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# ENERGY STAR® Program Requirements Product Specification for Residential Ceiling Fans and Ceiling Fan Light Kits

## Eligibility Criteria Final Draft Version 4.0

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8 Following is the Final Draft Version 4.0 product specification for ENERGY STAR certified residential  
9 ceiling fans and ceiling fan light kits. A product shall meet all of the identified criteria if it is to earn the  
10 ENERGY STAR.

### 11 1 DEFINITIONS

- 12 A. Airflow<sup>1</sup>: The rate of air movement at a specific fan-speed setting expressed in cubic feet per  
13 minute (CFM)
- 14 B. Basic Model<sup>2</sup>: All units of a given type of covered product (or class thereof) manufactured by one  
15 manufacturer; having the same primary energy source; and, which have essentially identical  
16 electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption,  
17 energy efficiency, water consumption, or water efficiency.
- 18 C. Belt-Driven Ceiling Fan<sup>1</sup>: A ceiling fan with a series of one or more fan heads, each driven by a  
19 belt connected to one or more motors that are located outside of the fan head.
- 20 D. Blade Span<sup>1</sup>: Measurement of the largest swept circle by any part of the fan blade assembly,  
21 including any blade attachments. This equals the lateral distance from the center of the axis of  
22 rotation of the fan blades to the furthest fan blade edge from the center of the axis of rotation,  
23 multiplied by two. Sometimes referred to as “diameter” in this specification.
- 24 E. Ceiling Fan Efficiency<sup>1</sup>: The ratio of the total airflow to the total power consumption, in units of  
25 cubic feet per minute per watt (CFM/W). For low-speed small-diameter ceiling fans, this is a  
26 weighted efficiency based on the ceiling fan performance in low speed, high speed, and standby  
27 mode. For low-mount high-speed small-diameter ceiling fans, this is a weighted efficiency based  
28 on the ceiling fan performance in high speed and standby mode.
- 29 F. Ceiling Fan Light Kit<sup>2</sup> (CFLK): Equipment designed to provide light from a ceiling fan that can be:  
30 (1) integral, such that the equipment is attached to the ceiling fan prior to the time of retail sale; or  
31 (2) attachable, such that at the time of retail sale the equipment is not physically attached to the  
32 ceiling fan, but may be included inside the ceiling fan at the time of sale or sold separately for  
33 subsequent attachment to the fan.
- 34 G. CFLK with Integrated Solid-State Lighting Circuitry<sup>3</sup>: A CFLK that has solid-state lighting (SSL)  
35 light sources, drivers, heat sinks, or intermediate circuitry (such as wiring between a replaceable  
36 driver and a replaceable light source) that are not consumer replaceable.
- 37 H. CFLK with Separable Light Source (“Separable”): A CFLK featuring lighting components (i.e. light  
38 emitting diodes (LEDs) and driver components or non-self-ballasted CFL lamps and ballast)  
39 which can be easily removed or replaced by the end user, thus not requiring replacement of the  
40 entire CFLK. For the purposes of this specification, this includes “Other SSL Products” as well as  
41 CFLKs shipping with ENERGY STAR certified lamps.

<sup>1</sup> Based on 10 CFR Part 430, Subpart B, Appendix U, *Definitions*. In the case of conflict, the definition in the CFR is authoritative.

<sup>2</sup> 10 CFR Part 430, Subpart A §430.2

<sup>3</sup> 10 CFR Part 430, Subpart B, Appendix V1, *Definitions*

- 42 I. Controls: Controls enable the user to turn on/off or adjust the lighting and fan movement (i.e. fan  
 43 speed and airflow direction). Controls may be in the form of pull chain, slide switch, wall  
 44 switch/panel, remote control, and/or mobile device application.
- 45 J. Highly-Decorative Ceiling Fan<sup>1</sup>: A ceiling fan with a maximum rotational speed of 90 RPM and  
 46 less than 1,840 CFM airflow at high speed, as determined by 10 CFR Appendix U to Subpart B of  
 47 Part 430.
- 48 K. High Speed<sup>1</sup>: The highest available ceiling fan speed, i.e., the fan speed corresponding to the  
 49 maximum blade revolutions per minute (RPM).
- 50 L. High-Speed Small-Diameter (HSSD) Ceiling Fan<sup>1</sup>: A ceiling fan that is not very-small-diameter,  
 51 highly decorative, or belt driven, is less than or equal to seven feet in blade span, and has a blade  
 52 thickness of less than 1/8 inch (3.2 mm) at the edge or a maximum tip speed greater than the  
 53 applicable limit specified in the table below:

Airflow Direction	Blade Edge Thickness (t)		Tip Speed Threshold	
	[mm]	[inch]	[m/s]	[feet/min]
Downward	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	16.3	3,200
Downward	t ≥ 4.8	t ≥ 3/16	20.3	4,000
Reversible	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	12.2	2,400
Reversible	t ≥ 4.8	t ≥ 3/16	16.3	3,200

- 54
- 55 M. LED Light Engine: An integrated assembly comprised of LED packages (components) or LED  
 56 arrays (modules), LED driver, and other optical, thermal, mechanical and electrical components.  
 57 The device is intended to connect directly to the branch circuit through a connector compatible  
 58 with the LED luminaire for which it was designed and does not use an ANSI standard base.<sup>4</sup> For  
 59 purposes of this specification, light engines that rely on the luminaire for optical control, and/or  
 60 thermal management, assemblies featuring remote-mounted drivers ("non-integrated"), and/or  
 61 GU24 based integrated SSL sources not in the scope of the ENERGY STAR Lamps specification  
 62 shall also be considered LED light engines.
- 63 N. Low-Mount High-Speed Small-Diameter Ceiling Fan: A high-speed small-diameter ceiling fan  
 64 considered safe for mounting in a residential setting (i.e. between 7 and 10 feet from the ground)  
 65 per UL 507<sup>5</sup>; with a blade thickness greater than or equal to 1/8 inch at the edge and a maximum  
 66 tip speed within the applicable limits in each direction as specified in the table below:

Airflow Direction	Blade Edge Thickness (t)		Tip Speed [feet/min]	
	[mm]	[inch]	>	≤
Downward-blowing	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	2,400	3,200
Downward-blowing	t ≥ 4.8	t ≥ 3/16	3,200	4,000
Upward-blowing	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	-	2,400
Upward-blowing	t ≥ 4.8	t ≥ 3/16	-	3,200

- 67 O. Low Speed<sup>1</sup>: The lowest available ceiling fan speed, i.e., the fan speed corresponding to the  
 68 minimum, non-zero blade RPM.
- 69 P. Low-Speed Small-Diameter (LSSD) Ceiling Fan<sup>1</sup>: A ceiling fan that is less than or equal to seven  
 70 feet in blade span, has a blade thickness greater than or equal to 1/8 inch (3.2 mm) at the edge  
 71 and a maximum tip speed less than or equal to the applicable limit specified in the table below,  
 72 and which are considered safe for mounting in a residential setting (i.e., between 7 and 10 feet  
 73 from the ground) per UL 507.<sup>5</sup>

Airflow Direction	Blade Edge Thickness (t)		Tip Speed Threshold	
	[mm]	[inch]	[m/s]	[feet/min]
Reversible	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	12.2	2,400

<sup>4</sup> Derived from IES RP-16-10

<sup>5</sup> UL Standard for Safety for Electric Fans, UL 507

Airflow Direction	Blade Edge Thickness (t)		Tip Speed Threshold	
	[mm]	[inch]	[m/s]	[feet/min]
Reversible	t ≥ 4.8	t ≥ 3/16	16.3	3,200

