



# Lab Recognition for Lighting Product Specifications

June 2011

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# Laboratory Recognition Overview

# Lab Recognition for Lighting Specifications



- The purpose of this document is to clarify for laboratories, ABs, CBs and manufacturers the test methods to which a laboratory must be accredited to gain EPA recognition for testing one or more lighting product specifications.
- The Application for EPA Recognition of a Laboratory allows laboratories to apply to be recognized to test one or more lighting product specifications. Recognized laboratories are listed by lighting product specification on EPA's Recognized Laboratories webpage.
- Scopes of Accreditation: When creating Scopes of Accreditation for a laboratory seeking EPA recognition for ENERGY STAR lighting specifications, the AB must include the titles of the test methods required by the specifications. This may be in addition to the title of the relevant ENERGY STAR specification(s) if the title is used as a section heading. For the Decorative Light Strings specification, the test method is listed in Appendix A. The full title of the Decorative Light Strings specification, and/or the reference to Appendix A should appear in a Laboratory's Scope of Accreditation.

# Testing Requirements



- EPA recognizes lighting laboratories for photometric tests only.
  - Fluorescent
  - HID
  - SSL
  - Halogen
- Electrical safety testing must be carried out by an OSHA Nationally Recognized Testing Laboratory (NRTL).
- Electromagnetic Interference (EMI)/Radio Frequency Interference (RFI) testing must be carried out by a FCC listed laboratory.  
<https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>

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# Laboratory Recognition for Luminaires Specification and Certified Subcomponents

# Laboratory Recognition for Luminaires Specification and Certified Subcomponents



## Luminaires Specification

- Fluorescent
- High Intensity Discharge
- Solid State Lighting
- Halogen

## Lighting Sub Components (CSD)

- LEDs (Package, Module or Array)
- Fluorescent Ballasts
- Fluorescent Lamps
- HID Ballasts
- HID Lamps

# Luminaires Specification



- Luminaires: Fluorescent
  - Directional
  - Non-Directional (self-ballasted lamps and lamp-ballast platforms)
- Luminaires: HID
  - Directional
  - Non-Directional (self-ballasted lamps and lamp-ballast platforms)
- Luminaires: SSL
  - Directional
  - Non-Directional
- Luminaires: Halogen
  - Directional
  - Non-Directional

# CSD Testing Requirements



- For the Certified Lighting Subcomponent Database (CSD), EPA recognizes laboratories for
  - Fluorescent Lamps (not integrally ballasted)
  - Fluorescent Ballasts
  - HID Lamps (not integrally ballasted)
  - HID Ballasts
- An EPA-recognized laboratory for Non-Directional Luminaires may also test self-ballasted lamps and lamp-ballast platforms for inclusion on the CSD.

# Luminaires: Fluorescent Test Reports Required for Certification



Product certification for a fluorescent luminaire requires that source/ballast/platform is listed on the CSD or test reports are submitted by an EPA-recognized lab for:

- ANSI C78.5-2003
- ANSI C82.2-2002
- CIE Publication No. 13.3-1995
- CIE Publication No. 15-2004
- IES LM-9-1999
- IES LM-40-2001
- IES LM-65-2001
- IES LM-66-2000

Product certification of a directional luminaire requires additional test reports from an EPA-recognized lab for the following test procedures:

