tested. **Passing Test**: all samples shall pass.

Lamp Current Crest Factor Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **circline**	≤ 1.7	Linear & circline: ANSI C82.11 Consolidated-2002 Sections 3.3.3 and 5.6 unless otherwise specified in ANSI C78.81. Compact: ANSI/IEC C78.901-2005	Laboratory test results shall be produced using the specific ballast model that will operate in the luminaire. **Sample Size**: ≥ 3 samples of each ballast model shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**	≤ 1.8	Metal halide: ANSI/ANSLG C78.43-2007 High pressure sodium: ANSI/ANSLG C78.42-2009 Measurement: ANSI C82.6-2005 section 6.9	
Fluorescent • **self ballasted compact (GU24)**	Exempt.		
Solid State			
Halogen Incandescent (outdoor only)			

Off-State Power Consumption Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
All Source Types	Luminaires shall not draw power in the off state. Exception: Luminaires with integral motion sensors, photosensors or individually addressable luminaires with external control and intelligence shall consume no more than 1 watt in the off state. Exception: Power supplies connected to multiple luminaires may draw up to 1.5 watts in the off state. Exception: External power supplies (EPS) employed to power luminaires shall meet the level V performance requirements under the International Efficiency Marking Protocol and include the level V marking on the EPS. Additional information on the Marking Protocol is available at www.energystar.gov/powersupplies	No standard available.	Laboratory test results shall detail off-state power consumption to the tenth of a watt.

Operating Frequency Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	20 to 33 kHz or ≥ 40 kHz	ANSI C82.2-2002	Laboratory test results shall be produced using the specific ballast model that will operate in the luminaire. **Sample Size**: ≥ 3 samples of each ballast model shall be tested. **Passing Test**: all samples shall pass.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**	120 to 400 Hz or ≥100 kHz	Measurement: ANSI/ANSLG C78.43-2007 ANSI C78.389-2004 (R2009) ANSI/ANSLG C82.14-2006	
Solid State	Frequency ≥ 120 Hz Note: This performance characteristic addresses problems with visible flicker due to low frequency operation and applies to steady-state as well as dimmed operation. Dimming operation shall meet the requirement at all light output levels.	No standard available (as of February 2011).	Laboratory test results shall be produced using the specific luminaire, LED light engine or GU24 based integrated LED lamp used in the luminaire. Light output waveform shall be measured with a photodetector, transimpedance amplifier and oscilloscope. Employed equipment models and method of measurement shall be documented. Temporal response, amplification and filtering characteristics of the system shall be suitably designed to capture the photometric waveform. Digitized photometric waveform data and an image of the relative photometric amplitude waveform shall be recorded. **Sample Size**: ≥ 3 luminaires, LED light engines or GU24 based integrated LED lamps shall be tested. **Passing Test**: all samples shall pass.
Halogen Incandescent (outdoor only)	Exempt		

Ballast/Driver Replaceability Requirements: Directional and Non-Directional Luminaires (Exemption: Inseparable SSL Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Ballasts or drivers shall be accessible and removable by an electrician without the cutting of wires and without damage to the luminaire housing, trim, decorative elements or the carpentry (e.g., ceiling drywall) to which the luminaire is attached. Exceptions: 1. luminaires employing GU24 based self-ballasted lamps 2. line voltage directional track lights 3. solid state cove mount luminaires 4. under cabinet luminaires Instructions shall be provided with the luminaire, detailing guidance on ballast or driver replacement by a "qualified electrician".	No standard available.	None.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			
Solid State: Directional			
Solid State: Non-Directional • **replaceable LED light engine** • **integrated LED lamp (GU24)**	See Source Replaceability Requirements on page 26.		
Solid State: Inseparable SSL Luminaires	Exempt.		
Halogen Incandescent (outdoor only)	Not applicable.		

