

EPA-Recognized Lighting Lab Guide

November 2019

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Purpose of Document

This document, created for lighting laboratories, accreditation bodies (ABs), and certification bodies (CBs) provides clarification and assistance regarding the process a laboratory must follow, and methods of measurement to which a laboratory must be accredited in order to gain EPA recognition for testing to one or more ENERGY STAR lighting product specifications and subcategories. Testing in an EPA recognized laboratory is a requirement for third-party certification, and thereby, ENERGY STAR certification. This guide covers the process of laboratories applying for EPA recognition, categories for EPA recognition, testing, and references.

Categories for ENERGY STAR Recognition

EPA laboratory recognition falls into four basic categories:

1. [Testing Lamps](#)
2. [Testing Luminaires](#) (and subcomponents of luminaires)
3. [Testing Ceiling Fans and Ceiling Fan Light Kits \(CFLKs\)](#)

Note: the required test methods for lamps, Luminaires, and Ceiling Fans and Ceiling Fan Light Kits (CFLKs) are listed under the "Method of Measurement" section of this document.

4. Testing Decorative Light Strings

Note: Annex A of the [ENERGY STAR Program Requirements Product Specification for Decorative Light Strings \(DLS\)](#) outlines the methods of measurement for DLS. Therefore, either the full title of the DLS specification or the full title of the DLS specification and the title and reference to Annex A should appear in the Scope of Accreditation.

Related Resources

For information on EPA's recognition processes, including the application for lab recognition, product specifications, or other methods of measurement and standards referenced in this guide, please visit the ENERGY STAR Laboratory Resources page. [Link](#)

List of EPA Recognized Laboratories for Lighting. [Link](#)

Questions about Department of Energy (DOE) test procedures may be directed to Lucy deButts: Lucy.deButts@ee.doe.gov

Questions about this document may be directed to: lighting@energystar.gov

Laboratories Must Apply for EPA Recognition

Application Process

If a laboratory is planning to seek EPA recognition as an accredited laboratory, the application process entails the following:

1. Read and ensure compliance with the Conditions and Criteria for Recognition of Laboratories for the ENERGY STAR Program.
[Conditions and Criteria for Recognition of Laboratories](#)
2. Complete and sign the Application for Recognition of Laboratories
[Application for Recognition of Laboratories](#)
3. Submit the application with a scanned version of the laboratory's scope of accreditation to:
Certification@energystar.gov

If an unaccredited laboratory is seeking EPA recognition as a Witnessed or Supervised Manufacturers' Testing Laboratory (W/SMTL), the laboratory must participate in an EPA-recognized CB W/SMTL program. Upon enrolling the laboratory in its W/SMTL program, the CB will submit the name of the laboratory and W/SMTL application to EPA for recognition as a W/SMTL for specific ENERGY STAR product category/categories.

Please note that data from test reports generated by laboratories within the W/SMTL program will be accepted only by the CB(s) with which they enroll. This topic is addressed as a frequently asked question on the ENERGY STAR website. [Link](#)

As an accredited laboratory or W/SMTL, the laboratory will need to maintain contact with EPA regarding any changes to the scope of accreditation, and participate in inter-laboratory correlation testing per EPA Directive #2011-03: Proficiency Testing and Inter-Laboratory Comparison Testing Requirements for Lighting Laboratories. [Link](#)

Scope of Accreditation

The Scope of Accreditation is a list of Methods of Measurement included in a laboratory's accreditation to ISO 17025.

Methods of Measurement are documents that must appear in a laboratory's scope of accreditation in order for the laboratory to earn EPA recognition for each subcategory. Each Method of Measurement document is listed in the specifications next to the relevant requirement(s). A list of these documents is provided on the "Methods of Measurement" section of this document.

Reference documents are listed in the specifications next to relevant requirements and listed on the last section of this guide for a quick handy reference. While they are not required to be on a lab's scope of accreditation they are essential for understanding and applying the requirements for which they were referenced. For example, EPA does not require accreditation to IES TM-21-11 but does require that the ENERGY STAR TM-21 Calculator be used to substantiate lumen maintenance life claims.

Directive 2011-02 clarifies EPA's requirements for recognized ABs to list methods of measurement on laboratory scopes of accreditation. With respect to lighting laboratories, it states:

“In the case of a laboratory applying for EPA-recognition to test lighting products pursuant to ENERGY STAR qualification, the EPA-recognized AB must include at a minimum in the laboratory's scope of accreditation the titles of the lighting-related methods of measurement to which the AB is accrediting the laboratory. This may be in addition to or instead of the title of the relevant ENERGY STAR specification. Methods of measurement shall be recorded on the Scope of Accreditation as they appear in ENERGY STAR Guide to EPA Laboratory Recognition by Lighting Category [i.e. this guide].”

