



ENERGY STAR[®] Program Requirement for Residential Light Fixtures

FINAL DRAFT Eligibility Criteria – Version 3.2

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Below is the **FINAL DRAFT** product specification (Version 3.2) for ENERGY STAR qualified residential light fixtures. A product must meet all of the identified criteria if it is to be labeled as ENERGY STAR by its manufacturer.

The intent of ENERGY STAR for Residential Light Fixtures is to move consumers from traditional incandescent fixtures to fixtures that use high-quality fluorescent or other energy-efficient technologies, including outdoor motion-sensors and daylight-sensors.

- 1) **Definitions:** Below is a brief description of a light fixture and other related terms as relevant to ENERGY STAR:
 - A. **Light Fixture (Luminaire):** A complete lighting unit consisting of a lamp or lamps, and ballasting (when applicable) together with the parts designed to distribute the light, position and protect the lamps, and connect the lamps to the power supply.
 - B. **Lamp:** A generic term for a manufactured source of light. By extension, the term is also used to denote sources that radiate in regions of the spectrum adjacent to the visible.
 - C. **Compact Fluorescent Lamp:** Multitube or multibend single-ended pin-based lamps.
 - D. **Linear Fluorescent Lamp:** Straight or U-bent double-ended lamps.
 - E. **Ballast:** A device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current and waveform) for starting and operating.
 - F. **Input Power:** The actual total power used by all the lamps and ballast(s) of the light fixture when operating, measured in watts (W).
 - G. **Lamp Current Crest Factor:** Ratio of peak current to the root mean square (RMS) lamp current.
 - H. **Ballast Frequency:** The frequency at which the ballast operates the lamp, measured in Hertz (Hz) or kilohertz (kHz).
 - I. **Color Rendering:** The effect that the spectral characteristics of the light emitted by the lamp has on the color appearance of the objects illuminated by the lamp. Color Rendering Index is measured on a scale of zero to 100, and is defined in terms of a comparison of the spectral tri-stimulus values of the objects under test illumination and a reference or standard illumination according to the recommendations of CIE Publication No. 13.3.
 - J. **Correlated Color Temperature (CCT):** The actual color of the lamp is called the color temperature and is defined in terms of the spectral tri-stimulus values (color coordinates) according to the recommendations of IESNA LM-16. For color coordinates near the Black Body loci, the correlated color temperature, measured in Kelvin (K), is used.
 - K. **NFPA:** The National Fire Protection Association (United States) develops the National Electrical Code (NEC).
 - L. **NVLAP:** National Voluntary Laboratory Accreditation Program.
 - M. **MRA:** Mutual Recognition Arrangement.
 - N. **ILAC:** International Laboratory Accreditation Cooperation (NVLAP MRA Signatory).
 - O. **APLAC:** Asia Pacific Laboratory Accreditation Cooperation (NVLAP MRA Signatory).

- P. NACLA: National Cooperation for Laboratory Accreditation (NVLAP MRA Signatory).
- Q. OSHA: Occupational Safety & Health Administration.
- R. NRTL: Nationally Recognized Testing Laboratory Program, which is a part of OSHA's Directorate of Technical Support.
- S. ANSI: American National Standards Institute.
- T. IESNA: Illuminating Engineering Society of North America.
- U. CIE: Commission Internationale de l'Eclairage.
- V. IEC: International Electrotechnical Commission
- W. UL: Underwriters Laboratories.
- X. NEMA: National Electrical Manufacturers Association.
- Y. ALA: American Lighting Association.
- Z. Recessed downlight retrofit kit: A non-linear lighting unit consisting of lamp(s), ballasting, optics, trim, and power supply connection designed to convert an incandescent or halogen type Insulated Ceiling (IC) or non-I.C. recessed downlight into an "air-tight" (AT) fixture that uses an energy-efficient source.
- AA. Optics – Include reflectors, baffles, lenses and/or diffusers, all which control the light distribution and the appearance of the lighted fixture.
- BB. Trim – Trim is the part of the 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). Airtight or non-airtight.
- CC. Pigtail – A short piece of cable with two connectors on each end for converting between one connector type and another; also referred to as a screw-based adapter and socket adapter.

Note: Language previously included in the pigtail definition that required pigtail connections to be non-reversible has been removed in this Final Draft. This change was made based on stakeholder comments that reversibility is an important consumer consideration for this product type due to the fact that, unlike other fixture types, a non-reversible recessed can would require an electrician to replace.

- 2) Qualifying Products: The ENERGY STAR Residential Light Fixture specification covers the requirements for indoor and outdoor light fixtures and recessed downlight retrofit kits, as defined in Section 1A and 1Z above, and intended primarily for residential type applications. For the purposes of this ENERGY STAR specification, residential applications include single-family and multi-family dwellings (such as houses and apartments), dormitories, public or military housing, assisted-living facilities, motels and hotels, and some light commercial applications.
- 3) Energy-Efficiency Specifications for Qualifying Products: Only those products listed in Section 2 that meet the criteria below may qualify as ENERGY STAR. Specifications for qualifying **indoor fixtures** can be found in Table 1. Specifications for qualifying **Recessed Downlight Retrofit Kits** can be found in Table 1A. Specifications for qualifying **outdoor fixtures** can be found in either Table 2A – Outdoor Fixtures: Compliance Through Efficient Light Source or Table 2B – Outdoor Fixtures: Compliance Through Reduced Operating Time.