Noise Requirements: Directional and Non-Directional Luminaires (Exemption: Outdoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	All ballasts & drivers used within the luminaire shall have a Class A sound rating. Ballasts and drivers are recommended to be installed in the luminaire in such a way that in operation, the luminaire will not emit sound exceeding a measured level of 24 dBA.	None referenced.	None.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			
Solid State			
Halogen Incandescent (outdoor only)	Exempt.		

Electromagnetic and Radio Frequency Interference Requirements: Directional and Non-Directional Luminaires (Exemption: Halogen Incandescent Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline** **High Intensity Discharge** • **metal halide** • **ceramic metal halide** • **high pressure sodium**	Ballasts shall meet FCC requirements: • Non-consumer emission limits for ballasts or power supplies designated for commercial use • Consumer emission limits for ballasts or power supplies designated for residential use	Code of Federal Regulations: CFR Title 47 Part 18	**Sample Size**: 1 ballast. **Passing Test**: the ballast shall pass.
Solid State	Power supplies and/or drivers shall meet FCC requirements: • Class A for power supplies or drivers that are marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home. • Class B for power supplies or drivers that are marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Requirement shall be met at all dimming levels, as applicable.	Code of Federal Regulations: CFR Title 47 Part 15	**Sample Size**: 1 power supply or driver, or 1 LED light engine or GU24 based integrated LED lamp, or 1 full luminaire if power supply or driver is not separable from the luminaire. **Passing Test**: the sample shall pass.
Halogen Incandescent (outdoor only)	Exempt.		

Thermal Performance Requirements

Maximum Measured Ballast or Driver Case Temperature Requirement: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline** **High Intensity Discharge** • **metal halide** • **ceramic metal halide** • **high pressure sodium**	Ballast case temperature measured at thermal equilibrium, at the hot spot location provided by the ballast manufacturer, shall not exceed the maximum recommended ballast case temperature, as provided by ballast manufacturer, during *in situ* (installed in the luminaire) operation. Note: This performance characteristic is separate and distinct from thermal requirements governing safety rather than longevity of the ballast. All luminaires shall meet this requirement. Exceptions: • Indoor portable luminaires using GU24 lamps, where the lamp is centered between a shade that is open on the top and bottom	ANSI/UL 1598-2008 (Acceptable when the thermocouple is placed at the hot-spot location indicated by the ballast manufacturer.)	Laboratory test results shall be produced using the specific lamp and ballast models that will be used in production. Laboratory test results shall be produced using the luminaire with the highest operating temperature among all luminaires in a product family being qualified (as applicable). **Sample Size**: 1 luminaire shall be tested. **Passing Test**: Measured temperature at the hot spot location provided by the ballast manufacturer shall be less than or equal to the manufacturer recommended maximum.
Solid State: Directional	At the temperature measurement point for the hottest location on the driver case (TMP_C as detailed by the driver manufacturer), the measured driver case temperature at thermal equilibrium shall not exceed the driver manufacturer's maximum recommended temperature during *in situ* (installed in the luminaire) operation. Note: This performance characteristic is separate and distinct from safety requirements.		Laboratory test results shall be produced using the specific models of LED package, LED module or LED array and LED driver that will be used in production. Laboratory test results shall be produced using the luminaire with the highest operating temperature among all luminaires in a product family being qualified (as applicable). **Sample Size**: 1 luminaire shall be tested. **Passing Test**: Measured temperature at the TMP_C shall be less than or equal to the manufacturer recommended maximum.
Solid State: Non-Directional • **replaceable LED light engine** • **integrated LED lamp (GU24)**	At the temperature measurement point for the hottest location on the driver case (TMP_d as detailed by the driver manufacturer), the measured driver case temperature at thermal equilibrium shall not exceed the driver manufacturer's maximum recommended temperature during *in situ* (installed in the luminaire) operation. Note: This performance characteristic is separate and distinct from safety requirements.	ANSI/UL 1598-2008 (Acceptable when the thermocouple is placed at the hot-spot location indicated by the driver manufacturer.)	Laboratory test results shall be produced using the specific models of LED package, LED module or LED array and LED driver (i.e. LED light engine or GU24 based integrated LED lamp) ("source") that will be used in production. Laboratory test results shall be produced using the luminaire with the highest operating temperature among all luminaires in a product family being qualified (as applicable). Luminaires incorporating more than one source shall have all sources installed during testing. **Sample Size**: 1 source sample shall be tested *in situ* (installed in the luminaire). **Passing Test**: Measured temperature at the TMP_d shall be less than or equal to the manufacturer recommended maximum.
Halogen Incandescent (outdoor only)	Not applicable.		