- IES LM-10-1996 and/or LM-10-2011
- IES LM-41-1998 and/or LM-41-2011

# Fluorescent Test Procedures



Requirement Category	Luminaire-Specific Test or CSD	Test Procedures		
Source Run up time	CSD	ANSI	C78.5-2003	Specifications for Performance of Self-ballasted Compact Fluorescent Lamps
PF, Operating Frequency	CSD	ANSI	C82.2-2002	Method of Measurement of Fluorescent Lamp Ballasts
Color Rendering	CSD	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CCT	CSD	CIE	Pub. No. 15:2004	Colorimetry
Efficacy, Output, Lumen Maintenance, CCT, CRI	CSD	IES	LM-9-09	Electric and Photometric Measurements of Fluorescent Lamps
Light Source Life, Lumen Maintenance	CSD	IES	LM-40-01	Life Testing of Fluorescent Lamps
Light Source Life, Lumen Maintenance	CSD	IES	LM-65-01	Life Testing of Compact Fluorescent Lamps
Efficacy, Output, Lumen Maintenance, CCT, CRI	CSD	IES	LM-66-00	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps.
Efficacy, Output, Zonal Lumen Distribution	Luminaire-specific Test	IES	LM-10-96 and/or LM-10-11	Photometric Testing of Outdoor Fluorescent Luminaires
Efficacy, Output, Zonal Lumen Distribution	Luminaire-specific Test	IES	LM 41-98 and/or LM-41-11	Approved Method for Photometric Testing of Indoor Fluorescent Luminaries

# Laboratory Recognition for Fluorescent (Non Directional, Self-Ballasted Lamps and Lamp- Ballast Platforms)



Requirement Category	Test Procedures		
Source Run-up time	ANSI	C78.5-2003	Specifications for Performance of Self-ballasted Compact Fluorescent Lamps
PF, Operating Frequency	ANSI	C82.2-2002	Method of Measurement of Fluorescent Lamp Ballasts
Color Rendering	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CCT	CIE	Pub. No. 15:2004	Colorimetry
Efficacy, Output, Lumen Maintenance, CCT, CRI	IES	LM-9-09	Electric and Photometric Measurements of Fluorescent Lamps
Light Source Life, Lumen Maintenance	IES	LM-40-01	Life Testing of Fluorescent Lamps
Light Source Life, Lumen Maintenance	IES	LM-65-01	Life Testing of Compact Fluorescent Lamps
Efficacy, Output, Lumen Maintenance, CCT, CRI	IES	LM-66-00	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps.

# Laboratory Recognition for Fluorescent (Directional)



Requirement Category	Test Procedures		
Efficacy, Output, Zonal Lumen Distribution	IES	LM-10-96 and/or LM-10-11	Photometric Testing of Outdoor Fluorescent Luminaires
Efficacy, Output, Zonal Lumen Distribution	IES	LM 41-98 and/or LM-41-11	Approved Method for Photometric Testing of Indoor Fluorescent Luminaries

# Laboratory Recognition for Fluorescent Ballasts to list subcomponents on the CSD



Requirement Category	Test Procedures		
PF, Operating Frequency	ANSI	C82.2-2002	Method of Measurement of Fluorescent Lamp Ballasts

# Laboratory Recognition for Fluorescent Lamps to list subcomponents on the CSD



Requirement Category	Test Procedures		
Color Rendering	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CCT	CIE	Pub. No. 15:2004	Colorimetry
Efficacy, Output, Lumen Maintenance, CCT, CRI	IES	LM-9-09	Electric and Photometric Measurements of Fluorescent Lamps
Light Source Life, Lumen Maintenance	IES	LM-40-01	Life Testing of Fluorescent Lamps

# Luminaires: HID

## Test Reports Required for Certification



Product certification for a HID luminaire requires that source/ballast/platform is listed on the CSD or test reports are submitted by an EPA-recognized lab for:

- ANSI C78.389-2004
- ANSI C82.6-2005
- CIE Publication No. 13.3 – 1995
- IES LM-47-2001 and/or LM-47-2011
- IES LM-51-2000

Directional luminaires requires additional test reports for the following test procedures:

- IES LM-31-1995 and/or LM-31-2011
- IES LM-46-2004

# HID Test Procedures



Requirement Category	Luminaire-Specific Test or CSD	Test Procedures		
Operating Frequency	CSD	ANSI	C78.389-2004 (R2009)	High-Intensity Discharge (HID)—Methods of Measuring Characteristics
PF, Lamp Current Crest Factor	CSD	ANSI	C82.6-2005	Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement
CRI	CSD	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
Light Source Life, Lumen Maintenance	CSD	IES	LM 47-01 and/or LM 47-11	Life Testing of High Intensity Discharge (HID) Lamps
Efficacy, Light Output, CCT, CRI	CSD	IES	LM-51-00	Electrical and Photometric Measurements of High Intensity Discharge Lamps
Efficacy, Output, Zonal Lumen Distribution	Luminaire-specific Test	IES	LM-31-95 and/or LM-31-11	Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps
Efficacy, Output, Zonal Lumen Distribution	Luminaire-specific Test	IES	LM-46-04	Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps

# Laboratory Recognition for HID (Non-Directional, Self-Ballasted Lamps and Lamp- Ballast Platforms)



Requirement Category	Test Procedures		
Operating Frequency	ANSI	C78.389-2004 (R2009)	High-Intensity Discharge (HID)—Methods of Measuring Characteristics
PF, Lamp Current Crest Factor	ANSI	C82.6-2005	Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement
CRI	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
Light Source Life, Lumen Maintenance	IES	LM 47-01 and/or LM 47-11	Life Testing of High Intensity Discharge (HID) Lamps
Efficacy, Light Output, CCT, CRI	IES	LM-51-00	Electrical and Photometric Measurements of High Intensity Discharge Lamps

# Laboratory Recognition for HID (Directional)



Requirement Category	Test Procedures		
Efficacy, Output, Zonal Lumen Distribution	IES	LM-31-95 and/or LM-31-11	Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps
Efficacy, Output, Zonal Lumen Distribution	IES	LM-46-04	Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps

# Laboratory Recognition for HID Ballasts to list subcomponents on the CSD



Requirement Category	Test Procedures		
Operating Frequency	ANSI	C78.389-2004 (R2009)	High-Intensity Discharge (HID)—Methods of Measuring Characteristics
PF, Lamp Current Crest Factor	ANSI	C82.6-2005	Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement

# Laboratory Recognition for HID Lamps to list subcomponents on the CSD



Requirement Category	Test Procedures		
CRI	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
Light Source Life, Lumen Maintenance	IES	LM 47-01 and/or LM 47-11	Life Testing of High Intensity Discharge (HID) Lamps
Efficacy, Light Output, CCT, CRI	IES	LM-51-00	Electrical and Photometric Measurements of High Intensity Discharge Lamps

# Luminaires: Solid State Test Reports Required for Certification



Product certification for non-directional solid state luminaires requires test reports from an EPA-recognized lab for all of the following test procedures or listing on the CSD:

- ANSI C82.77-2002
- CIE Publication No. 13.3 – 1995
- IES LM-79-2008
- IES LM-82-2011 (if LED light engine is used)
- IES TM-21-2011 (when published)

Product certification of a directional luminaire requires additional test reports from an EPA-recognized lab for the following test procedures:

- IES LM-79-2008, Section 10
- IES LM-58-1994 and/or LM-58-2011

# Luminaires: Solid State



- EPA will not be recognizing laboratories for solid state non-directional until LM-82 is published.
- EPA will be recognizing laboratories for directional SSL (using LM-79), but products can only be qualified using lumen maintenance option 2 (6000h luminaire testing) until TM-21 is published.

# SSL Test Procedures



Requirement Category	Luminaire-Specific Test or CSD	Test Procedures		
Efficacy, output, zonal lumen distribution, Color angular uniformity, Luminaire photometry	Luminaire-specific Test	IES	LM-79 section 10	Electrical and Photometric Measurements of Solid-State Lighting Products (Goniophotometer)
Color angular uniformity	Luminaire-specific Test	IES	LM-58-94 and/or LM-58-11	Guide to Spectroradiometric Measurements
Power Factor	Both	ANSI	C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CRI	Both	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CCT	Both	CIE	Pub. No. 15 - 2004	Colorimetry
Efficacy, output, Lumen Maintenance, CCT, CRI, Color maintenance	Both	IES	LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products
Light Source Life, Lumen Maintenance, Color maintenance	Both	IES	LM-80-08	Measuring Lumen Maintenance of LED Light Sources
Light Source Life, Lumen Maintenance	Both	IES	TM-21-11	Projecting Long Term Lumen Maintenance of LED Packages (in draft 12/2010)
Efficacy, output, Lumen Maintenance, CCT, CRI, Color maintenance, Light source life	Both	IES	LM-82-11	Characterization of LED light engines and Integrated LED Lamps for electrical and Photometric properties as a function of temperature