- 74 Q. Non-Standard Integrated LED Lamps: GU24 based integrated SSL sources that do not conform  
75 to an ANSI standard lamp shape or are not in the scope of the ENERGY STAR Lamps  
76 specification. These light sources shall also be considered LED light engines. See also LED Light  
77 Engine.
- 78 R. Other SSL Product: An integrated unit consisting of a light source, driver, heat sink, and  
79 intermediate circuitry that uses SSL technology (such as light-emitting diodes or organic light-  
80 emitting diodes) and is consumer replaceable in a CFLK. The term does not include LED lamps  
81 with ANSI-standard bases. Examples of other SSL products include OLED lamps, LED lamps  
82 with non-ANSI-standard bases, such as Zhaga interfaces, and LED light engines.<sup>3</sup>
- 83 S. Power Consumption: Defined as the active (real) and standby power and expressed in watts (W).
- 84 T. Residential Ceiling Fan<sup>2</sup>: A non-portable device designed for home use that is suspended from  
85 the ceiling for circulating air via the rotation of fan blades. Some ceiling fans are sold with ceiling  
86 fan light kits.
- 87 a) Standard Ceiling Fan<sup>1</sup>: A low-speed small-diameter ceiling fan that is not a very-small-  
88 diameter ceiling fan, highly decorative ceiling fan or belt-driven ceiling fan; for which the  
89 lowest point on fan blades is greater than 10 inches from the ceiling.
- 90 b) Hugger Ceiling Fan<sup>1</sup>: A low-speed small-diameter ceiling fan that is not a very-small-diameter  
91 ceiling fan, highly-decorative ceiling fan or belt-driven ceiling fan; for which the lowest point  
92 on the fan blades is less than or equal to 10 inches from the ceiling.
- 93 U. Solid-State Lighting<sup>3</sup>: Source technology where light is emitted from a solid object—a block of  
94 semiconductor – rather than from a filament or plasma, as in the case of incandescent and  
95 fluorescent lighting. This includes inorganic light-emitting diodes (LEDs) and organic light-emitting  
96 diodes (OLEDs).
- 97 V. Standby Mode<sup>2</sup>: The condition in which an energy-using product is connected to a main power  
98 source; and offers one or more of the following user-oriented or protective functions: to facilitate  
99 the activation or deactivation of other functions (including active mode) by remote switch  
100 (including remote control), internal sensor, or timer; or continuous functions, including information  
101 or status displays (including clocks) or sensor-based functions.
- 102 W. Very-Small-Diameter Ceiling Fan<sup>1</sup>: A small-diameter ceiling fan that is not a highly-decorative  
103 ceiling fan or belt-driven ceiling fan; and has one or more fan heads, each of which has a blade  
104 span of 18 inches or less.

105 **Note:** EPA has added Ceiling Fan Light Kits to the title of the specification, as they can now be certified  
106 solely through this specification. EPA also added language to the definition of ceiling fan efficiency to  
107 clarify that it is a weighted efficiency metric.

## 108 2 SCOPE

### 109 2.1 Included Products

- 110 • Products that meet the definition of a Residential Ceiling Fan (i.e., Standard and Hugger) or Low-  
111 Mount High-Speed Small-Diameter Ceiling Fan as specified herein are eligible for ENERGY  
112 STAR certification.
- 113 • Products that meet the definition of a Ceiling Fan Light Kit as specified herein are eligible for  
114 ENERGY STAR certification.

115 **2.2 Excluded Products**

- 116 • High-Speed Small-Diameter ceiling fans that do not meet the definition of Low-Mount HSSD.
- 117 • Large-Diameter ceiling fans, as defined in 10 CFR Part 430, Subpart B.
- 118 • Very-Small-Diameter, Highly Decorative, and Belt-driven ceiling fans, per Section 1, are not
- 119 covered by the definition of a Residential Ceiling Fan for ENERGY STAR certification.
- 120 • CFLKs packaged with bulbs that have an ANSI-standard lamp shape and base type that have not
- 121 been ENERGY STAR certified (e.g., A19 shape and E26 base).
- 122 • CFLKs not packaged with a light source.

123 **3 CERTIFICATION CRITERIA**

124 Below are the certification criteria for ceiling fans and ceiling fan light kits. Products shall meet all  
 125 applicable requirements to be certified as ENERGY STAR. Specifically, for a ceiling fan sold with a light  
 126 kit, both the applicable ceiling fan and ceiling fan light kit requirements shall be met.

127 **3.1 Ceiling Fan Requirements**

128 **3.1.1 Ceiling Fan Efficiency Requirements**

129 Certified products shall meet or exceed the minimum requirements presented in Table 1, below, when  
 130 operating in a downward-blowing direction.

131 Products that can be matched with several blade options shall be tested and meet these requirements  
 132 with the blade option resulting in the highest energy consumption. Products that can be configured as  
 133 either standard or hugger fans, depending on installation, shall meet the applicable requirements in each  
 134 configuration. All Low-Mount HSSD fans must meet the requirements in Table 1, regardless of the  
 135 installed configuration.

136 **Table 1: Ceiling Fan Efficiency Requirements**

Ceiling Fan Type	Blade Span <sup>†</sup> (inch)	Minimum Efficiency <sup>†</sup> (cfm/W)	Minimum High Speed Airflow <sup>†</sup> (cfm)	Test Method & Supplemental Testing Guidance
Standard and Low-Mount HSSD Ceiling Fans	D ≤ 36 inches	≥ 0.72*D + 41.93	≥ 1767	10 CFR Part 430, Subpart B, Appendix U  Products shipped with ceiling fan light kits shall be tested with those light sources mounted in their intended position and switched off.
	36 inches < D < 78 inches	≥ 2.63*D - 26.83	≥ 250*π*(D/24) <sup>2</sup>	
	D ≥ 78 inches		≥ 8296	
Hugger Ceiling Fan	D ≤ 36 inches	≥ 0.31*D + 36.84	≥ 1414	
	36 inches < D < 78 inches	≥ 1.75*D - 15	≥ 200*π*(D/24) <sup>2</sup>	
	D ≥ 78 inches		≥ 6637	

137 <sup>†</sup>D represents the fan blade span in inches  
 138

139 **Note:** EPA merged the Standard and Low-Mount HSSD ceiling fan criteria together in Table 1. These  
 140 were broken out in Draft 2, but are combined here to reduce any confusion given that the criteria are the  
 141 same for both types of fans.  
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143 **3.2 Ceiling Fan Light Kit Requirements**

144 **3.2.1 CFLK Efficacy Requirements (Applies to all CFLKs)**

145 **Table 2: Ceiling Fan Light Kit Efficacy Requirements**

CFLK Type	Minimum Efficacy (lumens/W)	Minimum Light Output (lumens)	Methods of Measurement and/or Reference Documents
<b>CFLK with Separable Light Sources: ENERGY STAR Certified Lamps</b>	See ENERGY STAR Lamps Specification	CFLKs not shipped with ENERGY STAR Certified Lamps shall deliver a minimum total light output of 800 lumens.	ENERGY STAR Lamps Specification in effect on the CFLK's model date of manufacture
<b>CFLK with Separable Light Sources: Other</b>	65.0		10 CFR Part 429 and 430, Subpart B, Appendix V1 (Fluorescent Lamp and Ballast Combinations: circline) 10 CFR Part 429 and 430, Subpart B, Appendix W (Fluorescent Lamp and Ballast Combinations: compact non-integrated) IES LM-82-12 (CFLKs with LED light engines) with energy efficiency measurements at room temperature determined in accordance with 10 CFR Part 429 and 430 Subpart B, Appendix V1 IES LM-82-12 (CFLKs with non-standard integrated LED lamps) with energy efficiency measurements at room temperature determined in accordance with CFR 429 and 430, Subpart B, Appendix BB
<b>CFLK with Integrated SSL Circuitry</b>	70.0		10 CFR Part 429 and 430, Subpart B, Appendix V1 CFLK shall be evaluated based on luminaire photometry. Values shall be derived from the complete luminaire, including optical losses.

