DOCKETED

Docket Number:	15-AAER-06
Project Title:	Small Diameter Directional LED Lamps and General Purpose LED Lamps
TN #:	206375
Document Title:	Express Terms 45 Day Languge
Description:	Proposed Regulations for Small Diameter Directional Lamps and General Service LED Lamps
Filer:	Harinder Singh
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/15/2015 3:27:21 PM
Docketed Date:	10/15/2015

Proposed State Regulations and Federal Updates

Proposed new language appears as underline (example) and proposed deletions appear as strikeout (~~example~~). Existing language appears as plain text. Three dots or "…" represents the substance of the regulations that exists between the proposed language and current language.

1601 Scope.

...[skipping (a)-(j)]

(k) Lamps, which are federally-regulated general service fluorescent lamps, federally-regulated incandescent reflector lamps, state-regulated general service incandescent lamps, general service lamps, state-regulated light-emitting diode (LED) lamps, state-regulated small-diameter directional lamps, and includes GU-24 base lamps.

…[skipping (l)-(w)

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

1602 Definitions.

…[skipping (a)-(j)]

(k) Lamps

…[skipping *Appliance Lamp* through *Average rated life*]

"Beam angle" means the angle within which the lamp produces 50% of the maximum luminous intensity.

…[skipping *Bi pin lamp* through *Candelabra base incandescent lamp*]

"Center beam candle power" means luminous intensity at the center of the beam of a reflector lamp, measured in candelas (cd).

…[skipping *Clear type lamp* and *Colored Fluorescent Lamp]*

"Connected LED lamp" means an LED lamp capable of changing its lumen output or spectral power distribution in response to an external control signal other than a change in RMS AC supply voltage or a 0-10 volt DC control signal. Connected LED lamp includes lamps that can be controlled wirelessly and through power line carrier digital communication.

…[skipping *Design voltage]*

"Duv" means the closest distance from the chromaticity coordinate of the light source to the Planckian locus on the International Commission on Illumination (CIE) (u', 2/3 v') coordinates with "+" sign for above and "-" sign for below the Planckian locus.

…[skipping *Enhanced Spectrum or Modified Spectrum* through *Lumen maintenance]*

"Lumen output" means the brightness of the lamp at full output, measured in Lumens.

…[skipping *Marine Lamp* through *plant light lamp]*

"Power" means the total amount of electric power required, measured in Watts, to operate the lamp, as measured at the base of the lamp.

…[skipping *R20 incandescent reflector lamp* through *State-regulated incandescent reflector lamp]*

"State-regulated Light Emitting Diode (LED) lamp" means a lamp capable of producing light with Duv between -0.012 and 0.012, and that has an E12, E17, E26, or GU-24 base, including LED lamps that are designed for retrofit within existing recessed can housings that contain one of the preceding bases. State-regulated LED lamp does not include a lamp with a brightness of

more than 2,600 lumens or a lamp that cannot produce light with a correlated color temperature between 2200 K and 7000 K.

"State-regulated small diameter directional lamp" means a directional lamp with a diameter of less than or equal to 2.25 inches and a GU10, GU11, GU5.3, GUX5.3, GU8, GU4, or E26 base. Small diameter directional lamp includes incandescent filament, LED, and any other lighting technology that falls within this definition. State-regulated small diameter directional lamp does not include products that use LEDs and have an E26 base, which are state-regulated light emitting diode lamps.

…[skipping *Three-way lamp* through the rest of section 1602]

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Section 1604 Test Methods for Specific Appliances.

...[skipping (a)-(j)]

(k) Lamps

…[skipping subsection (1)]

(2) The test method for state-regulated general service incandescent lamps~~, and~~ state regulated incandescent reflector lamps, and state-regulated small diameter directional lamps that use incandescent filament technology is 10 C.F.R. section 430.23(r) (Appendix R to Subpart B of part 430).

…[skipping subsection (3)]

(4) The test methods for-LED state-regulated small diameter directional lamps and state-regulated LED lamps ~~is IES LM-79-08~~ are contained in Table K-1.

Table K-1
Test Methods for State-Regulated LED Lamps and LED State--Regulated Small Diameter Directional Lamps