# Laboratory Recognition for Solid State (Non-directional)



Requirement Category	Test Procedures		
Power Factor	ANSI	C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CRI	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CCT	CIE	Pub. No. 15 - 2004	Colorimetry
Efficacy, output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES	LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products
Light Source Life, Lumen Maintenance	IES	TM-21-11	Projecting Long Term Lumen Maintenance of LED Packages (in draft 12/2010)
Efficacy, output, Lumen Maintenance, CCT , CRI, Color Maintenance, Light Source Life	IES	LM-82-11	Characterization of LED light engines and Integrated LED Lamps for electrical and Photometric properties as a function of temperature

# Laboratory Recognition for Solid State (Directional)



Requirement Category	Test Procedures		
Efficacy, Output, Zonal Lumen Distribution, Color Angular Uniformity, Luminaire Photometry	IES	LM-79 section 10	Electrical and Photometric Measurements of Solid-State Lighting Products (Goniophotometer)
Color Angular Uniformity	IES	LM-58-94 and/or LM-58-11	Guide to Spectroradiometric Measurements
Power Factor	ANSI	C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CRI	CIE	Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CCT	CIE	Pub. No. 15 - 2004	Colorimetry
Efficacy, Output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES	LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products
Light Source Life, Lumen Maintenance	IES	TM-21-11	Projecting Long Term Lumen Maintenance of LED Packages (in draft 12/2010)

# Luminaires: Halogen – Outdoor Only

## Test reports required for certification

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Product certification for non-directional halogen luminaires and subcomponents requires reports from an EPA-Recognized laboratory for the following tests:

- IES LM-49-2001 and/or LM-49-2011
- Motion sensing and photo sensing measurements to confirm that product meets Luminaire specification requirements

To test directional luminaires, all of the above plus:

- Zonal Lumen Density report

# Laboratory Recognition for Halogen (Non-Directional)



EPA recognition for testing non-directional halogen luminaires and subcomponents requires accreditation to the following test procedure:

- IES LM-49-2001 and/or LM-49-2011

In addition:

- Submission of laboratory's internal test procedure for motion sensing and photo sensing that demonstrates ability to competently test these fixtures

# Laboratory Recognition for Halogen (Directional)



EPA recognition for testing directional halogen luminaires requires accreditation to all of the following test procedure:

- IES LM-49-2001 and/or LM-49-2011

In addition:

- Submission of laboratory's internal test procedure for motion sensing and photo sensing that demonstrates ability to competently test these fixtures
- Evidence that a laboratory is equipped with a goniophotometer and accredited to either IES LM-79 section 10, IES LM-31-1991 and/or LM-31-2011, IES LM-46-2004, IES LM-10-1996 and/or LM-10-2011, or IES LM-41-1998 and/or LM-41-2011 to demonstrate competency to carry out luminaire photometry

# Other Reference Standards



EPA-recognized laboratories may also evaluate and provide documentation to CBs for the following standards:

- ANSI C78.376-2001
- ANSI C78.377-2008
- ANSI/ANSLG C78.42-2009
- ANSI/ANSLG C78.43-2007
- ANSI/ANSLG C78.81-2010
- ANSI/IEC C78.901-2005
- ANSI/ANSLG C81.61-2009
- ANSI/ANSLG C81.62-2009
- ANSI C82.11 Consolidated 2002
- ANSI/ANSLG C82.14-2006
- ANSI C82.4-2002
- ASTM E283-04
- IEC 60061-1
- IEC 60081 Amend 4 Ed 5.0
- IEC 60901
- IEC 61347-2-3-am2 ed1.0 b.2006
- IEC 62321 Ed. 1.0
- NEMA LSD 45-2009
- NEMA LL 9-2009
- CAN/CSA C22.2 NO. 74-96 (R2010) \*