In the case of a laboratory participating as a W/SMTL, the CB operating the W/SMTL program shall maintain a list of the ENERGY STAR product categories the W/SMTL agreement covers. [Link](#)

Most methods of measurement are from national or international organizations such as American National Standards Institute (ANSI) or Illuminating Engineering Society (IES). Please note that some ENERGY STAR specifications include exceptions or modifications regarding tests for specific products.

If the laboratory has been recognized previously for one or more product categories, the laboratory must ensure the AB updates its scope of accreditation commensurately with updated ENERGY STAR Specifications and Test Methods in accordance with the scheduled audits. Any changes to the scope of accreditation that affects a laboratory's recognition must be immediately reported to EPA.

Performance Testing Requirements

EPA recognizes lighting laboratories for photometric and electrical performance testing only. Transient protection may be on the scope of a laboratory's accreditation or performed by another accredited laboratory. The ENERGY STAR lighting specifications state that electrical safety testing must be carried out by one of the Occupational Safety and Health Administration's (OSHA) nationally recognized testing laboratories (NRTL). Safety testing different laboratory requirements is specified per OSHA. A full listing of OSHA NRTLs can be found on the OSHA website. [Link](#)

OSHA NRTLs may perform In Situ Temperature Measurement Testing (ISTMT) for SSL products, as can any lab whose scope of accreditation includes relevant sections/documents designated with an † on the "Methods of Measurement" table in this document.

Laboratory Recognition for ENERGY STAR Lamps Version 2.1 Specification

[Link](#)

The ENERGY STAR Lamps Specification covers energy efficient replacements for incandescent lamps utilizing fluorescent and solid state technologies. Testing requirements vary depending on the type of lamp being tested.

EPA recognition for lighting laboratories is specified by product specification (i.e., Lamps, Luminaires, Ceiling Fans, etc.) rather than lighting subcategory. Lighting laboratories may only test lighting products for which they are accredited to all required test methods, per this document.

Note

Testing of LED lamps requires the use of a goniophotometer. Testing of directional LED lamps will require a goniophotometer with a colorimeter or spectroradiometer in order to perform intensity and color angular uniformity tests.

See the "Methods of Measurement" table for the list of documents that must appear in a laboratory's scope of accreditation in order for the laboratory to earn EPA recognition.

Reference documents are listed in the specifications next to relevant requirements and listed in the last section of this guide for a quick handy reference. While they are not required to be on a lab's scope of accreditation they are essential for understanding and applying the requirements for which they were referenced.

Laboratory Recognition for ENERGY STAR Luminaires Version 2.2 Specification

[Link](#)

EPA recognition for lighting laboratories is specified by product specification (i.e., Lamps, Luminaires, Ceiling Fans, etc.) rather than lighting subcategory. Lighting laboratories may only test lighting products for which they are accredited to all required test methods per this document.

Testing requirements vary depending on the type of luminaire being tested (e.g., directional or non-directional) and light source technology (e.g., solid-state or fluorescent).

Also included in the luminaires recognition category are subcomponents such as LED light engines, lamps, ballasts, and platforms. EPA lists certified luminaire subcomponents in the Certified Lighting Subcomponent Database (CSD). The database helps luminaire partners' source components that meet the ENERGY STAR Luminaires specification performance requirements. Note:

- Luminaire partners are not limited to using the subcomponents on the CSD. They may use other subcomponents for which subcomponent manufacturers have provided test reports from EPA-recognized laboratories. Alternatively, luminaire partners may select subcomponents not listed on the CSD, and may themselves have the subcomponents tested by an EPA-recognized laboratory to ensure they will meet the requirements attributable to the subcomponent that are set forth in the ENERGY STAR specification; and
- While subcomponents listed in the CSD are useful to ENERGY STAR luminaire partners, **products listed in this database are not, by themselves, ENERGY STAR certified**. These subcomponents may not carry any of the ENERGY STAR marks on the product itself, on its packaging, or in associated literature either printed or electronic, and may not be referred to as ENERGY STAR qualified, certified, approved, or the like.