Table 1 - Indoor Fixtures

Performance Characteristic	ENERGY STAR Specification
<p>Efficiency:</p> <p>System Efficacy (Lumens Per Watt (LPW))¹, per lamp ballast combination</p>	<p>≥ 46 LPW for all lamp types below 30 total listed lamp watts.</p> <p>≥ 60 LPW for all lamp types that are ≤ 24 inches and ≥ 30 total listed lamp watts.</p> <p>≥ 70 LPW for all lamp types that are ≥ 24 inches and ≥30 total listed lamp watts.</p>
<p>Lamp Start Time</p>	<p>The time needed after switching on the lamp to start continuously and remain lighted must be an average of one second or less.</p> <p>For manufacturers using magnetic ballasts and lamps with integrated electronic starting chips (“instant-on”), lamps <u>must</u> be included with fixtures when shipped from the factory.</p>
<p>Note: EPA received a request to remind manufacturers that magnetically ballasted compact fluorescent fixtures must be shipped with a lamp that starts continuously and remains lighted within one second. These lamps are commonly referred to as “instant-on”. In response to this request, and to be consistent with references to this term in the NEMA-ALA Lamp Matrix, “instant-on” has been added to the Lamp Start Time requirement, above.</p>	
<p>Lamp Life</p>	<p>For fixtures that are shipped with a lamp, the average rated life of the lamp must be ≥ 10,000 hours.</p> <p>For fixtures that are not shipped with lamps, a list of lamp types must be provided that would result in the fixture complying with the specification. This list must be clearly visible to the consumer on the fixture packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions, such as F32T8/830 or CFQ26W/G24q/827, will suffice.</p>
<p>Color Rendering Index</p>	<p>≥ 80 for compact fluorescent lamps.</p> <p>≥ 75 for linear fluorescent lamps.</p>

¹ Efficacy shall be determined by the following equation:

$$\text{Efficacy [Lumens per Watt]} = \frac{\text{Measured Lamp Lumens [Lumens]}}{\text{Measured Input Power [watts]}}$$

Lamp Lumens: Lamp lumens must be measured using the lamp and ballast that are shipped with the fixture.

Input Power: Input power must be measured with the lamp and ballast that are shipped with the fixture.

For fixtures shipped without lamps, efficacy shall be determined by testing at least one of the lamp types listed on the fixture package.

Correlated Color Temperature	<p>For fixtures that are shipped with a lamp, and do not have a <i>rated</i> color temperature of 2700K or 3000K (<i>actual measured</i> CCT of 2700 to 3000K \pm 200K), the packaging should clearly describe the color of the product (cool or warm) and state its intended use.</p> <p>For fixtures that do not ship with a lamp, a list of lamp types must be provided that would result in the fixture complying with the specification. This list must be clearly visible to the consumer on the fixture packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions, such as F32T8/830 or CFQ26W/G24q/827, will suffice.</p>
Noise	Class A sound rating for electromagnetic and electronic ballasts, outside the fixture. Not to exceed a measured level of 24 dBA when measured in a room with ambient noise no greater than 20 dBA.
<p>Note: In a comment received by a stakeholder, it was pointed out that in many cases, noise can be a result of the ballast positioning inside the fixture. In other words, the ballast may not “hum” outside the fixture, but once it is placed inside the fixture, resulting vibration may cause a disturbing sound. While EPA acknowledges this potential issue, it is not EPA’s intention to delay the finalization of this Version 3.2 Specification to conduct the research necessary to determine whether or not a change in this requirement is warranted. However, given continued interest and available data, EPA may address this topic in future specification revisions.</p>	
Fixture Warranty	A written warranty must be included in fixture packaging at the time of shipment, which covers repair or replacement of defective parts of the fixture housing, optics, trim and electronics (excluding the lamp) for two years from the date of purchase.
Dimming	<p>Torchiere style portable fixtures shall be dimmable from 100% to 30%, or less, of maximum light output, or be switchable to three levels of brightness, not including the off position.</p> <p>Other fixture types that utilize dimmable ballasts shall be dimmable from 100% to 30%, or less, of maximum light output, or be switchable to three levels of brightness, not including the off position.</p>
<p>Note: In regards to “dimming”, EPA received comments suggesting that the specification require test data be submitted to verify manufacturer claims. While EPA is interested in discussing this proposed requirement further, it is not EPA’s intention to delay the finalization of this Version 3.2 Specification to do so. Given continued interest, EPA may address this topic in future revisions.</p>	

<p><u>Durability:</u> ANSI-IEC Standardized Lamps</p> <p>Non ANSI-IEC Standardized Lamps</p>	<p>Lamps shall meet ANSI C78.901-2001 or C78.81-2001 and C81.61 as appropriate.</p> <p>For fixtures using non-ANSI-IEC standardized lamps, supply a manufacturer lamp specification sheet as appropriate. (Use ANSI lamp data sheets found in ANSI C78.901 or C78.81 and C81.61 as reference).</p> <p>Note: Specific lamp characteristics that should be included in the lamp specification sheet are detailed in Table 3.</p>
<p>Note: In the Draft 1 document, EPA proposed amending the current specification (Version 3.1) to include requirements for ANSI-IEC Lamp Standardization. In the event that a non-ANSI-IEC lamp is used, partners will be required to supply a manufacturer lamp specification sheet that describes the electrical and dimensional information typically found in ANSI lamp data sheets. No comments were received from manufacturers regarding this amendment. Manufacturers and other stakeholders with final comments regarding the ANSI-IEC Standardized and Non ANSI-IEEC Standardized lamp requirements must provide feedback by September 15, 2003 to be considered for the Final Version 3.2 specification.</p>	
<p>ANSI Standardized Ballast</p> <p>Maximum Ballast Operating Case Temperature for Optimal Performance</p>	<p>See "Performance Characteristics For Electronic and Magnetic Ballasts" presented later in this table.</p> <p>See the Maximum Ballast Operating Case Temperature Requirements for Optimal Performance presented later in this table.</p>
<p><u>Safety</u>²:</p> <p>Portable Fixtures</p> <p>Hardwired Fixtures</p> <p>Ballasts and "Non Edison base Fluorescent Adapters"</p>	<p>Fixtures must be tested and listed by an OSHA NRTL as acceptable for compliance with NFPA 70, National Electrical Code (NEC).</p> <p>The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with ANSI/UL 153.</p> <p>The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with UL 1598.</p> <p>The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with ANSI/UL 935 or UL 1993, as appropriate.</p>