\* Must be accredited by the Standards Council of Canada

# Electrical Safety Requirements



The following electrical safety tests must be carried out by an OSHA Nationally Recognized Testing Laboratory (NRTL):

- ANSI/IEEE C62.41-2002 (Transient Protection)
- ANSI/UL 153-2002
- ANSI/UL 935-2009
- ANSI/UL 1029-2010
- ANSI/UL 1310-2010
- ANSI/UL 1574-2004
- ANSI/UL 1598-2008
- ANSI/UL 1598B-2010
- ANSI/UL 1993-2009
- ANSI/UL 2108-2004\*
- ANSI/UL 8750-2009\*

\*Until OSHA adds these tests to its offerings, a test report from an OSHA NRTL without UL 8750-2009 or UL 2108-2004 on its scope of accreditation will be acceptable.

# EMI Requirements



Electromagnetic Interference (EMI) testing must be carried out by an FCC-recognized laboratory:

- FCC CFR Title 47 Part 15
- FCC CFR Title 47 Part 18

<https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>

# Lumen Maintenance Testing of LED Packages/Arrays/Modules

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- IES LM-80-08

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# Lamp Specifications and Laboratory Recognition

# Laboratory Recognition for Lamp Specifications

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- **Compact Fluorescent Lamps**
- **Integral LED Lamps (Omnidirectional/Directional)**
- **Integral LED Lamps, Decorative**

# Compact Fluorescent Lamps (CFL)



<b>Compact Fluorescent Lamps (CFL)</b>	
<b>Criteria Item</b>	<b>Test Method</b>
Lamp Power (Watts) & Configuration	IES LM-9-1999 IES LM-66-00 (for single-ended CFLs)
Color Rendering Index (CRI)	CIE Publication No. 13.3
Power Factor	IES LM-9-1999 IES LM-66-00 (for single-ended CFLs)
Rapid Cycle Stress Test	IES LM-65-01 (for single-ended CFLs)
Life Testing for Fluorescent Lamps	LM-40-01
Lumen Maintenance	ENERGY STAR Elevated Temperature Test Procedure (Appendix B)
Run-up Time, Lumen Maintenance at 40% rated life	ANSI C78.5-2003

# Integral LED Lamps, Omnidirectional/Directional



<b><i>Omnidirectional/Directional Lamps (Shapes: A, BR, BT, ER, K, MR, P, PAR, PS, R, S, T)</i></b>	
<b>Criteria Item</b>	<b>Test Method</b>
Correlated Color Temperature (CCT) and Duv, Color Rendering Index (CRI), Color Maintenance, Power Factor, Minimum Luminous Efficacy, Minimum Light Output, Color Spatial Uniformity (for directional lamps), Minimum Light Output (for BR, ER, K, and R lamps)	IES LM-79-08 sections 9 and 12
Luminous Intensity Distribution, Minimum Center Beam Intensity (for PAR and MR16 lamps)	IES LM-79-08 section 10 (Goniophotometer)
Lumen Maintenance	IES LM-79-08 section 9 Elevated Temperature Test per ENERGY STAR CFL Version 4.0 (40% rated life) IES LM-80-08*
Rapid Cycle Stress Test	IES LM-65-01

\* Lab is not required to be accredited to LM-80-08 to be recognized to test Integral LED Lamps. However, in the case of a partner pursuing the early initial qualification option (see ENERGY STAR Program Requirements for Integral LED Lamps, Section 8A), which requires accreditation to LM-80-08, the CB will need a supplemental test report from an EPA-recognized lab accredited to LM-80-08.