**Supplementary Testing Guidance for Products Using LED Light Engines**

Laboratory test results shall be produced using the specific models of LED package, LED module or LED array and LED driver (i.e. LED light engine) that will be used in production. In situ temperature measurement value shall be determined in accordance with ANSI/UL 153:2002 (Sections 124-128A), ANSI/UL 1574:2004 (Section 54), or ANSI/UL 1598-2012 (Sections 19.7, 19.10-16), as applicable. Light output, input power and resulting efficacy at room temperature shall be determined in accordance with 10 CFR Part 429 and 430, Subpart B, Appendix V1; measurements at the in situ Tb value shall be determined in accordance with IES LM-82. Product shall meet requirements at both temperatures.

146 **3.2.2 Option 1 Performance Requirements: for CFLKs Shipping with ENERGY STAR**  
147 **Certified Light Bulbs**

148 For this certification pathway, CFLKs must ship with bulbs certified to the ENERGY STAR Lamp  
149 Specification effective on the date of manufacture of CFLK and be included in the CFLK certification  
150 documentation. Sections 3.2.3-3.2.4 do not apply as lighting performance requirements are fulfilled  
151 through the certification of the lamp and the following five requirements listed in this section. Lamp

152 efficacy, light output, correlated color temperature, and ratings can be referenced on the ENERGY STAR  
 153 Lamps product listing. Certain CFLK specific requirements (as noted below) still apply to the CFLK.

154 To satisfy the requirements of this specification, ceiling fan light kits (CFLKs) shipping with ENERGY  
 155 STAR certified lamps shall:

- 156 1. Be packaged with light bulb(s) certified to the ENERGY STAR Lamps Specification in effect on  
 157 the CFLK's model date of manufacture. ENERGY STAR certified lamp model information for all  
 158 potential lamp models shipping with the CFLK must be included in the CFLK certification.
- 159 2. Be shipped with lamps suitable for the CFLK type. For example, a lamp shipped with an enclosed  
 160 CFLK must be safety tested in a totally enclosed situation and may not be rated or labeled "not  
 161 for use in totally enclosed fixtures," or similar.
- 162 3. Have in situ temperature of the ambient air inside of the enclosure measured to verify that the air  
 163 temperature does not exceed 45°C; in situ temperature shall be measured by placing a  
 164 thermocouple halfway between the surface of the bulb and the interior surface of the CFLK  
 165 enclosure.
- 166 4. Meet applicable safety ratings ANSI/UL 1993-2012, and ANSI/UL 8750-2009.
- 167 5. Be shipped with lamps directly installed or the ENERGY STAR certified lamps shipped with  
 168 CFLKs must comply with the packaging requirements of the lamps specification.

169 **3.2.3 Option 2 Performance Requirements: for CFLKs with Integrated Solid-State**  
 170 **Lighting Circuitry and CFLKs with Separable Light Sources Other than ENERGY**  
 171 **STAR Certified Lamps**

172 For all applicable requirements below, unless otherwise noted, laboratory test results shall be produced  
 173 using the specific models of lamp and ballast or LED package, LED module or LED array and LED driver  
 174 that will be used in production. Unless otherwise noted (e.g. minimum rated lifetime for fluorescent  
 175 products), one sample of each lamp-ballast model combination, or LED package/LED module/LED array  
 176 and LED driver model combination shall be tested. Sample must pass the following requirements.

177 **Table 3: Ceiling Fan Light Kit Performance Requirements**

<b>CFLK Performance criteria</b>	<b>Requirement</b>	<b>Methods of Measurement and/or Reference Documents</b>
<b>Color Consistency</b>	<p><b>Correlated Color Temperature (CCT):</b>            CFLK must correlate to at least one of the following ANSI nominal CCTs and fall within the designated 7-step quadrangle or ellipse using the Objective Chromaticities detailed in the reference publications.</p> <ul style="list-style-type: none"> <li>• 2700 Kelvin</li> <li>• 3000 Kelvin</li> <li>• 3500 Kelvin</li> <li>• 4000 / 4100 Kelvin</li> <li>• 5000 Kelvin</li> </ul>	<p><b>Methods of Measurement:</b>            IES LM-9-09 (Fluorescent Lamp and Ballast Combinations: circline)            10 CFR Part 429 and 430, Subpart B, Appendix W (Fluorescent Lamp and Ballast Combinations: compact non-integrated)            IES LM-79-08 (CFLKs with Integrated Solid-State Lighting Circuitry)            IES LM-82-12 (CFLKs with LED light engines)            IES LM-82-12 (CFLKs with non-standard integrated LED lamps) with energy efficiency measurements at room temperature determined in accordance with CFR 429 and 430, Subpart B, Appendix BB.</p> <p><b>Calculation:</b>            CIE 15.2004</p> <p><b>Reference Documents:</b>            ANSI C78.376-2001 (Fluorescent Lamp and Ballast Combinations: circline)            ANSI/NEMA/ANSLG C78.377-2015 (CFLKs with Integrated Solid-State Lighting Circuitry &amp; Other SSL Products Using Consumer Replaceable LED Light Engines)</p>

CFLK Performance criteria	Requirement	Methods of Measurement and/or Reference Documents
		<p><b>Testing Color Tunable CFLKs:</b></p> <p>The requirements of this section do not apply to products that only have color shifting dimmable (dim-to-warm) functionality because they are only evaluated at the highest wattage or voltage setting.</p> <p>For full-color-tunable and white-tunable CFLKs:</p> <ul style="list-style-type: none"> <li>• All tests and evaluations included in this specification shall be performed at the most consumptive white light setting covered by this specification; and</li> <li>• Watts, lumens, chromaticity, and CRI shall be tested and reported for default and most consumptive white light setting covered by this specification.</li> </ul> <p>In order to facilitate compliance testing, the partner shall provide detailed instructions for the control settings or control signals (as applicable) for reaching the default, and most consumptive white light modes as applicable.</p>
	<p><b>Color Maintenance:</b> Luminaire change in chromaticity coordinates from 0-hour measurement, at any measurement point during operation, shall be <math>\leq</math> a total linear distance of 0.007 on the CIE 1976 u'v' diagram.</p>	<p><b>Methods of Measurement:</b> IES LM-79-08 (CFLKs with Integrated Solid-State Lighting Circuitry &amp; Other SSL Products Using Consumer Replaceable LED Light Engines)  IES LM-80-08 and its Addendum A or IES LM-80-15 (CFLKs with Integrated Solid-State Lighting Circuitry &amp; Other SSL Products Using Consumer Replaceable LED Light Engines) IES LM-84-14 (Other SSL Products Using Consumer Replaceable LED Light Engines)</p> <p><b>Reference Documents:</b> CIE 13.3-1995</p> <p>In situ temperature measurements (CFLKs with Integrated Solid-State Lighting Circuitry &amp; Other SSL Products Using Consumer Replaceable LED Light Engines): ANSI/UL 153:2002 (Sections 124-128A) ANSI/UL 1574:2004 (Section 54) ANSI/UL 1598-2012 (Sections 19.7, 19.10-16)</p>
<p><b>Color Accuracy</b></p>	<p>CFLK shall be capable of meeting or exceeding CIE Color Rendering Index values as follows,</p> <p><math>R_a \geq 80</math> and <math>R_9 &gt; 0</math></p>	<p><b>Methods of Measurement:</b> CIE 13.3-1995 IES LM-9-09 (Fluorescent Lamp and Ballast Combinations: circline)</p> <p>10 CFR Part 429 and 430, Subpart B, Appendix W (Fluorescent Lamp and Ballast Combinations: compact non-integrated) IES LM-79-08 (CFLKs with Integrated Solid-State Lighting Circuitry) IES LM-82-12 (CFLKs with LED light engines) IES LM-82-12 (CFLKs with non-standard integrated LED lamps) with energy efficiency measurements at room temperature determined</p>