Measurement	Test Procedure	Required or Optional*
Input power, Lumen output, Lumens per Watt, Correlated Color Temperature, Duv, Color Rendering Index, Power Factor	IES LM-79 (2008) with additional guidance provided in 80 Fed. Reg. 39665-39666 (July 9, 2015), §430.23(dd) and Appendix BB to Subpart B of Part 430.	Required
Lumen Maintenance and Time to Failure	IES LM-84 (2014) and TM-28 (2014) with additional guidance provided in 80 Fed. Reg. 39665-39667 (July 9, 2015), §430.23(dd) and Appendix BB to Subpart B of Part 430.	Required
Standby Power	IEC 62301 (2011) with additional guidance provided in 80 Fed. Reg. 39667 and with the following additional guidance for connected LED lamps: (A) Ensure that the lamp is connected to only one network type and the lamp is in Network Mode (i) If lamp has ability to connect to multiple networks, only one network shall be	Required

	tested, and the network selected for testing shall be selected using the following prioritization: 1. Wi-Fi 2. ZigBee 3. ANT 4. Bluetooth 5. RF 6. Wired 7. Other (B) Measure standby power as described in section 5.3.2 of IEC 62301 (2011) for a total period of no less than 60 minutes. (i) Standby power should be measured at a lamp that is a distance of 10 meters (+/- 0.5 meters) from the hub, or wireless controller if no hub exists. If connection is not possible at this distance, conduct testing within 1 meter of the maximum connection distance. (C) To calculate standby power, divide the accumulated energy consumption in watt-hours by the duration of the test in hours. Record this value as the average Network Standby Power. For lamps that are not connected LED lamps, record this value as "not applicable."	
Flicker	Title 24, part 6, Joint Appendix 10 (2015), tested at both 100% and 20% output. Lamps with a percent amplitude modulation (percent flicker) less than 30 percent at frequencies less than 200Hz shall report "yes" for "reduced flicker operation" described in section 1606, otherwise report "no."	Optional
Lumen Maintenance, Rated Life, and Survival Rate for Compliance with Title 24 Joint Appendix 8 and minimum dimming level.	Title 24, part 6, Joint Appendix 8 (2015).	Optional
Audible Noise	ENERGY STAR Recommended Practice – Noise (2013) with the following modification: measurements shall be	Optional

	taken at 100 percent output as well as at 20 percent output if dimmable.	

* Required test procedures must be conducted per section 1603(a) for each basic model of lamp. Option test procedures are conditionally required depending on manufacturer claims of performance as described in sections 1607(d)(12) and 1606 table X.

…[skipping subsection (5)]

…[skipping (l)-(w)]

The following documents are incorporated by reference in Section 1604.

CALIFORNIA ENERGY COMMISSION TEST METHODS

...[skipping CEC/Gas-Fired Heat Pumps]

California Title 24, Part 6, Joint Appendix 8 JA-8 -- 2015	Qualification Requirements for High Efficacy Light Sources
California Title 24, Part 6, Joint Appendix 10 JA-10 -- 2015	Test Method for Measuring Flicker of Lighting Systems and Reporting Requirements
California Joint Appendix JA8 -- 2008	Testing of Light Emitting Diode Light Sources
Copies available from:	California Energy Commission Energy Hotline 1516 Ninth Street, MS-25 Sacramento, California 95814 Phone: (916) 654-5106 FAX: (916) 654-4304

FEDERAL TEST METHODS

…[skipping C.F.R., Title 10, section 430.23 through EPA "Test Method for Calculating the Energy Efficiency of Single-Voltage External AC-DC and AC-AC Power Supplies"]

ENERGY STAR Recommended Practice – Noise (2013)	EPA ENERGY STAR Program Requirements Product Specification for Lamps (Light Bulbs) Version 1.1 (August 2014)
Copies available from:	US EPA CLIMATE PROTECTION PARTNERSHIP

	ENERGY STAR PROGRAMS HOTLINE & DISTRIBUTION (MS-6202J) 1200 PENNSYLVANIA AVE NW WASHINGTON, DC 20460 WWW.ENERGYSTAR.GOV
80 Federal Register 39665-39667 (July 9, 2015)	Energy Conservation Program: Test Procedures for Integrated Light-Emitting Diode Lamps, Proposed Rule
Copies available from:	OFFICE OF THE FEDERAL REGISTER 800 NORTH CAPITOL STREET, NW SUITE 700 WASHINGTON DC 20001 PHONE: (202) 741-6000 FAX: 202 741-6012 WWW.FEDERALREGISTER.GOV

…[skipping American National Standards Institute (ANSI) through Hydraulic Institute (HI)]

ILLUMINATING ENGINGEERING SOCIETY (IES)

IES LM 79-08	Approved Method: Electrical and Photometric Measurements of Solid State Lighting Products
IES LM-84-14	Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaries.
IES TM-28 (2014)	Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaires
IES LM-49 (2011)	Life Testing of General Lighting Incandescent Filament Lamps
Copies available from:	Illuminating Engineering Society 120 Wall Street, 17th Floor New York, NY 10005-4001 www.ies.org Phone: (212) 248-5000 FAX: (212) 248-5017/18

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 62301 (2011) (E)	Household electrical appliances - Measurement of standby power
IEC 62087 (2002)(E)	Methods of Measurement for the Power Consumption of Audio, Video, and Related Equipment
IEC 62087:2008(E), Edition 2.0	Methods of Measurement for the Power Consumption of Audio, Video, and Related Equipment
IEC 62301:2005	Household Electrical Appliances Measurement of Standby Power
Copies available from:	IEC Central Office 3, rue de Varembé P.O. Box 131 CH – 1211 GENEVA 20 Switzerland

…[skipping International Organization for Standards (ISO) through end of 1604].