See the "Methods of Measurement" table for the list of documents that must appear in a laboratory's scope of accreditation in order for the laboratory to earn EPA recognition for each subcategory. In order to perform In Situ Temperature Measurement Testing (ISTMT) of solid-state luminaires the Laboratory must be accredited for the appropriate ISTMT methods designated with an † for the product under test. The certification body will review the test report to ensure the lab is accredited for the appropriate ISTMT method based upon the type of product tested.

Reference documents are listed in the specifications next to relevant requirements and listed in the last section of this guide for a quick handy reference. While they are not required to be on a lab's scope of accreditation they are essential for understanding and applying the requirements for which they were referenced.

Laboratory Recognition for ENERGY STAR Ceiling Fans Version 4.0 Specification

[Link](#)

The ENERGY STAR Ceiling Fans Specification covers products that meet the definition of a Residential Ceiling Fan (i.e., Standard and Hugger) or Low-Mount High-Speed Small-Diameter Ceiling Fan as well as those that meet the definition of a Ceiling Fan Light Kit.

EPA recognition for lighting laboratories is specified by product specification (i.e., Lamps, Luminaires, Ceiling Fans, etc.) rather than lighting subcategory. Lighting laboratories may only test lighting products for which they are accredited to all required test methods per this document.

Note:

The ENERGY STAR Ceiling Fans Version 4.0 Specification defines:

- Ceiling Fan Light Kit (CFLK) as equipment designed to provide light from a ceiling fan that can be:
 - Integral, such that the equipment is attached to the ceiling fan prior to the time of retail sale; or
 - Attachable, such that at the time of retail sale the equipment is not physically attached to the ceiling fan, but may be included inside the ceiling fan at the time of sale or sold separately for subsequent attachment to the fan.
- CFLK with Integrated Solid-State Lighting Circuitry as a CFLK that has solid-state lighting (SSL) light sources, drivers, heat sinks, or intermediate circuitry (such as wiring between a replaceable driver and a replaceable light source) that are not consumer replaceable.
- CFLK with Separable Light Source (“Separable”) as a CFLK featuring lighting components (i.e. light emitting diodes (LEDs) and driver components or non-self-ballasted CFL lamps and ballast) which can be easily removed or replaced by the end user, thus not requiring replacement of the entire CFLK. For the purposes of this specification, this includes “Other SSL Products” as well as CFLKs shipping with ENERGY STAR certified lamps.

See the "Methods of Measurement" table for the list of documents that must appear in a laboratory’s scope of accreditation in order for the laboratory to earn EPA recognition for each CFLK category.

Reference documents are listed in the specifications next to relevant requirements and listed in the last section of this guide for a quick handy reference. While they are not required to be on a lab’s scope of accreditation they are essential for understanding and applying the requirements for which they were referenced.

✓ Must Appear in a Laboratory Scope of Accreditation. ‡ Required for Laboratories Performing ISTMT. § Method of Measurement not requiring accreditation at this time.