CFLK Performance criteria	Requirement	Methods of Measurement and/or Reference Documents
		<p>in accordance with CFR 429 and 430, Subpart B, Appendix BB.</p> <p><b>Reference Documents:</b> CIE 13.3-1995</p> <p>In situ temperature measurements (separable): ANSI/UL 153:2002 (Sections 124-128A) ANSI/UL 1574:2004 (Section 54) ANSI/UL 1598-2012 (Sections 19.7, 19.10-16)</p> <p><b>Supplemental Testing Guidance:</b> LED light engine (“source”) CRI shall meet the requirement as determined by comparing the in situ (installed in the luminaire) <math>T_b</math> value to the LM-82 test report. In situ temperature measurement value shall be determined in accordance with ANSI/UL 153:2002 (Sections 124-128A), ANSI/UL 1574:2004 (Section 54), or ANSI/UL 1598-2012 (Sections 19.7, 19.10-16), as applicable. LM-82 test reports shall detail luminous efficacy, luminous flux, chromaticity coordinates, CCT and CRI values for all tested temperatures. Linear interpolation shall be employed to determine source photometric performance at temperatures between the LM-82 reported temperatures higher and lower than the in situ temperature. Luminaires incorporating more than one source shall have all sources installed and operational during in situ temperature testing.</p>
<b>Minimum Rated Life</b>	<p>10,000 hours (Fluorescent Lamp and Ballast Combinations: compact non-integrated)</p> <p><b>Passing Test:</b> ≥ 50% of the sample set shall be functioning at the lifetime requirement.</p>	<p><b>Methods of Measurement:</b> IES LM-40-10 (circline) 10 CFR Part 429 and 430, Subpart B, Appendix W (Fluorescent Lamp and Ballast Combinations: compact non-integrated)</p> <p><b>Sample Size:</b> ≥ 3 samples of each CFLK model shall be tested.</p> <p><b>Supplemental Testing Guidance:</b> Conditional certification may be granted if both of the following are met: 1. Testing has been completed for at least 40% of rated life. 2. A date for testing completion has been established by the test laboratory.</p> <p>Conditional certification shall be immediately withdrawn if final testing results do not meet the requirement.</p>
	<p>25,000 hours (Indoor Separable CFLKs using LED Light Engines) 35,000 hours (Outdoor Separable CFLKs using LED Light Engines) 50,000 hours (CFLKs with Integrated Solid-State Lighting Circuitry)</p>	<p>SSL CFLK Rated Life is determined by a lumen maintenance projection of <math>L_{70}</math>. See section 3.2.4 below for more related SSL Rated Life testing requirements.</p>
<b>Start Time</b>	Light source shall remain continuously illuminated within 750 milliseconds of	<p><b>Methods of Measurement:</b> <a href="#">ENERGY STAR Start Time Test Method</a> or 10</p>

CFLK Performance criteria	Requirement	Methods of Measurement and/or Reference Documents
	<p>application of electrical power</p> <p>Exception: CFLKs meeting the connected criteria shall remain continuously illuminated within 1000 milliseconds of application of electrical power.</p>	<p>CFR Parts 429 and 430, Subpart B, Appendix W</p> <p><b>Reference Document:</b> ANSI C82.11 Consolidated-2002, Section-5.2</p>
<b>Run Up Time</b>	<p>Only applicable to Fluorescent CFLKs</p> <p>Reported value of time for lamps to reach 80% of stabilized lumen output after application of electrical power shall be <math>\leq</math> 45 seconds</p>	<p><b>Method of Measurement:</b> <a href="#">ENERGY STAR Run-Up Time Test</a></p> <p><b>Reference Document:</b> IES LM-54-12 IES LM-66-14</p>
<b>Power Quality</b>	<p>Total CFLK input power <math>\leq</math> 5 watts: Power Factor <math>\geq</math> 0.5</p> <p>Total CFLK input power <math>&gt;</math> 5 watts: Power Factor <math>\geq</math> 0.7</p>	<p><b>Method of Measurement:</b> C82.77-10:2014</p>
<b>Transient Protection</b>	<p>CFLK integrated light source, ballast or driver shall comply with ANSI/IEEE C62.41.1-2002 and ANSI/IEEE C62.41.2-2002, Category A operation. The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode. Units shall be fully operational at the completion of testing.</p>	<p><b>Methods of Measurement:</b> ANSI/IEEE C62.41.1-2002 and ANSI/IEEE C62.41.2-2002, Category A operation</p>
<p><b>Operating Frequency:</b> This performance characteristic addresses problems with visible flicker due to low frequency operation and applies to steady-state as well as dimmed operation. Dimming operation shall meet the requirement at all light output levels.</p>	<p>Fluorescent 20 to 33 kHz or <math>\geq</math> 40 kHz</p> <p>SSL <math>\geq</math> 120 Hz</p>	<p><b>Fluorescent Method of Measurement:</b> ANSI C82.2-2002</p> <p><b>SSL Method of Measurement:</b> None referenced</p> <p><b>Reference Document:</b> IEEE PAR1789</p> <p><b>Supplemental Testing Guidance:</b> Laboratory test results shall be produced using the specific luminaire, or LED light engine used in the luminaire. Light output waveform shall be measured with a photodetector with a rise time of 10 microseconds or less, transimpedance amplifier and oscilloscope. Employed equipment models and method of measurement shall be documented. Temporal response, amplification and filtering characteristics of the system shall be suitably designed to capture the photometric waveform. Digitized photometric waveform data and an image of the relative photometric amplitude waveform shall be recorded. Measured data shall be recorded to a digital file with an interval between each measurement no greater than 0.00005 sec (50 microseconds) corresponding to an equipment measurement rate of no less than 20kHz, and capture at least 1 second of data. Sample Size: 1 luminaire, LED light engine, or retrofit kit shall be tested.</p>
<b>Serviceability</b>	Light sources and ballasts or drivers shall be accessible and removable by an electrician	