# Integral LED Lamps, Decorative



<b>Decorative Lamps (Shapes: B, BA, C, CA, DC, F, G)</b>	
<b>Criteria Item</b>	<b>Test Method</b>
Correlated Color Temperature (CCT) and Duv, Color Rendering Index (CRI), Color Maintenance, Power Factor, Minimum Luminous Efficacy, Minimum Light Output	IES LM-79-08 sections 9 and 12
Lumen Maintenance	IES LM-79-08 section 9 IES LM-80-08*
Rapid Cycle Stress Test	IES LM-65-01

\*Lab is not required to be accredited to LM-80-08 to be recognized to test Integral LED Lamps. However, in the case of a partner pursuing the early initial qualification option (see ENERGY STAR Program Requirements for Integral LED Lamps, Section 8A), which requires accreditation to LM-80-08, the CB will need a supplemental test report from an EPA-recognized lab accredited to LM-80-08.

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# Decorative Light Strings Specification and Laboratory Recognition

# Decorative Light Strings (DLS)

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- Test method as outlined in ENERGY STAR DLS Eligibility Criteria Version 1.4

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# Expiring Specifications

# Expiring Specifications



- **SSL Luminaires**
- **Residential Light Fixtures (RLF)**
- **GU24 based lamps** (will be replaced by Lamps Specification in 2011/2012)
- **Fluorescent Ballasts** (labs recognized for Luminaires: Fluorescent can carry out subcomponent tests)
- **Fluorescent Lamps** (labs recognized for Luminaires: Fluorescent can carry out subcomponent tests)

# Solid State Lighting Luminaires (SSL)



<i>Solid State Lighting Luminaires (SSL)</i>	
Criteria	Test Method
Luminaire Efficacy (Light Output, Input Power), Color Rendering Index (CRI), Chromaticity and Correlated Color Temperature (CCT)	IES LM-79-08 sections 9 and 12
Power Factor	ANSI C82.77-2002
Zonal Lumen Density (except Ceiling Mounted Luminaires with diffusers)	IES LM-79-08 section 10* (Goniophotometer)
Lumen Maintenance (L <sub>70</sub> )	IES LM-80-08**

\*Lab will be only partially recognized if lacking accreditation to LM-79-08 section 10. In this case, the CB will need a supplemental test report from an EPA-recognized lab accredited to LM-79-08 section 10.

\*\*Lab is not required to be accredited to LM-80-08 to be recognized to test SSL Luminaires. However, the CB will need a supplemental test report from an EPA-recognized lab accredited to LM-80-08.

# Residential Light Fixtures (RLF), Outdoor



<i>Residential Light Fixtures (RLF), Outdoor</i>	
<b>Criteria Item</b>	<b>Test Method</b>
System Efficacy	IES LM-9-1999 IES LM-66-00 (for single-ended CFLs) ANSI C82.2-2002
Lamp Life	IES LM-40-01 IES LM-65-01

# Residential Light Fixtures (RLF), Indoor



<i>Residential Light Fixtures (RLF), Indoor</i>	
Criteria Item	Test Method
System Efficacy	IES LM-9-1999 IES LM-66-00 (for single-ended CFLs) ANSI C82.2-2002
Lamp Requirements	IES LM-40-01 IES LM-65-01
Lumen Maintenance	IES LM-40-01 IES LM-9-1999 IES LM-65-01 IES LM-66-00 (for single-ended CFLs)
Color Rendering Index (CRI)	CIE Publication No. 13.3 IES LM-58-94
Correlated Color Temperature (CCT)	IES LM-58-94 IES LM-16-93

# GU24 Based Lamps



<b>GU24 Lamps</b>	
<b>Criteria Item</b>	<b>Test Method</b>
System Efficacy	ANSI C78.5: 2003 IES LM-66-00 (for single-ended CFLs)
General Ballast Requirement, Lamp Start Time, Run-up Time	ANSI C78.5-2003
1,000 hour Lumen Maintenance	IES LM-66-00 (for single-ended CFLs) IES LM-65-01 (for single-ended CFLs) ANSI C78.5-2003
Color Rendering Index (CRI)	CIE Publication No. 13.3 IES LM-58-94
Correlated Color Temperature (CCT)	IES LM-58-94 IES LM-16-93
Average Rated Lamp Life	IES LM-65-01 (for single-ended CFLs) ANSI C78.5-2003