² When private labeling products, a letter from the original equipment manufacturer (OEM) that acknowledges the private labeling of its products must be provided. The letter must include the name of the private labeling company, the model numbers of the products being submitted for ENERGY STAR as listed on the QPI form, and the OEM's OSHA NRTL file number for the appropriate category control number (e.g., "fluorescent surface mounted luminaires, portable lamps, etc.").

Performance Characteristics for Electronic Fluorescent Ballasts:

General

Per ANSI C82.11 Section 5 except paragraph 5.3.1.

Power Factor

≥ 0.5

Lamp Current Crest Factor

≤ 1.7

Maximum Ballast Operating Case Temperature for Optimal Performance

$\leq 90^{\circ}$ C or not to exceed ballast manufacturer requirements, whichever is lower.

Note: all qualified fixtures are expected to meet the Maximum Ballast Operating Case Temperature for Optimal Performance requirements. This includes every qualified fixture including linear, suspended, close-to-ceiling, IC, ICAT and Non-IC recessed canisters, etc. as well as those fixtures that may be exempt from UL1598.

Note: EPA received a number of stakeholder comments and questions regarding which types of fixtures are required to meet the Maximum Ballast Operating Case Temperature for Optimal Performance requirements. In response, information provide in the “Note”, above, has been expanded to clarify that every fixture type eligible for ENERGY STAR qualification must meet the Maximum Ballast Operating Case Temperature for Optimal Performance requirement. This change is repeated below in the “Performance Characteristics for Magnetic Fluorescent Ballasts” section and in “Table 3: Reference Standards and Required documentation”.

Electromagnetic and Radio Frequency Interference

Ballast must be FCC rated for consumer use (FCC 47 CFR Part 18 Class B for EMI & RFI Consumer Limits)

Ballast Frequency

20 to 33 kHz or ≥ 40 kHz

Transient Protection

Per ANSI C82.11b, paragraph 5.10.1 (100hz Ring Wave, 2.5kV, both common mode and differential mode, 7 strikes)

End of Life Protection

Required for all T5 and smaller lamps. Manufacturer must submit laboratory data or an engineering description outlining the scheme that is used to achieve the end of life function within the ballast.

[Tests for these protection circuits are under development by ANSI subcommittee C82-1 for inclusion in C82.11. ENERGY STAR may require further documentation when standard is adopted.]

<u>Performance Characteristics for Magnetic Fluorescent Ballasts:</u>	
General	Per ANSI C82.1 Section 5 except paragraph 5.3.1 and 5.3.2.1.
Power Factor	≥ 0.5
Lamp Current Crest Factor	≤ 1.7
Maximum Ballast Operating Case Temperature for Optimal Performance	<p>$\leq 90^{\circ}$ C or not to exceed ballast manufacturer recommendation, whichever is lower.</p> <p>Note: all qualified fixtures are expected to meet the Maximum Ballast Operating Case Temperature for Optimal Performance requirements. This includes every qualified fixture including linear, suspended, close-to-ceiling, IC, ICAT and Non-IC recessed canisters, etc. as well as those fixtures that may be exempt from UL1598.</p>
Electromagnetic and Radio Frequency Interference	Not Applicable
Ballast Frequency	60 Hz
Transient Protection	Not Applicable
End of Life Protection	Not Applicable

Recessed Downlight Retrofit Kits: The following ENERGY STAR performance requirements must be met by recessed downlight retrofit kits **in addition** to those listed in Table 1 – Indoor Fixtures, above.

Note: EPA received the recommendation that all recessed downlights, regardless of whether they are intended for retrofit or new construction, should be covered under the same specification. While it is not EPA’s intention to delay the finalization of this Version 3.2 Specification, EPA is interested in collecting feedback and information from additional stakeholders regarding this recommendation. Given continued interest and available data, EPA may address this topic in future revisions. Currently, recessed cans are eligible for ENERGY STAR using Table 1 of this specification. All interested stakeholders are encouraged to comment on this recommendation for future consideration.