CFLK Performance criteria	Requirement	Methods of Measurement and/or Reference Documents
	<p>without the cutting of wires and without damage to the luminaire housing, trim, decorative elements or the carpentry (e.g., ceiling drywall) to which the luminaire is attached. Instructions shall be provided with the luminaire, detailing guidance on ballast or driver replacement by a “qualified electrician”</p> <p><b>Exceptions:</b> CFLKs shipping with ENERGY STAR certified lamps, light engines with integrated drivers, and CFLK with Integrated Solid-State Lighting Circuitry.</p>	
<p><b>Thermal Performance:</b> This performance characteristic is separate and distinct from safety requirements and can be measured by an EPA recognized laboratory.</p>	<p>Ballast or driver shall not exceed the maximum recommended case temperature, as provided by ballast or driver manufacturer, during in situ (installed in the luminaire) operation.</p>	<p><b>Reference Documents:</b> ANSI/UL 153:2002 (Sections 124-128A) ANSI/UL 1574:2004 (Section 54) ANSI/UL 1598-2012 (Sections 19.7, 19.10-16).</p> <p><b>Supplemental Testing Guidance:</b></p> <p><b>Fluorescent:</b> Ballast case temperature shall be measured at thermal equilibrium, at the hot spot location provided by the ballast manufacturer.</p> <p><b>SSL:</b> Driver case temperature shall be measured at thermal equilibrium, at the temperature measurement point for the hottest location on the driver case (TMPC as detailed by the driver manufacturer).</p>
<p><b>Safety</b></p>	<p>CFLKs and their key components (light source and driver or ballasts) must comply with the appropriate safety certifications.</p> <p>Connected products must continue to comply with the applicable product safety standards – the addition of the functionality shall not override existing safety protections and functions.</p>	<p>Fluorescent CFLKs must demonstrate compliance with ANSI/UL 1598, ANSI/UL 2108, ANSI/UL 935-, ANSI/UL 1310, and ANSI/UL 1993, as applicable.</p> <p>SSL CFLKs must demonstrate compliance with ANSI/UL 1598, ANSI/UL 2108, ANSI/UL 8750, ANSI/UL 1310, ANSI/UL 2108, and ANSI/UL 8750, as applicable.</p> <p>Documentation shall be produced by an OSHA <a href="#">NRTL laboratory</a>.</p>
<p><b>Dimmability:</b> This applies to any CFLK marketed as dimmable; if not marketed as dimmable, packaging and marketing materials must identify that the CFLK is “not dimmable”</p>	<p>A dimmable CFLK shall provide continuous dimming from 100% to 20% of light output. Exception: Step dimming CFLKs</p> <p>At minimum claimed light output, CFLK shall not emit noise above 24dBA when measured at a distance of one meter or less.</p> <p>See labelling and packaging section for related marking requirements.</p> <p>A dimmable SSL CFLK designed to work with forward-phase dimmers shall meet NEMA SSL 7A for compatibility.</p>	<p><b>Methods of Measurement:</b> NEMA SSL 7A <a href="#">ENERGY STAR Recommended Practice - Light Output on a Dimmer</a> <a href="#">ENERGY STAR Test Method - Noise</a></p> <p><b>Reference Documents:</b> ISO 7574-4:1985, B.2.1 ANSI S12.55- 2012/ISO3745:2012</p>
<p><b>Flicker</b></p>	<p>CFLKs shall meet NEMA 77-2017 for temporal light modulation limits. The following flicker-related metrics shall be reported:</p> <ul style="list-style-type: none"> <li>• Highest measured Short Term Flicker Indicator (P<sub>ST</sub>)</li> <li>• Highest measured Stroboscopic Visibility Measure (SVM)</li> </ul>	<p><b>Method of Measurement:</b> NEMA 77-2017</p>

178 **Note:** EPA has indicated that only dimmable SSL CFLKs designed to work with forward-phase dimmers  
 179 must meet NEMA SSL 7A. Also, EPA has clarified the metrics to be reported based on NEMA 77-2017.

180 **3.2.4 Option 2 Lumen Maintenance Requirements: CFLKs with Integrated Solid-State**  
 181 **Lighting Circuitry and CFLKs with Separable Light Sources Other than ENERGY**  
 182 **STAR Certified Lamps**

183 **Table 4: Ceiling Fan Light Kit Lumen Maintenance Requirements**

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Documents	Supplemental Testing Guidance
<b>Fluorescent:</b> non-self-ballasted fluorescent lamps shipped with the CFLK	Lamp shall have an average rated lumen maintenance of at least 80% of initial lamp lumens at 40% of rated lamp life.	<b>Methods of Measurement:</b> IES LM-40-10 IES LM-09-09 (Circline)  10 CFR Part 429 and 430, Subpart B, Appendix W to Subpart B (Fluorescent Lamp and Ballast Combinations: compact non-integrated) <b>Reference Documents:</b> ANSI C82.1 ANSI C82.3 ANSI C78.901 IES LM-66-14	<b>Sample Size:</b> ≥ 3 samples of each lamp model shall be tested and all units must pass.
<b>Solid-State</b>  <b>Option 1:</b>  <b>CFLK, LED Light Engine, LED Package, Module, or Array</b>	The LED package(s)/ module(s)/array(s) and LED light engines used in CFLKs with Integrated Solid-State Lighting Circuitry or Separable CFLKs, shall meet the following L <sub>70</sub> rated lumen maintenance life values, in situ: <ul style="list-style-type: none"> <li>• L<sub>70</sub>(6k) ≥ 25,000 hours for indoor Separable CFLKs using LED Light Engines</li> <li>• L<sub>70</sub>(6k) ≥ 35,000 hours for outdoor Separable CFLKs using LED Light Engines</li> <li>• L<sub>70</sub> ≥ 50,000 hours for all CFLKs with integrated Solid-State Lighting circuitry</li> </ul> Lifetime claims shall be substantiated with a TM-21 lumen maintenance life	<b>Option 1</b>  <b>Methods of Measurement:</b> Lumen Maintenance: IES LM-80-08 and its Addendum A or IES LM-80-15  Lumen Maintenance Projection Method: IES TM-21-11 and its Addendum B  CCT Calculation: CIE 15.2004  <b>Reference Documents:</b> ANSI/UL 153:2002 (Sections 124-128A) ANSI/UL 1574:2004 (Section 54) ANSI/UL 1598-2012 (Sections 19.7, 19.10-16)  Chromaticity Specifications: ANSI/NEMA/ANSLG C78.377-2015  Lumen Maintenance:	<b>Sample Size:</b> 1 complete luminaire or LED light engine.  <b>LM-80 Sample Size:</b> Minimum sample size of 20 units for LED packages, or 10 units for LED arrays or LED modules, for each T <sub>s</sub> and drive current combination (refer to IES TM-21-11, section 4.2). Important guidance regarding LM-80 test reports, their application, and provisions for successor subcomponents are detailed in <a href="#">ENERGY STAR Requirements for the Use of LM-80 Data</a> .  <b>Passing Test:</b> All of the conditions below shall be met. If any of the conditions are not met, the component performance option may not be used, and Option 2, below, must be used for compliance.  1. In the sample luminaire, the <i>in situ</i> TMP <sub>LED</sub> temperature is less than or equal to the temperature specified in the LM-80 test report for the corresponding or higher drive current, within the manufacturer's specified operating current range.  2. The drive current measured in the luminaire is less than or equal to the drive current specified in the LM-80 test report at the corresponding temperature or higher.  3. The TM-21 calculator report projects

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Documents	Supplemental Testing Guidance
	projection report.	<a href="#">ENERGY STAR TM-21 Calculator</a>	<p>lumen maintenance life (i.e. L<sub>70</sub>) meeting or exceeding requirements.</p> <p>Lumen maintenance projections must support all LED colors used.</p> <p>Compliance with the above shall be documented with a TM-21 lumen maintenance life projection report as detailed in TM-21, section 7. The report shall be generated using data from the LM-80 test report for the employed LED package/module/array model (“device”), the forward drive current applied to each device, and the in situ TMP<sub>LED</sub> temperature of the hottest device in the luminaire. In addition to LM-80 reporting requirements, the following information shall be reported:</p> <ul style="list-style-type: none"> <li>• Sampling method and sample size (per LM-80 section 4.3)</li> <li>• Test results for each T<sub>S</sub> and drive current combination</li> <li>• Description of device including model number and whether device is an LED package, module or array (see Definitions)</li> <li>• ANSI target, and calculated CCT value(s) for each device in sample set</li> <li>• Δ u’v’ chromaticity shift value on the CIE 1976 diagram for each device in sample set</li> <li>• A detailed rationale, with supporting data, for application of results to other devices (e.g. LED packages with other CCTs)</li> </ul> <p>Access to the TMP<sub>LED</sub> for the hottest LED may be accomplished via a minimally sized hole in the luminaire housing, tightly resealed with a suitable sealant if created for purposes of testing.</p> <p>All thermocouple attachments and intrusions to luminaire housing shall be photographed.</p>
<p><b>Solid-State</b></p> <p><b>Option 2:</b></p> <p><b>CFLK or LED Light Engine</b></p>	<p>CFLKs with integrated Solid-State Lighting circuitry and Separable CFLKs using LED light engines shall meet the following L<sub>70</sub> rated lumen maintenance life values, in situ:</p> <ul style="list-style-type: none"> <li>• L<sub>70</sub>(6k) ≥ 25,000 hours for indoor Separable CFLKs using LED Light Engines</li> <li>• L<sub>70</sub>(6k) ≥ 35,000 hours for outdoor Separable CFLKs</li> </ul>	<p><b>Option 2</b></p> <p><b>Methods of Measurement:</b></p> <p>Lumen Maintenance: IES LM-84-14</p> <p>Lumen Maintenance Projection Method: IES TM-28-14 – Projection Method 1, Direct Extrapolation</p> <p>CCT Calculation: CIE 15.2004</p> <p><b>Reference Documents:</b></p> <p>Chromaticity</p>	<p>CFLK shall be operated continuously in accordance with ANSI/UL 1598-2012, ANSI/UL 1574-2004 or ANSI/UL 153-2002 during the testing; any deviations from this shall be reported. LED light engines (“source”) shall be operated continuously in situ (installed in the luminaire), with the luminaire operating in accordance with the appropriate safety standard for the product type during the testing. Luminaires incorporating more than one source shall have all sources installed and operational during the testing. During initial and final measurements, T<sub>b</sub> temperature shall be controlled to match T<sub>b</sub> temperature measured when source is operated in situ.</p> <p>Test reports shall detail efficacy, luminous</p>