Recessed Downlight Thermal Performance Requirements

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
All Source Types	**Insulation contact (Type IC):** Recessed downlights marketed as Type IC shall be approved for zero clearance insulation cover by an OSHA NRTL laboratory, and shall also meet the requirements for airtight luminaires, listed below. **Airtight construction:** Recessed downlight housings or certified/listed accessories marketed as airtight shall exhibit leakage less than 2.0 cubic feet per minute (CFM) at 75 Pascals (or 1.57 lbs/ft2) when tested in accordance with ASTM E283-04, and shall be sealed with a gasket or caulk. The following measures shall be taken to ensure that luminaires can be properly installed and inspected: 1. Product packaging shall meet the requirements set forth in the Product Labeling & Packaging Requirements. 2. The luminaire itself shall include a label certifying "airtight", or similar designation, to show air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283-04. The label shall be clearly visible to a building inspector. 3. Installation instructions shall be included listing all components of the assembly that will be necessary to ensure an airtight installation and how the components should be properly installed. For example, depending on the method used to achieve airtight installation, the instructions should alternatively show how a gasket is to be attached, what type of caulk to use and how it should be applied, or which certified airtight trim kits are designed to be installed with the luminaire housing.	ANSI/UL 1598-2008 ASTM E283-04	None.

Minimum Operating Temperature Requirements: Directional and Non-Directional Outdoor Luminaires (Exemption: Indoor Luminaires)

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
All Source Types	Luminaire shall have a minimum operating temperature of 0°F (-18°C) or below.	No standard available.	None.

Safety Requirements

Indoor Luminaire Safety: Portable Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Demonstrate compliance with ANSI/UL 153-2002.	ANSI/UL 153-2002	Documentation shall be produced by an OSHA NRTL laboratory.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			
Solid State	Demonstrate compliance with ANSI/UL 153-2002 and ANSI/UL 8750-2009.	ANSI/UL 153-2002 ANSI/UL 8750-2009	
Halogen Incandescent (outdoor only)	Not applicable.		

Indoor and Outdoor Luminaire Safety: Hardwired Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline**	Demonstrate compliance with ANSI/UL 1574-2004, ANSI/UL 1598-2008, ANSI/UL 2108-2004, as applicable.	ANSI/UL 1574-2004 ANSI/UL 1598-2008 ANSI/UL 2108-2004	Documentation shall be produced by an OSHA NRTL laboratory.
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**			
Solid State	Demonstrate compliance with ANSI/UL 1574-2004, ANSI/UL 1598-2008, ANSI/UL 1598B-2010, ANSI/UL 2108-2004, ANSI/UL 8750-2009, as applicable.	ANSI/UL 1574-2004 ANSI/UL 1598-2008 ANSI/UL 1598B-2010 ANSI/UL 2108-2004 ANSI/UL 8750-2009	
Halogen Incandescent (outdoor only)	Demonstrate compliance with ANSI/UL 1598-2008, ANSI/UL 2108-2004, as applicable.	ANSI/UL 1598-2008 ANSI/UL 2108-2004	

Electronic Ballast or Driver Safety Requirements: Ballasts, Drivers and "Non-Edison Base Fluorescent Adapters"