Table 1A – Additional Indoor Recessed Downlight Retrofit Kits

Performance Characteristic	ENERGY STAR Specification
Efficiency:	
Fixture Efficiency	When retrofitted, 50% minimum, with 85% of the lumen output within the 0 to 60 degree zone.
Reflectors	Reflectors must be included to maximize fixture efficiency.
Fixture Lumen Output	When retrofitted, fixture shall deliver a minimum of 900 lumens (initial), net of fixture losses, when operated in an insulated ceiling environment.
Aperture	Maximum 7.0”.
Restricted Air movement	Manufactured without penetrations between the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the conditioned space. OR Performance tested in accordance with ASTM E283.
Electrical Connections	Edison socket with wire “pigtail” to the ballast.
Safety:	Fixtures must be tested and listed by an OSHA NRTL as acceptable for compliance with NFPA 70, National Electrical Code (NEC).
Fixture Conversions, Retrofits	The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with UL 1598 and UL 1598B.
Packaging Requirements	Recessed downlight retrofit kit packaging must clearly indicate what model numbers the recessed downlight retrofit kits are compatible with. Recessed downlight retrofit kit packaging must clearly indicate that the downlight retrofit kit complies with ASTM E283. Recessed downlight retrofit kit packaging must include instructions on how to properly install the product.

	<p>Recessed downlight retrofit kit packaging and instructions must clearly indicate whether or not the product is dimmable. If dimmable, user instructions must clearly indicate what type of dimming circuit it can be used on.</p> <p>Recessed downlight retrofit kit packaging and instructions must clearly state any known incompatibility with photo controls, dimmers or timing devices.</p>
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Table 2A - Outdoor Fixtures: Compliance Through Efficient Light Source

Performance Characteristic	ENERGY STAR Specification
Maximum Input Power	150 watts
System Efficacy	<p>≥ 40 Lumens Per Watt, for fixtures up to 70 listed lamp watts.</p> <p>≥ 50 Lumens Per Watt, for fixtures from 70 to 150 listed lamp watts.</p>
Lamp Socket Compatibility	<p>Lamp socket can accept, but shall not operate, any lamp that either exceeds the input power range of the fixture or is a lamp type not intended for use in the fixture (i.e. metal halide lamp in a mogul base CFL fixture).</p> <p>Note: Fixtures that utilize self-ballasted compact fluorescent lamps, regardless of base type (mogul, medium, etc), are not eligible to earn the ENERGY STAR under the requirements set forth in this table.</p>
Lamp Life	<p>For fixtures that are shipped with a lamp, the average rated life of the lamp must be ≥ 10,000 hours.</p> <p>For fixtures that are not shipped with lamps, a list of lamp types must be provided that would result in the fixture complying with the specification. This list must be clearly visible to the consumer on the fixture packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions, such as F32T8/830 or CFQ26W/G24q/827, will suffice.</p>
Electromagnetic and Radio Frequency Interference	Ballast must be FCC rated for consumer use (FCC 47 CFR Part 18 Class B for EMI & RFI Consumer Limits).

Note: EPA received a number of questions from partners asking if the requirements from Table 1 for Indoor Fixtures should also apply to Table 2A for Outdoor Fixtures: Compliance Through Efficient Light Source. Requirements for Lamp Life and Electromagnetic and Radio Frequency Interference are now included. In future specification revisions EPA may consider including additional requirements from Table 1 into Table 2A.

<p><u>Controls:</u></p> <p>Time of Day</p>	<p>Fixture must contain an integrated daylight threshold sensor that automatically prevents operation during daylight hours. The sensor must automatically reset to sensing mode within 24 hours of a manual override or testing operation. If the daylight threshold sensor can be adjusted such that the fixture can operate during full daylight, the fixture package must provide a range of settings that will result in the fixture complying with the specification.</p>
<p>Fixture Warranty</p>	<p>A written warranty must be included in fixture packaging at shipment, which covers repair or replacement of defective parts of the fixture housing or electronics (excluding the lamp) for two years from the date of purchase.</p>
<p>Safety</p>	<p>Fixtures must be compliant with NFPA 70, the National Electrical Code (NEC), including requirements for wet locations (Articles 410-4a and Article 100).</p>

Table 2A Special Application - Outdoor Fixtures: With A Controlled Circuit

<p>Shut-off</p>	<p>Automatic shut-off during daylight hours via controlled circuit. For fixtures sold without individual photocells, the package must include the following language next to the ENERGY STAR label: "This product is ENERGY STAR qualified only when installed on a photocell controlled circuit." This note will also be included in the product's fixture description on the ENERGY STAR Qualified Product Information List.</p> <p>Note: This option is designed for use in instances where multiple fixtures may "see" each other and thereby causing lamp cycling. This is only intended for fixtures used in multi-tenant housing such as apartments, condos, etc.</p>
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Note: As mentioned in the Draft 1 document, an exemption has been made in this Version 3.2 specification for time-of-day controls that are commonly used in multi-tenant buildings. This exemption does not apply to the average single-fixture purchases commonly made by the consumer at retail. Manufacturing partners who wish to qualify fixtures using "Table 2A Special Application" have to provide proof that the fixture will not be sold through retail channels. Furthermore, fixtures that are qualified using this table will have the following note in the Fixture Description cell on the Qualified Products List: "This product is ENERGY STAR qualified only when installed on a photocell controlled circuit."