Source Type	ENERGY STAR Requirements	Methods of Measurement and/or Reference Documents	Supplemental Testing Guidance
	using LED Light Engines <ul style="list-style-type: none"> <li>• L<sub>70</sub> ≥ 50,000 hours for all CFLs with integrated Solid-State Lighting circuitry</li> </ul> Lifetime claims shall be substantiated with a TM-28 lumen maintenance life projection report.	Specifications: ANSI/NEMA/ANSLG C78.377-2015 ANSI/UL 153:2002 (Sections 124-128A) ANSI/UL 1574:2004 (Section 54) ANSI/UL 1598-2012 (Sections 19.7, 19.10-16) ANSI/UL 1598C-2014  Chromaticity Specifications: ANSI/NEMA/ANSLG C78.377-2015  Lumen Maintenance: <a href="#">ENERGY STAR TM-28 Calculator</a>	flux, chromaticity coordinates, CCT, and CRI values at all test intervals. Test intervals shall be conducted according to IES TM-28-14 §4.2 with a maximum interval length of 1,000 hours. Lumen maintenance projections must support all LED colors used.  <b>Sample Size:</b> According to IES TM-28-14 – §5.1.5 CFLK with Integrated Solid-State Lighting Circuitry: 3 or more complete CFLs. Separable: 3 or more sources and the necessary number of luminaires required to operate the sources continuously in situ.  <b>Passing Test:</b> All luminaires or sources shall pass.

184 **4 CONTROL AND STANDBY REQUIREMENTS**

185 **4.1 Wired and Remote Controls**

186 Certified products shall permit convenient consumer adjustment of fan speed and lighting source control.  
 187 This may be accomplished by means of one or more:

- 188 • Wall-mounted switch(es)
- 189 • Readily accessible pull chain(s)
- 190 • Remote control(s)
- 191 • Mobile device application(s)

192 For purposes of this specification, “readily accessible” shall be defined as a chain length sufficient to  
 193 reach a height of no more than 80 inches (203 cm) above the floor when the residential ceiling fan is  
 194 mounted according to the residential ceiling fan’s installation instructions. For those residential ceiling  
 195 fans that can accommodate ceiling fan light kits, the lights and the fans shall be able to be controlled  
 196 separately, allowing users to switch off lights during fan operation or operate the lights without using the  
 197 residential ceiling fan.

198  
 199 Certified products shall also provide for consumer adjustment of airflow direction (upward or downward)  
 200 by one of the following means:

- 201 • A vertically or horizontally mounted slide switch on the motor housing. For vertically mounted  
 202 switches, the downward position shall correspond to downward airflow. For horizontally mounted  
 203 switches, airflow direction shall be clearly identified on the switch housing or within the product  
 204 literature.
- 205 • A wall-mounted switch
- 206 • A readily accessible pull chain
- 207 • A remote control or mobile device application

208 Certified products that offer Wi-Fi-based remote control must provide at least one alternative control  
 209 method as a backup in case of Wi-Fi connectivity failure.

- 210 • For ceiling fans only, the backup shall, at a minimum, control on/off and fan speed.
- 211 • For ceiling fans with light kits, the backup shall, at a minimum, control fan and lighting on/off, fan  
 212 speed, and dimming (if dimmable).

213

214 **Note:** EPA has updated the language and requirements for a backup control method for ceiling fans with  
215 a Wi-Fi-based primary controller. EPA did not intend to limit the scope of what would qualify as a backup  
216 control by using the word “protocol” in Draft 2. EPA’s intention is that backup devices such as wall  
217 switches, pull chains, RF/IR remotes, etc. qualify as long as the requirements specified in this Final Draft  
218 are met. EPA has also clarified that, at a minimum, the backup control method shall be capable of turning  
219 the fan and lighting on and off, changing the fan speed, and dimming the lights (if dimmable).

## 220 **4.2 Products with Connected Functionality – Optional**

### 221 **4.2.1 Connected Product Criteria**

222 Connected functionality is optional and products may be certified as ENERGY STAR without meeting  
223 these requirements. Those that meet these connected criteria will be identified as connected in the  
224 ENERGY STAR Product Finder.

225  
226 To be identified as connected, a certified product shall include the base product plus elements (hardware  
227 and software or firmware) or instructions required to enable communication in response to consumer-  
228 authorized energy or performance related commands (e.g. instructions for downloading a mobile  
229 application, Bluetooth syncing guidance) and shall meet the requirements in sections 4.2.2-4.2.6. These  
230 elements may be resident inside or outside of the base product. Connected products typically  
231 communicate with controls via a radio frequency system (e.g., Wi-Fi, DALI, ZigBee, Bluetooth), although  
232 some versions use other methods (e.g., DMX).

233 The specific design and implementation of the connected product is at the partner’s discretion provided it  
234 enables economical, consumer-authorized third party access to the functions provided in sections 4.2.3,  
235 4.2.4, and 4.2.5. Compliance with connected functionality requirements shall be demonstrated through  
236 examination of product and/or product documentation.

### 237 **4.2.2 Open Access**

238 The certified product shall enable connectivity by one of following means:

- 239 1. Open-standards communications from the certified product, or
- 240 2. Open-standards communications from an external controller, included with the product or  
241 available separately.
- 242 3. Where no suitable open standards communications method exists (e.g., an IP interface), an  
243 available and documented communication method must be used. In these cases, a manufacturer-  
244 specific method to implement the functions in sections 4.2.3, 4.2.4 and 4.2.5 shall be published  
245 for use with the product.

246 To enable interconnection with the product, an interface specification, Application Programming Interface  
247 (API) or similar documentation shall be made available to interested parties that enables section 4.2.3,  
248 4.2.4 and 4.2.5 connected functionality, and includes accuracy, units and measurement intervals for  
249 Energy Consumption Reporting.

### 250 **4.2.3 Energy Consumption Reporting**

251 The product, or the gateway device or cloud service connected to it, shall be capable of interconnecting  
252 with consumer authorized entities to communicate data representative of its interval energy consumption.  
253 It is recommended that data be reported in watt-hours for intervals of 30 minutes; however, representative  
254 data may also be reported in alternate units and intervals as specified in the product manufacturer’s  
255 interface specification or API. If the product does not provide power consumption directly in watts, the  
256 manufacturer shall make available a method for estimating power consumption, in watts, from the  
257 representative data that is provided by the product.

258 **4.2.4 Operational Status Reporting**

259 At a minimum, the product, or the gateway device or cloud service connected to it, shall be capable of  
260 providing the operational status (e.g., on/off status, speed, direction) to energy management systems and  
261 other consumer authorized devices, services or applications via a communication link.