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **circline**	Demonstrate compliance with ANSI/UL 935-2009, ANSI/UL 1310-2005, ANSI/UL 1993-2009, as applicable. Demonstrate compliance with CSA 22.2 Number 74, or IEC 61374-2-3-am2 ed1.0 b.2006, as appropriate.	ANSI/UL 935-2001 ANSI/UL 1310-2005 ANSI/UL 1993-2009 End of life (linear T5): CSA 22.2 Number 74, or IEC 61374-2-3-am2 ed1.0 b.2006	Documentation shall be produced by an OSHA NRTL laboratory.
Fluorescent • **self ballasted compact (GU24)**	Demonstrate compliance with ANSI/UL 1310-2005, ANSI/UL 1993-2009, as applicable.	ANSI/UL 1310-2005 ANSI/UL 1993-2009	
High Intensity Discharge • **metal halide** • **ceramic metal halide** • **high pressure sodium**	Demonstrate compliance with ANSI/UL 1029-2010.	ANSI/UL 1029-2010	
Solid State: Non-Directional • **replaceable LED light engine**	Demonstrate compliance with ANSI/UL 1310-2005, ANSI/UL 2108-2004, ANSI/UL 8750-2009, as applicable.	ANSI/UL 1310-2005 ANSI/UL 8750-2009 ANSI/UL 2108-2004	
Solid State: Non-Directional • **integrated LED lamp (GU24)**	Demonstrate compliance with ANSI/UL 1310-2005, ANSI/UL 1993-2009, ANSI/UL 2108-2004, ANSI/UL 8750-2009, as applicable.	ANSI/UL 1310-2005 ANSI/UL 1993-2009 ANSI/UL 2108-2004 ANSI/UL 8750-2009	
Solid State: Directional	Demonstrate compliance with ANSI/UL 1310-2005, ANSI/UL 2108-2004, ANSI/UL 8750-2009, as applicable.	ANSI/UL 1310-2005 ANSI/UL 2108-2004 ANSI/UL 8750-2009	
Halogen Incandescent (outdoor only)	Not applicable.		

Product Labeling & Packaging Requirements

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline** **High Intensity Discharge** • **metal halide** • **ceramic metal halide** • **high pressure sodium**	**For luminaires shipped with lamps:** ▪ Packaging shall clearly describe the nominal color designation of the lamp in units of Kelvin (e.g. 2700K, 3000K). **For luminaires shipped with lamps containing mercury:** ▪ both the lamp and the luminaire packaging shall have a label indicating mercury content which must be managed and disposed of properly, and shall reference: www.epa.gov/cfl or www.lamprecycle.org **For luminaires not shipped with lamps:** ▪ Packaging shall include a list of lamp types that would ensure compliance with this specification when paired with the qualifying luminaire. Packaging shall not list lamp types which will not ensure performance compliant with this specification. This list shall be clearly visible to the consumer on the luminaire packaging. These can be generic NEMA or ANSI lamp descriptions, and shall include a color designation (e.g., F32T8/830 or CFQ26W/G24q/827) ▪ Packaging shall recommend that consumers select a lamp with a rated life of 10,000 hours or more. **For recessed downlight luminaires that are insulation-contact (Type IC) rated:** Packaging shall clearly state this rating. Sample language: "IC-rated for direct contact with insulation". **For recessed downlight luminaires that are airtight (AT) certified:** Packaging shall indicate that the luminaire permits air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283-04. Sample language: "Certified airtight per ASTM E283-04." **For outdoor luminaires:** Packaging shall indicate the minimum (lowest) starting temperature for the lamp and ballast platform of the luminaire. **For luminaires marketed as dimmable:** • Luminaire packaging shall indicate dimming range (as applicable), compatible dimmers or other controls, and known incompatibilities with dimmers, occupancy or vacancy sensors, timing devices or other external lighting controls. Partner shall periodically review this packaging language to determine if updates are needed. Partner is encouraged to also include on packaging a web address where additional compatibility information is detailed. • Step dimming capability, if employed, shall be clearly indicated. **Optional certification marking:** While not a requirement for qualification, EPA recommends partners provide a conspicuous ENERGY STAR certification mark (e.g. sticker, hangtag) on qualified luminaires themselves: • to facilitate building inspectors confirming qualification status of installed luminaires • to provide out-of-the-box marketing of a luminaire's ENERGY STAR qualification • to demonstrate to consumers a partner's commitment to advancing energy efficiency in lighting	No standard available.	None.