Table 2B - Outdoor Fixtures: Compliance Through Reduced Operating Time	
Performance Characteristic	ENERGY STAR Specification
Maximum Input Power	250 watts
<u>Controls:</u> Time of Day Motion	<p>Fixture must contain an integrated daylight threshold sensor that automatically prevents operation during daylight hours. The sensor must automatically reset to sensing mode within 24 hours of a manual override or testing operation. If the daylight threshold sensor can be adjusted such that the fixture can operate during full daylight, the fixture package must provide a range of settings that will result in the fixture complying with the specification.</p> <p>Fixture also must contain an integrated motion sensor. The sensor must allow automatic shut-off of the lamp within 15 minutes of being manually activated by a switch or automatically activated by the sensor. The sensor must automatically reset to sensing mode within 24 hours of a manual override or testing operation. If the integrated motion sensor can be adjusted such that shut-off will not occur within 15 minutes, the fixture package must provide a range of settings that will result in the fixture complying with the specification.</p>
Fixture Warranty	A written warranty must be included in fixture packaging at shipment, which covers repair or replacement of defective parts of the fixture housing or electronics (excluding the lamp) for two years from the date of purchase.
Safety	Fixtures must be compliant with NFPA 70, the National Electrical Code (NEC), including requirements for wet locations (Articles 410-4a and Article 100).

- 4) Qualification Process, Acceptable Testing Facilities, Testing Standards & Required Documentation:
The following section describes the steps required to qualify residential light fixtures as ENERGY STAR, provides information about acceptable testing facilities, and states the testing standards and documentation required for each performance characteristic.

Steps for Partners to Qualify Residential Light Fixtures for ENERGY STAR

To qualify a residential lighting fixture as ENERGY STAR, it must be tested according to the protocol outlined below. **Note: EPA reserves the right to require additional documentation, at any time, in order to determine compliance with all performance characteristics.**

- A. Partner must test qualifying products and obtain required documentation to meet the performance characteristics listed in Section 3 of this specification. Refer to Table 3, below, to determine the reference standard and required documentation applicable to each performance characteristic.

The following stipulations apply:

- For performance characteristics that require testing, the minimum required sample size is three units for each lamp/ballast combination.

- For multiple fixture models that use the same lamp/ballast combination, only one set of test results is required. For example, two fixtures that use the same lamp and ballast combination, but have different trim, lens and/or chase need only be tested once.
 - For fixture models that may use different ballasts (either in terms of the type of ballast or manufacturer), each lamp/ballast combination must undergo testing and the test results must be submitted for qualification. For example, if a residential light fixture partner plans to use ballasts from several manufacturers in any one fixture, the fixture must be tested with each manufacturer's ballast.
 - For fixture models with one ballast type that can work with multiple lamp types, the fixtures need only be tested with one lamp type. The lamp type must either be the one supplied with the fixture at shipment or, if a lamp is not supplied, one of the lamp types listed on the packaging. Please note that EPA expects all lamps listed on the packaging to comply with the specification when operating on the fixture's ballast. To ease the burden on the manufacturer, however, test data need be submitted for only one lamp type operating on the fixture's ballast.
- B. Submit a signed and completed copy of the ENERGY STAR Residential Light Fixture Qualified Product Information (QPI) form along with required documentation. To obtain the current version of the form, visit the "Lighting" section of the ENERGY STAR Web site at www.energystar.gov/partners and click on "Product Specifications."

Explanation of Acceptable Testing Facilities:

- To ensure quality product in the marketplace, ENERGY STAR requires test data from a laboratory accredited by one of the following: NVLAP, a laboratory accredited through one of NVLAP's MRA signatory partners (ILAC, APLEC, NACLA), or, when appropriate, from an OSHA NRTL or a laboratory accredited by an OSHA NRTL (see Table 3 for specific requirements).

Please note that the required laboratory data for lumen output, CRI, CCT, and lamp life must come from a NVLAP accredited laboratory whose scope of accreditation includes the specific reference standards that are listed in Table 3 of this specification. Partner should obtain from the laboratory both its certificate of accreditation and its scope of accreditation and submit them to ENERGY STAR. Documentation for safety requirements must come from an OSHA NRTL. All other documentation may come from one of the accredited laboratories mentioned in the previous paragraph.

- Use the information below to locate an acceptable testing facility:
 - For a list of NVLAP accredited laboratories, visit the NVLAP Web site at <http://www.nist.gov/nvlap> or call (301) 975-4016.
 - For a list of signatories to the ILAC MRA, visit the ILAC Web site at www.ilac.org.
 - For a list of signatories to the APLAC MRA, visit the APLAC Web site at <http://www.ianz.govt.nz/aplac/>.
 - For a list of signatories to the NACLA MRA, visit the NACLA Web site at www.nacla.net.
 - For a list of accredited OSHA NRTL's, visit <http://www.oshaslc.gov/dts/otpca/nrtl/index.html> or call (202) 693-2110.

- C. ENERGY STAR partners (fixture manufacturers) may obtain test data through any of the applicable following sources:

- **A public or private laboratory accredited by NVLAP or one of its MRA signatories or a public or private laboratory accredited by an OSHA NRTL.** Partner should supply laboratory test reports with a completed QPI form.
- **The original equipment manufacturer.** Partners should supply laboratory test reports or an ENERGY STAR Platform Letter of Qualification with a completed QPI form. The ENERGY STAR Platform Letters of Qualification are given to manufacturers who pre-qualified certain performance requirements for their lamp and/or ballast.
- **An industry association.** Partners should supply laboratory test reports or a letter issued by ENERGY STAR to said industry association that acknowledges the association's data sources. ENERGY STAR issues such letters to industry associations, who take responsibility for certain performance requirements of lamp/ballast combinations.

Note: Fixture manufacturers may use the NEMA-ALA Lamp and Ballast Matrices as a source for obtaining required information to qualify fixtures. These matrices can be found at www.nema-ala.org.