262 **4.2.5 Remote Management**

263 The product shall be capable of receiving and responding to energy management system or other  
264 consumer authorized remote requests, via devices, services or applications, similar to hard-wired  
265 consumer controllable functions.

266 **4.2.6 Information to Consumers**

267 If additional devices, services, and/or infrastructure are required to activate the product’s connected  
268 capabilities, prominent labels, or other forms of consumer notifications shall be displayed at the point of  
269 purchase and in the product literature. (e.g. “This product has Z-wave control capability and requires  
270 interconnection with a Z-wave controller to enable local control.”)

271 **4.3 Standby Power Consumption**

272 **Table 5: Standby Power Consumption Requirements**

<b>ENERGY STAR Requirements</b>	<b>Methods of Measurement and/or Reference Documents</b>
Standby power consumptions of certified ceiling fans and ceiling fan light kits shall be reported separately.  Laboratory test results shall detail standby power consumption to at least the tenth of a watt.	10 CFR Part 430, Subpart B, Appendix U

273 **5 MINIMUM WARRANTY**

274 Partners must provide a copy of the actual warranty that is included with the product packaging. Partner  
275 is solely responsible for honoring warranty; intermediate parties (e.g. showrooms, electrical distributors,  
276 retailers) are not responsible for warranty requirements.

277 Certified ceiling fans shall provide a warranty of at least 3 years for all non-lighting components of  
278 certified residential ceiling fans.

279 For ceiling fan light kits that:

- 280 • Incorporate replaceable drivers, a written warranty shall be included with CFLK packaging at the  
281 time of shipment which covers repair or replacement of defective parts of the CFLK housing,  
282 mounting hardware, optics, driver and trim for a minimum of 3 years from the date of purchase.
- 283 • Incorporate non-replaceable drivers, the above warranty requirement is extended to 5 years.

284 **Note:** Though some commenters suggested that EPA remove the warranty requirement for non-lighting  
 285 components of the ceiling fan, one commenter suggested that it be raised to five years. EPA feels that the  
 286 three year warranty will help influence the electronics market to offer more reliable components for driver  
 287 electronics while avoiding the additional costs that a five year warranty would induce. As such, EPA has  
 288 maintained the three year warranty on non-lighting components of the ceiling fan from Draft 2.

289 **6 PRODUCT CERTIFICATION**

290 **6.1 CFLK Product Families**

291 Grouped product submissions for ENERGY STAR certification shall meet the following requirements:  
 292 Certified products within a product family shall be identical to the tested, representative model with the  
 293 exception of allowed variations listed in the table below. The representative model shall be the variation  
 294 expected to have the greatest difficulty meeting the performance requirements outlined in this  
 295 specification.  
 296  
 297

**Table 6: Allowable Variations within Product Families**

CFLK Attribute	Allowable Variation	Additional Test Data Required for Each Variant
Ballast / Driver (no change in nominal wattage or current)	Allowed so long as variations will not negatively impact CFLK’s compliance with any performance criteria in this specification.	Thermal measurements of each variation may be required (e.g. ballast case temperature or TMP <sub>C</sub> ).
Correlated Color Temperature (CCT) (also review Light Source above)	Allowed so long as the lamp series or LED package/module/array series (and associated drive current), ballast or driver, and thermal management components are identical, and so long as variations will not negatively impact CFLK’s compliance with any performance criteria in this specification.  The representative model shall be the version within the product family with the lowest CCT for SSL products and the highest CCT for discharge products.  Partner shall use different CFLK model numbers to distinguish between models shipped with light sources of varying CCTs.	None
Electrical Connection (SSL Retrofits)	Allowed (e.g. E26 and GU24).	None
Finish	CFLK body color/pigment.	None
Heat Sink / Thermal Management Components	Not allowed.	None
Housing / Chassis	Allowed so long as the light source or lamp-holder, ballast or driver, and heat sink (as applicable) are integrated into housing / chassis variations in such a way that the thermal performance of the CFLK is not degraded by changes to the housing / chassis.	Engineering rationale or thermal measurements of each variation may be required (e.g. ballast case temperature, TMP <sub>LED</sub> , or TMP <sub>C</sub> ).

CFLK Attribute	Allowable Variation	Additional Test Data Required for Each Variant
Light Source <sup>6</sup>  (refers to the make and/or model of the source; also review CCT below)	Allowed so long as variations will not negatively impact CFLK's compliance with any performance criteria in this specification.	<ul style="list-style-type: none"> <li>• Certified performance data from additional light source if separable</li> <li>• Integrating sphere test for CFLK with Integrated Solid-State Lighting Circuitry</li> </ul>
Mounting	Allowed.	None
Product Wattage <sup>7</sup>	<p>For CFLK with Integrated Solid-State Lighting Circuitry:</p> <ul style="list-style-type: none"> <li>• The only product wattage variation allowed to the CFLK is a change that provides a different drive current to the LED package, array or module.</li> <li>• The LED package, array, or module model must not change, although CCT remains an allowable variation.</li> </ul> <p>The model tested should be the highest wattage, highest CRI, and lowest CCT variant.</p>	<ul style="list-style-type: none"> <li>• LED drive current measurement</li> <li>• Integrating sphere scan to represent performance of variants including: <ul style="list-style-type: none"> <li>▪ CCT</li> <li>▪ Lumen Output</li> <li>▪ CRI</li> <li>▪ Power Consumption</li> <li>▪ Chromaticity</li> </ul> </li> </ul>
	<p>For Fluorescent products:</p> <ul style="list-style-type: none"> <li>• The lamp wattage may change, but not the general type or configuration.</li> </ul> <p>Example: A 32W triple-tube, pin-based fluorescent representing a 26W triple-tube, pin-based fluorescent would be acceptable, but not representing a 26W twin-tube fluorescent.</p> <ul style="list-style-type: none"> <li>• The only performance change to the CFLK is to the lamp (or lamp and ballast) with a lower wattage.</li> <li>• The model tested should be the highest wattage, highest CRI, and highest CCT variant.</li> </ul>	<ul style="list-style-type: none"> <li>• Certified lamp data for variants</li> <li>• Integrating sphere scan to represent performance of variants including: <ul style="list-style-type: none"> <li>▪ CCT</li> <li>▪ Lumen Output</li> <li>▪ CRI</li> <li>▪ Power Consumption</li> <li>▪ Chromaticity</li> </ul> </li> </ul>
Reflector / Trim	Allowed so long as CFLK light output is not reduced.	Luminous flux for each basic trim or reflector variation of the darkest or least efficient finish may be required.
Shade / Diffuser	Allowed so long as neither CFLK light output nor airflow are reduced.	None

298 **6.2 Solid-State Lumen Performance Data**

299 Content and application of IES LM-80-08 reports for CFLKs shall comply with the [ENERGY STAR](#)  
300 [Requirements for the Use of LM-80 Data.](#)

<sup>6</sup> Partners may not retroactively add variations to a product family unless requirements in Table 1 are still met. For example, if the representative model tested is a SSL product with a 3000K nominal CCT, partner may not retroactively add a 2700K model without additional testing, as this was not the lowest CCT initially tested.

<sup>7</sup> When wattage as a variation is used, changes to optics and LED package, array or module (where applicable) are not permitted, as these changes would result in a change in distribution which must be re-evaluated against the luminaire specific requirements. The additional models would still require an integrating sphere LM-79 test to verify other photometric and electrical performance requirements. Each wattage variation should be listed individually.