Solid State	Packaging shall clearly describe the nominal color designation in units of Kelvin (e.g. 2700K, 3000K). **For recessed downlight luminaires that are insulation-contact (Type IC) rated:** Packaging shall clearly state this rating. Sample language: "IC-rated for direct contact with insulation". **For recessed downlight luminaires that are airtight (AT) certified:** Packaging shall indicate that the luminaire permits air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283-04. Sample language: "Certified airtight per ASTM E283-04." **For outdoor luminaires:** Product packaging shall indicate the minimum (lowest) starting temperature of the luminaire. **For luminaires marketed as dimmable:** • External packaging shall print dimming range (if applicable), a list of compatible dimmers or other controls, any known incompatibilities with dimmers, occupancy or vacancy sensors, timing devices or any other external lighting controls. • Step dimming capability, if employed, shall be clearly indicated. **Optional certification marking:** While not a requirement for qualification, EPA recommends partners provide a conspicuous ENERGY STAR certification mark (e.g. sticker, hangtag) on qualified luminaires themselves: • to facilitate building inspectors confirming qualification status of installed luminaires • to provide out-of-the-box marketing of a luminaire's ENERGY STAR qualification • to demonstrate to consumers a partner's commitment to advancing energy efficiency in lighting		
Halogen Incandescent (outdoor only)	**For luminaires not shipped with lamps:** ▪ Packaging shall include a list of lamp types that would ensure compliance with this specification when paired with the qualifying luminaire. This list shall be clearly visible to the consumer on the luminaire packaging. These can be generic NEMA or ANSI lamp descriptions. ▪ Packaging shall recommend that consumers select a halogen incandescent lamp with a rated life of 3,000 hours or more. ▪ Packaging shall not recommend lamping luminaire with self ballasted compact fluorescent lamps ("CFLs"). **For recessed downlight luminaires that are insulation-contact (Type IC) rated:** Packaging shall clearly state this rating. Sample language: "IC-rated for direct contact with insulation". **For recessed downlight luminaires that are airtight (AT) certified:** Packaging shall indicate that the luminaire permits air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283-04. Sample language: "Certified airtight per ASTM E283-04." **Optional certification marking:** While not a requirement for qualification, EPA recommends partners provide a conspicuous ENERGY STAR certification mark (e.g. sticker, hangtag) on qualified luminaires themselves: • to facilitate building inspectors confirming qualification status of installed luminaires • to provide out-of-the-box marketing of a luminaire's ENERGY STAR qualification • to demonstrate to consumers a partner's commitment to advancing energy efficiency in lighting		