Note: At the request of stakeholders, EPA added reference for the NEMA-ALA Lamp and Ballast matrix. It is the hope of EPA that including this reference will assist partners in locating components that have already been tested and approved for use in ENERGY STAR qualified fixtures, thus, easing some of the testing and documentation burden.

Table 3 – Reference Standards and Required Documentation

Performance Characteristic (refer to Tables 1, 1A, 2A or 2B as appropriate)	Methods of Measurement Reference Standards	Required Documentation (to be attached to QPI Form)
<p>Note: In the table below, a parenthetical note has been added to each performance characteristic for ease of referencing back to the appropriate ENERGY STAR specification requirement provided in Tables 1, 1A, 2A or 2B.</p>		
System Efficacy: Light Output Input Power (Tables 1, 1A, 2A)	IESNA LM-9; LM-66 IESNA LM-9; LM-66; ANSI C82.2	Laboratory test results must come from the generic lamp and specific ballast combination that will operate in the fixture. Provide a test report from a laboratory: <ol style="list-style-type: none"> 1. accredited by NVLAP; or 2. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p>

Fixture Efficiency (Table 1A)	IESNA LM-41-98	<p>Laboratory test results must come from the lamp and ballast combination that is shipped with the fixture. Provide a test report from:</p> <ol style="list-style-type: none"> 1. a laboratory accredited by NVLAP; or 2. a laboratory accredited by one of its MRA signatories. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p>
Reflectors (Table 1A)	N/A	Record the reflector type in the appropriate space on the Qualified Product Information (QPI) Form.
Fixture Lumen Output (Table 1A)	IESNA LM-41-98	<p>Laboratory test results must come from the lamp and ballast combination that is shipped with the fixture. Provide a test report from:</p> <ol style="list-style-type: none"> 1. a laboratory accredited by NVLAP; or 2. a laboratory accredited by one of its MRA signatories. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p>
Lamp Start Time (Tables 1, 1A)	ANSI C82.11-5.2	<p>Laboratory test results must come from the lamp and ballast combination that is shipped with the fixture. Provide a test report from:</p> <ol style="list-style-type: none"> 1. a laboratory accredited by NVLAP; or 2. a laboratory accredited by one of its MRA signatories; or 3. a laboratory accredited by an OSHA NRTL; or 4. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic.

<p>Lamp Life (Tables 1, 1A)</p>	<p>IESNA LM-40; LM-65</p>	<p>Laboratory test results are not required for ENERGY STAR qualification. However, a test report from a laboratory accredited by NVLAP must be submitted upon EPA request.</p> <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p>
<p>Color Rendering Index (Tables 1, 1A)</p>	<p>IESNA LM-58; CIE 13.3</p>	<p>Laboratory tests must be completed on a lamp intended for use in the fixture. Provide a test report from a laboratory:</p> <ol style="list-style-type: none"> 1. accredited by NVLAP; or 2. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p>
<p>Correlated Color Temperature (Tables 1, 1A)</p>	<p>IESNA LM-58; LM-16</p>	<p>Laboratory tests must be completed on a lamp intended for use in the fixture. Provide a test report from a laboratory:</p> <ol style="list-style-type: none"> 1. accredited by NVLAP; or 2. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p>

<p>Noise (Tables 1, 1A)</p>	<p>Class A sound rating for electromagnetic and electronic ballasts, measured outside the fixture. Not to exceed a measured level of 24 dBA (audible) when measured with a sound meter (similar in performance to B&K type 2209) where the microphone is located 12 inches from the fixture in any direction in a room with ambient noise no greater than 20 dBA.</p>	<p>Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request.</p>
<p>Fixture Warranty (Tables 1, 2A & 2B)</p>	<p>No Standard Available (Use manufacturer protocol)</p>	<p>Provide a copy of the actual two-year fixture manufacturer written warranty that is included in product packaging.</p>
<p>Dimming (Tables 1, 1A)</p>	<p>No Standard Available (Use manufacturer protocol)</p>	<p>A laboratory report is NOT required to be attached at the time of product submittal. However, it should be stated on the QPI form if the ballast is dimmable. Note: A laboratory test report proving the fixture is dimmable from 100% to 30% must be submitted upon EPA request.</p>