 Lighting Methods of Measurement			Lamps				Luminaires								Ceiling Fans with Lighting		
			Solid-State		Compact Fluorescent		Solid-State			Fluorescent					Solid-State		CFLKs with Separable Fluorescent Light Source(s)
Method of Measurement		Document Title	ENERGY STAR Specification Section	Directional	Omnidirectional & Decorative	Directional	Omnidirectional & Decorative	Directional Luminaires	Non-directional Luminaires and Subcomponents	LED Packages, Arrays, and Modules	Directional Luminaires	Non-directional Luminaires	CSD - Ballasts	CSD - Lamps	CFLKs with Separable Light Source(s)	CFLKs with Integrated SSL Circuitry	
ANSI / IEEE	C62.41.2-2002	IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits	Transient Protection	✓	✓	✓	✓								✓	✓	✓
ANSI	C82.2-2002 (R2016)	Method of Measurement of Fluorescent Lamp Ballasts	Operating Frequency								✓	✓	✓				✓
ANSI	C82.77-10-2014	American National Standard for Lighting Equipment - Harmonic Emission Limits—Related Power Quality Requirements	Power Factor	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓
ANSI / UL	153:2002 Sections 124-128A	Standard for Safety of Portable Electric Luminaires	Luminous Efficacy and Output, Lumen Maintenance					‡	‡	‡					‡	‡	
ANSI / UL	1574:2004 Section 54	Standard for Safety of Track Lighting Systems	Luminous Efficacy and Output, Lumen Maintenance					‡	‡	‡					‡	‡	
ANSI / UL	1598:2008 Sections 19.7, 19.10-16	Standard for Safety of Luminaires	Luminous Efficacy and Output, Lumen Maintenance					‡	‡	‡					‡	‡	
ANSI / UL	1598C	Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits	Luminous Efficacy and Output, and Zonal Lumen Density					‡	‡						‡	‡	
CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources	Color Rendering (CRI)	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
CIE	Pub. No. 15:2004 <i>Note: not a method of measurement but requires accreditation.</i>	Colorimetry	CCT	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
ENERGY STAR	Ambient Temperature Life Test Method Sept 2015	Ambient Temperature Life Test Method, September 2015	Ambient Temperature Life Test Method	✓	✓												
ENERGY STAR	Elevated Temperature Life Test Method Sept 2015	Elevated Temperature Life Test Method, September 2015	Elevated Temperature Life Test Method	✓	✓	✓	✓										
ENERGY STAR	Elevated Temperature Light Output Ratio Test Method Sept 2015	Elevated Temperature Light Output Ratio Test Method, September 2015	Elevated Temperature Light Output Ratio	✓		✓											
ENERGY STAR	Recommended Practice - Light Output on a Dimmer	Recommended Practice - Light Output on a Dimmer, December 2015	Maximum Light Output, Minimum Light Output	§	§	§	§								§	§	§
ENERGY STAR	Recommended Practice - Light Source Flicker	Recommended Practice - Light Source Flicker, December 2015	Flicker	§	§	§	§										
ENERGY STAR	Run Up Time Test Method Sept 2015	Run-Up Time Test Method, September 2015	Source Run-up Time			✓	✓				✓	✓					✓
ENERGY STAR	Start Time Test Method Oct 2017	Start Time Test Method, October 2017	Source Start Time	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓
ENERGY STAR	Test Method - Noise September 2015	Test Method – Noise September 2015	Source Audible Noise	§	§	§	§								§	§	§
IEC	62301 Edition 2.0 2011-01	Household electrical appliances - Measurement of standby power	Standby Power Consumption	✓	✓	✓	✓	✓	✓		✓	✓					
IES	LM-9-09	Electric and Photometric Measurements of Fluorescent Lamps	Efficacy, Output, Lumen Maintenance, CCT, CRI								✓	✓	✓				✓
IES	LM-10-96	Photometric Testing of Outdoor Fluorescent Luminaires	Efficacy, Light Output, Zonal Lumen Distribution								✓						
IES	LM-20-13	Photometric Testing of Reflector Type Lamps	Center Beam Intensity	✓		✓											
IES	LM-40-10	Life Testing of Fluorescent Lamps	Light Source Life, Lumen Maintenance								✓	✓	✓				✓
IES	LM-41-14	Approved Method for Photometric Testing of Indoor Fluorescent Luminaires	Efficacy, Light Output, Zonal Lumen Distribution								✓						
IES	LM-58-13	Guide to Spectroradiometric Measurements	Color Angular Uniformity					✓									
IES	LM-65-14	Life Testing of Compact Fluorescent Lamps	Light Source Life, Lumen Maintenance			✓	✓				✓	✓	✓				

Reference Documents

While not required to be on a lab's scope of accreditation, reference documents are essential for understanding and applying the requirements for which they were referenced.