301 **6.3 Significant Digits and Rounding**

- 302 1. All calculations shall be carried out with directly measured (unrounded) values.  
303 2. Unless otherwise specified, compliance with specification limits shall be evaluated using directly  
304 measured or calculated values without any benefit from rounding.  
305 3. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR  
306 website shall be rounded to the nearest significant digit as expressed in the corresponding  
307 specification limit.  
308 4. Ceiling Fan Efficiency shall be expressed as a whole number in accordance with Section 3.1 of  
309 10 CFR Part 430, Subpart B, Appendix U.  
310 5. Ceiling Fan Light Kit efficacy shall be rounded to the nearest tenth of a lumen per watt in  
311 accordance with 10 CFR Part 429, Subpart B §429.33.

312 **6.4 Ceiling Fan Sampling**

313 One of the following sampling plans shall be used for purposes of testing for ENERGY STAR certification  
314 of ceiling fans:

- 315 1. A single unit is selected, obtained, and tested. The measured performance of this unit and of  
316 each subsequent unit manufactured must be equal to or better than the ENERGY STAR  
317 specification requirements. Results of the tested unit may be used to certify additional individual  
318 model variations within a basic model group as long as the definition for basic model group  
319 provided in Section 1, above, is met; or  
320 2. Units are selected for testing and results calculated according to the sampling requirements  
321 defined in 10 CFR Part 429, Subpart B §429.32 for ceiling fans and 10 CFR Part 429, Subpart B  
322 §429.33 for ceiling fan light kits. The certified rating must be equal to or better than the ENERGY  
323 STAR specification requirements. Results of the tested unit may be used to certify additional  
324 model variations within a basic model group as long as the definition for basic model group  
325 provided in Section 1, above, is met. Further, all individual models within a basic model group  
326 must have the same certified rating. Based on the applicable sampling criteria, this rating must  
327 be used for all manufacturer literature, the qualified product list, and certification of compliance  
328 to DOE standards.

329 **7 LABELING & PACKAGING**

330 **7.1 Ceiling Fans Sold without Ceiling Fan Light Kits**

331 Certified residential ceiling fans sold without ceiling fan light kits shall provide information on product  
332 packaging or with product instructions regarding ENERGY STAR certified ceiling fan light kits that may be  
333 used with that particular residential ceiling fan.

334 **7.2 Ceiling Fan Light Kit Packaging Requirements (sold with a fan or separately)**

- 335 1. Packaging and marketing claims shall represent the product consistent with its certification.  
336 2. Packaging shall clearly describe the nominal color designation of the lamp in units of Kelvin (e.g.  
337 2700K, 3000K) and may display recommended corresponding nomenclature as outlined below.  
338 This can also be met through use of a Lighting Facts label (as applicable). If packaging includes a  
339 color descriptor term, EPA recommends the following corresponding nomenclature as outlined  
340 below:  
341 a. 2700K – Soft White  
342 b. 3000K – Warm White  
343 c. 3500K – Neutral White  
344 d. 4000/4100K – Cool White  
345 e. 5000K – Daylight

- 346 3. **For CFLKs shipped with lamps containing mercury:** Both the lamp and the CFLK packaging  
347 shall have a label indicating mercury content which must be managed and disposed of properly,  
348 and shall reference: [www.epa.gov/cf](http://www.epa.gov/cf)
- 349 4. **For outdoor CFLKs (Exempt: CFLKs using solid-state lighting):** Packaging shall indicate the  
350 minimum (lowest) starting temperature for the lamp and ballast platform of the CFLK.
- 351 5. **For CFLKs marketed as dimmable:** CFLK packaging shall indicate dimming range (as  
352 applicable), a list or web site address with compatible dimmers or other controls or NEMA  
353 light+dimmer compatibility marking, and known incompatibilities with dimmers, occupancy or  
354 vacancy sensors, timing devices or other external lighting controls, or a message noting  
355 limitations and web site address to find out more specific information. Partner shall periodically  
356 review this packaging language to determine if updates are needed. Additionally, Partner is  
357 encouraged to maintain an up to date web address where additional compatibility information is  
358 detailed; step-dimming capability, if employed, shall be clearly indicated.
- 359 6. While not a requirement for certification, EPA recommends partners provide a conspicuous  
360 ENERGY STAR certification mark (e.g. sticker, hangtag) on certified CFLKs themselves: to  
361 facilitate building inspectors confirming certification status of installed CFLKs and to provide out-  
362 of-the-box marketing of a CFLK's ENERGY STAR certification and to demonstrate to consumers  
363 a partner's commitment to advancing energy efficiency in lighting

## 364 8 LIGHTING TOXICS REDUCTION REQUIREMENTS: ALL CFLKS

365 CFLKs shall not exceed hazardous substance concentrations set forth in the European Union's (EU)  
366 Restriction of the Use of Certain Hazardous Substances ([RoHS](#)) Directive, 2003.

367 CFLKs shall not exceed:

- 368 • 0.1% by weight in homogenous material (1000 ppm): Mercury, Lead, Hexavalent Chromium, PBB  
369 (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers)
- 370 • 0.01% by weight in homogenous material (100 ppm): Cadmium

371 A list of RoHS exemptions that will be accepted by the ENERGY STAR program that may be relevant to  
372 CFLKs and lamps is detailed below:

373 Exemptions:

- 374 1. Mercury in single capped (compact) fluorescent lamps not exceeding (per burner):  
375 a. Lamps  $\leq$  23.0 rated watts shall contain  $\leq$  2.5 milligrams (mg) mercury per lamp  
376 Lamps  $\geq$  23.0 rated watts shall contain  $\leq$  3.0 milligrams (mg) mercury per lamp
- 377 2. Lead in glass of fluorescent tubes not exceeding 0.2% by weight
- 378 3. Lead in high melting temperature type solders (i.e. lead-based alloys containing 85% by weight or  
379 more lead)
- 380 4. Electrical and electronic components containing lead in a glass or ceramic other than dielectric  
381 ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound
- 382 5. Cadmium and its compounds in electrical contacts
- 383 6. Lead in solders to complete a viable electrical connection between semiconductor die and carrier  
384 within integrated circuit flip chip packages
- 385 7. Lead with PbBiSn-Hg and PbInSn-Hg in specific compositions as main amalgam and with PbSn-  
386 Hg as auxiliary amalgam in very compact energy saving lamps.
- 387 8. Cadmium in color-converting II-IV LEDs ( $< 10 \mu\text{g Cd per mm}^2$  of light-emitting area) for use in  
388 solid-state illumination or display systems.

389 For purposes of third-party certification, lamp toxics documentation shall not be reviewed when products  
390 are initially certified or during verification testing. Instead, partner shall maintain documentation on file to  
391 demonstrate that certified products meet these requirements. EPA reserves the right to request this  
392 documentation at any time. For the purposes of documenting mercury content, the following test  
393 procedure shall be used: IEC 62554 Ed 1.0 Sample Preparation for Measurement of Mercury Level in  
394 Fluorescent Lamps (2011-08-19).

395 For materials other than mercury, partner may rely on component suppliers to provide certification or  
396 declaration documents to show that homogenous materials used in lamps comply with the requirement.  
397 Alternatively, partner may have components tested in accordance with IEC 62321 or other appropriate  
398 analytical technique to verify that homogenous materials do not exceed the concentration limits of the six  
399 regulated substances. Handheld XRF analyzers/scanners may also be used to verify compliance.

## 400 **9 EFFECTIVE DATE**

401 The ENERGY STAR Residential Ceiling Fan and Ceiling Fan Light Kit specification shall take effect on  
402 **June 15, 2018**. To be certified as ENERGY STAR, a product model shall meet the ENERGY STAR  
403 specification in effect on the model's date of manufacture. The date of manufacture is specific to each  
404 unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

405 **Note:** EPA is on track to finalize this specification in September 2017. Once the specification is final, CBs  
406 will be able to certify products using it immediately. Approximately 9 months later, the specification will  
407 become effective and only those fans certified to new specification will be listed.

## 408 **10 FUTURE SPECIFICATION REVISIONS**

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