<p><u>Durability:</u> (Tables 1, 1A)</p> <p>ANSI Standardized Lamps</p> <p>Non ANSI Standardized Lamps</p>	<p>ANSI C78.901-2001; ANSI C78.81-2001; ANSI C81.61</p> <p>ANSI C78.901-2001; ANSI C78.81 (as reference) ANSI C81.61</p>	<p>Specify applicable ANSI or ANSI-IEC Standard Data Sheet Number and ANSI designated base type on the QPI Form.</p> <p>For fixtures using non-ANSI standardized lamps, supply a manufacturer lamp specification sheet that describes the electrical and dimensional information including the following as appropriate. (Use ANSI lamp data sheets found in ANSI C78.901 and C78.81 as reference):</p> <ul style="list-style-type: none"> ○ Lamp Description: <ul style="list-style-type: none"> - Lamp Abbreviation - Nominal Wattage - Nominal Dimension (OAL, Width, Depth) - Bulb Designation - Circuit Application ○ Physical Characteristics <ul style="list-style-type: none"> - Dimensional Characteristics - Base Specifications (must be standardized, reference ANSI C81.61) ○ Operating Position ○ Cathode Characteristics <ul style="list-style-type: none"> - Type ○ Radio Interference Suppression Capacitor <ul style="list-style-type: none"> - Minimum (uF) (at 60Hz) - Maximum (uF) (at 60Hz) ○ Lamp Starting Time ○ Reference Ballast Characteristics <ul style="list-style-type: none"> - Rated input voltage (V) - Reference Current (A) - Impedance (ohms) ○ Thermal Conditions <ul style="list-style-type: none"> - Base temperature rise (K max.)
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		<ul style="list-style-type: none"> o Information for Ballast Design: <ul style="list-style-type: none"> - Starting Voltage <ul style="list-style-type: none"> ▪ Voltage between lamp terminals: <ul style="list-style-type: none"> At 0°F(-18°C) and above, (Vrms) min. At 0°F(-18°C) and above, (Vpeak) max. o Maximum Lamp Operating Current Ratio (%) o Preheat Current <ul style="list-style-type: none"> - Minimum at 90% of rated line voltage (A) - Maximum at 106% of rated line voltage (A) o Cathode heat Requirements <ul style="list-style-type: none"> - Dummy load resistor, for both cathodes in series o Information for Luminaire Design o Nominal Lamp Operation <ul style="list-style-type: none"> - Maximum temperature at point X on lamp base (°C) o Abnormal Lamp Operation o Maximum base temperature (°C)
<p>Note: As mentioned in the Draft 1 document, EPA is amending the current specification to include requirements for ANSI-IEC Lamp Standardization. In the event that a non-ANSI-IEC lamp is used, partners shall supply a manufacturer lamp specification sheet that describes the electrical and dimensional information typically found in ANSI lamp data sheets, as listed above. Additional documentation provided in this table supports the durability requirements proposed in Tables 1 and 1A of this Final Draft Version 3.2 specification. No comments were received from manufacturers regarding this amendment. Manufacturers and other stakeholders with final comments regarding the ANSI-IEC Standardized and Non ANSI-IEEC Standardized lamp requirements must provide feedback by September 15, 2003 to be considered for the Final Version 3.2 specification.</p>		
<p><u>Safety: Indoor</u></p> <ul style="list-style-type: none"> • Portable Fixtures (Table 1) • Hardwired Fixtures (Table 1) 	<p>ANSI/UL 153</p> <p>UL 1598</p>	<p>Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL.</p> <p>Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL.</p>

<p><u>Safety: Indoor (cont.)</u></p> <ul style="list-style-type: none"> • Ballasts and “Non-Edison based Fluorescent Adapters” (Tables 1, 1A) • Fixture Conversions, Retrofits (Table 1A) 	<p>ANSI/UL 935 or UL 1993</p> <p>UL 1598 and UL 1598B</p>	<p>Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL.</p> <p>Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL.</p>
<p><u>Safety: Outdoor</u> (Tables 2A & 2B)</p>	<p>NFPA 70, the National Electrical Code (NEC), including requirements for wet locations when applicable (Articles 410-4a and Article 100)</p>	<p>Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL. Including evidence of the Rain Test for Wet Location when applicable.</p>
<p>Power Factor (Tables 1, 1A)</p>	<p>ANSI C82.11-3.3.1</p>	<p>Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request.</p>
<p>Lamp Current Crest Factor (Tables 1, 1A)</p>	<p>ANSI C82.11-3.3.3 and 5.6 ANSI C82.1-5.6.1</p>	<p>Laboratory testing must be completed using the ballast that is shipped with the fixture. Provide a test report from:</p> <ol style="list-style-type: none"> 1. a laboratory accredited by NVLAP; or 2. a laboratory accredited by one of its MRA signatories; or, 3. a laboratory accredited by an OSHA NRTL; or 4. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic.

<p>Maximum Ballast Operating Case Temperature for Optimal Performance (Tables 1, 1A)</p>	<p>UL 1598, Section 11 (Acceptable when the thermocouple is placed at the hot-spot location indicated by the ballast manufacturer for performance.)</p> <p>Lighting Research Center (LRC) “Proposed Durability Testing Method: Temperature”</p> <p>Note: All qualified fixtures are expected to meet the Maximum Ballast Operating Case Temperature for Optimal Performance requirements. This includes every qualified fixture including linear, suspended, close-to-ceiling, IC, ICAT and Non-IC recessed canisters, etc. as well as those fixtures that may be exempt from UL1598.</p>	<p>Supply manufacturer or lab data.</p> <p>Note: A laboratory test report must be submitted upon EPA request. The test report should show that the temperature of the ballast case, when installed in the fixture and after being in operation for at least 7.5 hours, does not exceed the manufacturer’s maximum ballast case temperature for performance. The temperature of the ballast case should be taken at the “hot-spot” locations for performance as indicated by the ballast manufacturer. If the maximum ballast operating case temperature and hot-spot locations cannot be obtained from the ballast manufacturer, measurements should be completed in accordance with the LRC’s “Proposed Durability Testing Method: Temperature”. The laboratory test report may come from one of the following: 1) “In-house” fixture manufacturer laboratory; 2) lamp or ballast manufacturer laboratory; 3) third party independent laboratory.</p>
<p>Note: A number of stakeholders expressed concern that EPA is now requiring maximum ballast operating case temperature for optimal performance to be tested by a NVLAP accredited laboratory. This was not EPA’s intent when developing this requirement. A list of acceptable laboratories is now provided at the end of the Note in column three, above, which includes one of the three sources: (1) “in-house” fixture manufacturer laboratory; (2) lamp or ballast manufacturer laboratory; or (3) third party independent laboratory. Further it was suggested that EPA clarify when the UL 1598 test method should be used Vs. the LRC method. A parenthetical note has been added above to provide this information.</p> <p>Another stakeholder comment pointed out that the specification failed to state that manufacturers should test the maximum ballast case temperature for performance after the fixture has been in operation for at least 7.5 hours. This clarification has been added above.</p> <p>Please also note that in the Draft 1 document, EPA stated that LRC measured maximum ballast operating case temperatures inside the fixtures and found that many were above 90°C. This sentence should have said that LRC measured maximum ballast operating case temperatures inside the fixtures and found that SOME were above 90° and MANY WERE ABOVE 75 and 65°C.</p>		
<p>Electromagnetic and Radio Frequency Interference (Tables 1, 1A)</p>	<p>Consumer Limits Per FCC 47 CFR Part 18.305 and 18.307</p>	<p>No lab report is required to be attached to QPI form.</p> <p>Note: A laboratory test report must be submitted upon EPA request.</p> <p>Not required for magnetically ballasted fixtures.</p>