Reference Document	Document Title	ENERGY STAR Specification Section	Notes	Lamps				Luminaires							Ceiling Fans			
				Solid-State		Compact Fluorescent		Solid-State			Fluorescent				Solid-State		CFLK with Separable Fluorescent Light Source(s)	
				Directional	Omnidirectional & Decorative	Directional	Omnidirectional & Decorative	Directional Luminaires	Non-directional Luminaires and Subcomponents	LED Packages, Arrays, and Modules	Directional Luminaires	Non-directional Luminaires	CSD - Ballasts	CSD - Lamps	CFLKs with Separable Light Source(s)	CFLKs with Integrated SSL Circuitry		
ANSI / IEEE	C62.41.1-2002	Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits	Transient Protection					✓	✓			✓	✓					
ANSI / IEEE	C62.41.2-2002	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits	Transient Protection	✓	✓	✓	✓	✓	✓			✓	✓					
ANSI	C78.20-2003	Electric Lamps—A, G, PS and Similar Shapes with E26 Medium Screw Bases	Lamp Shape Dimensions		✓		✓											
ANSI	C78.21-2011	Incandescent Lamps—PAR and R Shapes	Lamp Shape Dimensions	✓		✓												
ANSI	C78.23-1995 (R2003)	Incandescent Lamps—Miscellaneous Types	Lamp Shape Dimensions		✓		✓											
ANSI / ANSLG	C78.357-2010	For Incandescent Lamps: Tungsten Halogen Lamps (non-vehicle)	Lamp Shape Dimensions	✓		✓												
ANSI	C78.376-2014	Specifications for the Chromaticity of Fluorescent Lamps	CCT			✓	✓					✓	✓		✓			✓
ANSI / ANSLG	C78.377-2015 (or C78.377-2017 for Luminaires)	Specifications for the Chromaticity of Solid State Lighting Products	CCT, Lumen Maintenance	✓	✓			✓	✓	✓					✓	✓		
ANSI	C78.50-2014	Electric Lamps – Assigned LED Lamp Codes	Lamp Shape Dimensions	✓		✓												
ANSI	C78.79-2014	Electric Lamps – Nomenclature for Envelope Shapes Intended for use with Electric Lamps	Lamp Shape Dimensions	✓		✓												
ANSI	C78.81-2010 or C78.81-2016	Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics	Light Source Shipment					✓	✓			✓	✓					
ANSI	C78.901-2014 or C78.901-2016	Single-based Fluorescent Lamps - Dimensional and Electrical Characteristics	Light Source Shipment									✓	✓					✓
ANSI	C79.1-2002	Nomenclature for Glass Bulbs Intended for Use with Electric Lamps	Lamp Shape Dimensions	✓	✓	✓	✓											
ANSI / ANSLG	C81.61-2009 (R2014) (or C81.61-2017 for Luminaires)	Specifications for Bases (Caps) for Electric Lamps	Lamp Base, Light Source Shipment	✓	✓	✓	✓					✓	✓					
ANSI / ANSLG	C81.62-2009 (R2014) or C81.61-2017	Lampholders for Electric Lamps	Light Source Replaceability									✓	✓					
ANSI	C82.11-2011 or C82.11-2017	High-Frequency Fluorescent Lamp Ballasts	Source Start Time									✓	✓					
ANSI	C82.77-10-2014	Method of Measurement of Fluorescent Lamp Ballasts	Power Factor	✓	✓	✓	✓	✓	✓			✓	✓					
ANSI / ASA	S12.55-2012/ISO 3745:2012	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic rooms and hemi-anechoic rooms	Audible Noise	✓	✓	✓	✓								✓	✓		✓
ANSI / UL	153:2002 or 153:2014	Standard for Safety of Portable Electric Luminaires	Color Rendering Index (CRI), Color Maintenance, Maximum Measured Ballast or Driver Case Temperature, Indoor Luminaire Safety					✓	✓			✓	✓	✓	✓	✓	✓	✓
ANSI / UL	935-2009	Standard for Safety of Fluorescent-Lamp Ballasts	Electronic Ballast or Driver Safety									✓	✓	✓	✓	✓	✓	✓
ANSI / UL	1310-2010	Standard for Safety of Class 2 Power Units	Electronic Ballast or Driver Safety					✓	✓			✓	✓	✓	✓	✓	✓	✓
ANSI / UL	1574:2004	Standard for Safety of Track Lighting Systems	Color Rendering Index (CRI), Color Maintenance, Maximum Measured Ballast or Driver Case Temperature, Indoor Luminaire Safety									✓	✓	✓	✓	✓	✓	✓
ANSI / UL	1598:2008 (or 2012 for Ceiling Fans with Lighting or CFLKs)	Standard for Safety of Luminaires	Color Rendering Index (CRI), Color Maintenance, Maximum Measured Ballast or Driver Case Temperature, Recessed Downlight Thermal Performance, Indoor Luminaire Safety									✓	✓	✓	✓	✓	✓	✓
ANSI / UL	1993-2012 (or 1993-2017 for Luminaires)	Standard for Safety of Self-Ballasted Lamps and Lamp Adapters	Electrical Safety	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓
ANSI / UL	2108-2004 or 2108-2015	Standard for Low-Voltage Lighting Systems	Indoor Luminaire Safety, Electronic Ballast or Driver Safety					✓	✓						✓	✓		
ANSI / UL	8750-2009 or 8750-2015	Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products	Indoor Luminaire Safety, Electronic Ballast or Driver Safety					✓	✓						✓	✓		
ASTM	E283-04(2012)	Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	Recessed Downlight Thermal Performance					✓	✓	✓		✓	✓	✓	✓			

Reference Documents

While not required to be on a lab's scope of accreditation, reference documents are essential for understanding and applying the requirements for which they were referenced.