Lighting Toxics Reduction Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Method of Compliance	Supplemental Testing Guidance
All Source Types	Luminaires and lamps shall not exceed hazardous substance concentrations set for in the European Union's (EU) Restriction of the Use of Certain Hazardous Substances (RoHS) Directive, 2003. Luminaires and lamps shall not exceed: • 0.1% by weight in homogenous material (1000 ppm): Mercury, Lead, Hexavalent Chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers) • 0.01% by weight in homogenous material (100 ppm): Cadmium Unless otherwise stated below, fluorescent lamps of all types shall not exceed 5 mg of mercury (per burner) A list of RoHS exemptions that will be accepted by the ENERGY STAR program that may be relevant to luminaires and lamps is detailed below: Exemptions: 1. Mercury in single capped (compact) fluorescent lamps not exceeding (per burner): a. For general lighting purposes ≥150W: 15 mg b. For general lighting purposes with circular or square structural shape and tube diameter (<17 mm): currently no limit 2. Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp): a. Tri-band phosphor with long lifetime (≥ 25,000 hr): 8 mg 3. Mercury in other fluorescent lamps not exceeding (per lamp): a. Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12): 10 mg b. Non-linear halophosphate lamps (all diameters): 15 mg c. Non-linear tri-band phosphor lamps with tube diameter > 17 mm (e.g. T9): currently no limit 4. Mercury in other High Pressure Sodium (vapor) lamps for general lighting purposes not exceeding (per burner): currently no limit 5. Mercury in High Pressure Mercury (vapor) lamps (HPMV): currently no limit 6. Mercury in metal halide lamps: currently no limit 7. Lead in glass of fluorescent tubes not exceeding 0.2% by weight 8. Lead in high melting temperature type solders (i.e. lead-based alloys containing 85% by weight or more lead) 9. Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound 10. Cadmium and its compounds in electrical contacts 11. Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages 12. Lead with PbBiSn-Hg and PbInSn-Hg in specific compositions as main amalgam and with PbSn-Hg as auxiliary amalgam in very compact energy saving lamps. 13. Cadmium in color-converting II-IV LEDs (< 10 µg Cd per mm^2 of light-emitting area) for use in solid state illumination or display systems.	Documentation of RoHS Directive compliance not required for initial qualification. Partner shall prepare and maintain technical documentation to demonstrate compliance, and upon request shall provide certification body such documentation showing that the luminaires/lamps comply with the requirements of the RoHS Directive. Partner may rely on component suppliers to provide certification or declaration documents to show that homogenous materials used in luminaires/lamps comply with the RoHS Directive. Alternatively, Partner may have luminaire/lamp components tested in accordance with IEC 62321 or other appropriate analytical technique to verify that homogenous materials do not exceed the concentration limits of the six regulated substances. Handheld XRF analyzers/scanners may also be used to verify compliance.	None.

Warranty Requirements: Directional and Non-Directional Luminaires

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Standards	Supplemental Testing Guidance
Fluorescent • **linear** • **compact** • **self ballasted compact (GU24)** • **circline** **High Intensity Discharge** • **metal halide** • **ceramic metal halide** • **high pressure sodium**	For luminaires incorporating replaceable ballasts, a written warranty shall be included with luminaire packaging at the time of shipment which covers repair or replacement of defective parts of the luminaire housing, mounting hardware, optics, ballast and trim for a minimum of 3 years from the date of purchase. GU24 based self-ballasted lamps shipped with the luminaire shall carry a minimum 3 year warranty, based on usage of no less than 3 hours per day. For luminaires incorporating non-replaceable ballasts, the above warranty requirement is extended to 5 years. Partner is solely responsible for honoring warranty; intermediate parties (e.g. showrooms, electrical distributors, retailers) are not responsible for honoring warranty requirements.	No standard available.	Provide: A copy of the actual luminaire manufacturer written warranty that is included with product packaging.
Solid State	For luminaires incorporating replaceable drivers, a written warranty shall be included with luminaire packaging at the time of shipment which covers repair or replacement of defective parts of the luminaire housing, mounting hardware, optics, driver and trim for a minimum of 3 years from the date of purchase. GU24 based integrated LED lamps shipped with the luminaire shall carry a minimum 3 year warranty. For luminaires incorporating non-replaceable drivers, the above warranty requirement is extended to 5 years. Warranty language shall place no limitations on coverage based on duration of luminaire operation (e.g. hours per day). Partner is solely responsible for honoring warranty; intermediate parties (e.g. showrooms, electrical distributors, retailers) are not responsible for honoring warranty requirements.		
Halogen Incandescent (outdoor only)	A written warranty shall be included with luminaire packaging at the time of shipment which covers repair or replacement of defective parts of the luminaire housing, mounting hardware, optics, electronics and trim for a minimum of 3 years from the date of purchase. Partner is solely responsible for honoring warranty; intermediate parties (e.g. showrooms, electrical distributors, retailers) are not responsible for honoring warranty requirements.		

END OF SPECIFICATION