Ballast Frequency (Tables 1, 1A)	Oscilloscope instruction manual	Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request. Not required for magnetically ballasted fixtures.
Transient Protection (Tables 1, 1A)	ANSI C82.11b, paragraph 5.10.1	Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request. Not required for magnetically ballasted fixtures.
End of Life Protection (Tables 1, 1A)	ANSI C78.81-12.6 and C78.901-13.8	Required for all T5 and smaller lamps with high frequency electronic ballasts. Attach, from the manufacturer or a laboratory, an engineering description outlining the scheme that is used to achieve the end of life function within the ballast. Not required for magnetically ballasted fixtures.
Aperture (Table 1A)	No Standards Available	Record the aperture size in the appropriate space on the Qualified Product Information (QPI) Form.
Restricted Air Movement (Table 1A)	ASTM E283	Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request.
Electrical Connections (Table 1A)	No Standards Available	Supply engineering description and/or schematic.
Indoor Product Packaging Requirements: (Tables 1) <ul style="list-style-type: none"> Lamp Life Correlated Color Temperature 	No Standards Available	Provide a written copy or a PDF graphic of the language that will be displayed on product packaging.
Indoor Product Packaging Requirements: (Tables 1A) <ul style="list-style-type: none"> Recessed Downlight Retrofit Kit 	No Standards Available	Provide a written copy or a PDF graphic of the language that will be displayed on product packaging and provide the appropriate installation instructions

Outdoor Product Packaging Requirements: (Tables, 2A, 2A Special Applications, and 2B) <ul style="list-style-type: none"> • Time of Day Control • Shut-Off • Motion Control 	No Standards Available	Provide a written copy or a PDF graphic of the language that will be displayed on product packaging.
Lamp Socket Compatibility (Table 2A)	N/A	Provide with the QPI form a written description about the physical characteristics and the operation of the lamp socket indicating that the lamp holder could accept but shall NOT operate any lamp that either exceeds the input power range of the fixture, or is a lamp type not intended to be used in that particular fixture.
Time of Day Control (Tables 2A & 2B)	N/A	Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request.
Motion Control (Table 2B)	N/A	Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request.
Shut-off (Table 2A)	N/A	Supply manufacturer or lab data. Note: A laboratory test report must be submitted upon EPA request.

- 5) **Effective Date:** The date that manufacturers may begin to qualify products as ENERGY STAR will be defined as the *effective date* of the agreement. The ENERGY STAR Version 3.2 Specification for Residential Light Fixtures shall go into effect on **September 19, 2003**. Any previously executed agreement on the subject of ENERGY STAR qualified residential light fixtures, shall be terminated effective September 19, 2003.

Note: As of September 19, 2003, all partners will be required to provide EPA with the product performance data and documentation outlined in this Version 3.2 specification. The majority of changes proposed in this document consist of minor clarifications on existing specification requirements. Based on the first round of stakeholder comments, it is EPA's belief that this revised specification can be implemented by this effective date. Furthermore, EPA has received no comments specifically in regards to whether or not the proposed effective date is appropriate. Stakeholders that wish to comment on this date must do so before September 15, 2003 to be considered by EPA.

- A. **Qualifying and Labeling Products under the Version 3.2 Specification:** All products, including models originally qualified under Version 3.1 with a **date of manufacture** after **September 19, 2003**, must meet the new Version 3.2. requirements in order to use the ENERGY STAR on the product or in product literature. The date of manufacture is specific to each unit, and is the date (e.g., month and year) of which a unit is considered to be completely assembled.

- B. Elimination of Automatic Grandfathering: EPA does not allow grandfathering under this Version 3.2 specification. **ENERGY STAR qualification under Version 3.1 is not automatically granted for the life of the product model.** Therefore, any product sold, marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current specification in effect at that time.

Manufacturers of existing qualified products will have **3 months from the effective date to submit required documentation** to remain qualified under this Version 3.2 specification.

- 6) Future Specification Revisions: ENERGY STAR reserves the right to change the 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 will be arrived at through industry discussions.

Complete Phase Out of Linear Magnetic Ballasts: Linear fluorescent fixtures with a magnetic ballast and lamps greater than 24 inches in length and over 30 listed lamp watts, no longer qualify for ENERGY STAR. All linear fluorescent fixtures with lamps greater than 24 inches in length and over 30 listed lamp watts must use an electronic ballast to qualify for ENERGY STAR.

Phase-out of Magnetic Ballasts: It is EPA's intent that future ENERGY STAR Residential Light Fixture technical specifications will require ALL fluorescent fixtures to use electronic ballasts.