Reference Document	Document Title	ENERGY STAR Specification Section	Notes	Lamps				Luminaires						Ceiling Fans				
				Solid-State		Compact Fluorescent		Solid-State			Fluorescent			Solid-State		CFLK with Separable Fluorescent Light Source(s)		
				Directional	Omnidirectional & Decorative	Directional	Omnidirectional & Decorative	Directional Luminaires	Non-directional Luminaires and Subcomponents	LED Packages, Arrays, and Modules	Directional Luminaires	Non-directional Luminaires	CSD - Ballasts	CSD - Lamps	CFLKs with Separable Light Source(s)		CFLKs with Integrated SSL Circuitry	
ENERGY STAR	TM-21 Calculator	ENERGY STAR TM-21 Calculator	Lumen Maintenance	The ENERGY STAR TM-21 Calculator shall be used to substantiate lumen maintenance life claims based on IES LM-80 test data.	✓	✓			✓	✓						✓	✓	
ENERGY STAR	TM-28 Calculator	ENERGY STAR TM-28 Calculator	Lumen Maintenance	The ENERGY STAR TM-28 Calculator shall be used to substantiate lumen maintenance life claims based on IES LM-84 test data.												✓	✓	
ENERGY STAR	Lamp Center Beam Intensity Benchmark Tool	ENERGY STAR Lamp Center Beam Intensity Benchmark Tool	Minimum Center Beam Intensity – PAR, MR and MRX lamps			✓												
ENERGY STAR	Luminous Intensity Distribution Calculator	ENERGY STAR Luminous Intensity Distribution Calculator	Luminous Intensity Distribution			✓			✓									
IEC	60901 (2011)	Single-capped Fluorescent Lamps - Performance Specifications	Light Source Shipment		✓	✓	✓	✓										
IEC	62321:2008 (ed. 1)	Electrotechnical Products - Determination Of Levels Of Six Regulated Substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)	Lighting Toxics		✓	✓	✓	✓										
IES	LM-54-12	Guide to Lamp Seasoning	Efficacy, Output, Center Beam Intensity, Luminous Intensity Distribution, Lumen Maintenance, Lifetime, CCT, CRI, Color Maintenance. Color Angular Uniformity				✓	✓										✓
IES	LM-66-14	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps	Lumen Maintenance, Run-Up Time															✓
IES	LM-80-08 and its Addendum A or LM-80-15	Measuring Lumen Maintenance of LED Light Sources Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules	Lumen Maintenance	Content and application of IES LM-80 reports must comply with the ENERGY STAR Requirements for the Use of LM-80 Data.	✓	✓				✓								
IES	TM-21-11 and its Addendum B	Projecting Long Term Lumen Maintenance of LED Light Sources	Light Source Life, Lumen Maintenance	Accreditation to TM-21 is not required, but EPA does require that the ENERGY STAR TM-21 Calculator be used to substantiate lumen maintenance life claims.	✓	✓			✓	✓								
IES	TM-27-14	Standard Format for the Electronic Transfer of Spectral Data	CRI		✓	✓	✓	✓										
IES	TM-28-14	Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaires	Lumen Maintenance		✓	✓				✓								
IES	TM-30-15	Evaluating Light Source Color Rendition	CRI		✓	✓	✓	✓										
ISO	7574-4:1985	Statistical Methods for Determining and Verifying Stated Noise Emission Values of Machinery and Equipment	Audible Noise		✓	✓	✓	✓	✓	✓						✓	✓	✓
NEMA	LSD 45-2009	Recommendations for Solid State Lighting Sub-Assembly Interfaces for Luminaires	Light Source Replaceability						✓	✓								
NEMA	SSL 7A-2013 or SSL 7A-2015	Phase Cut Dimming for Solid State Lighting: Basic Compatibility	Dimming		✓	✓			✓	✓								
US DOE	10 CFR 429	Certification, Compliance, and Enforcement for Consumer Products and Commercial and Industrial Equipment	Efficacy, Lumen Maintenance, Lifetime	Questions regarding the CFRs should be directed to the US Department of Energy.				✓										
US DOE	16 CFR § 305.2	Energy and Water Use Labeling for Consumer Products Under the Energy Policy and Conservation Act - Definitions	Light Output	For all lamps covered by FTC.	✓	✓	✓	✓										
US DOE	International Efficiency Marking Protocol	International Efficiency Marking Protocol for External Power Supplies. Version 3.0, September 2013	Standby Power						✓	✓		✓	✓					