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

1605.1 Federal and State Standards for Federally-Regulated Appliances.

…[skipping (a)-(j)]

(k) Lamps

(1) Federally-Regulated General Service Fluorescent Lamps.

(A) General Service Fluorescent Lamps Manufactured Before July 15, 2012. The average lamp efficacy and the color rendering index of federally-regulated general service fluorescent lamps manufactured before July 15, 2012, shall be not less than the applicable values shown in Table K-~~1~~2.

Table K-~~1~~2
Standards for Federally-Regulated General Service Fluorescent Lamps Manufactured Before July 15, 2012

…[skipping re-numbered table K-2]

(B) General Service Fluorescent Lamps Manufactured On or After July 15, 2012. The correlated color temperature and minimum average lamp efficacy (LPW) of federally-regulated general service fluorescent lamps shall be not less than the applicable values shown in Table K-~~2~~3.

Table K-~~2~~3
Standards for Federally-Regulated General Service Fluorescent Lamps Manufactured On or After July 15, 2012

…[skipping re-numbered table K-3]

(2) Federally-Regulated Incandescent Reflector Lamps. ~~The average lamp efficacy of federally-regulated incandescent reflector lamps shall not be less than the applicable values shown in Table K-2, subject to the following.~~

(A) Incandescent Reflector Lamps Manufactured Before July 15, 2012. The average lamp efficacy of federally-regulated incandescent reflector lamps manufactured on or after November 2, 1995 and manufactured before July 15, 2012 shall be not less than the applicable values shown in Table K-~~3~~4, subject to the following.

(1) The standards specified in Table K-~~3~~4 shall apply with respect to:

a. ER incandescent reflector lamps, BR incandescent reflector lamps, BPAR incandescent reflector lamps, and similar bulb shapes on and after January 1, 2008; and

b. Incandescent reflector lamps with a diameter of more than 2.25 inches, but not more than 2.75 inches, on and after June 15, 2008.

(2) The standards specified in Table K-~~3~~4 shall not apply to the following types of incandescent reflector lamps:

a. Lamps rated at 50 watts or less that are ER30, BR30, BR40, or ER40;

b. Lamps rated at 65 watts that are BR30, BR40, or ER40 lamps; and

c. R20 incandescent reflector lamps rated 45 watts or less.

Table K-~~3~~4
Standards for Federally-Regulated Incandescent Reflector Lamps Manufactured Before July 15, 2012

…[skipping re-numbered table K-4]

(B) Incandescent Reflector Lamps Manufactured on or After July 15, 2012. The average lamp efficacy of federally-regulated incandescent reflector lamps with rated lamp wattage between 40 – 205 watts, and manufactured on or after July 15, 2012, shall be not less than the applicable values shown in Table K-4~~5~~.

Table K-4~~5~~
Standards for Federally-Regulated Incandescent Reflector Lamps Manufactured On or After July 15, 2012

…[skipping re-numbered table K-5]

(3) Medium Base Compact Fluorescent Lamps. A bare lamp and covered lamp (no reflector) medium base compact fluorescent lamp manufactured on or after January 8, 2007, shall meet the requirements set forth in Table K-~~5~~6.

Table K-~~5~~6
Standards for Medium Base Compact Fluorescent Lamps

…[skipping re-numbered table K-6]

(4) Federally-Regulated General Service Incandescent Lamps and Modified Spectrum General Service Incandescent Lamps. The energy consumption rate of federally regulated

general service incandescent lamps and modified spectrum general service incandescent lamps, manufactured on or after the effective dates shown, shall be no greater than the maximum rated wattage shown in Tables K-~~6~~7 and K-~~7~~8.

…[skipping (4)(A) and (4)(B)]

Table K-~~6~~7
Standards for Federally-Regulated General Service Incandescent Lamps

…[skipping re-numbered table K-7]

Table K-~~7~~8
Standards for Federally-Regulated Modified Spectrum General Service Incandescent Lamps

…[skipping re-numbered table K-8]

(5) Candelabra Base Incandescent Lamps and Intermediate Base Incandescent Lamps. The energy consumption rate of federally regulated candelabra base incandescent lamps and intermediate base incandescent lamps, manufactured on or after January 1, 2012, shall be no greater than the maximum rated wattage shown in Tables K-~~8~~9.

Table K-~~8~~9
Standards for Federally Regulated Candelabra Base Incandescent Lamps and Intermediate Base Incandescent Lamps

…[skipping re-numbered table K-9]

…[skipping the rest of section 1605.1]

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

1605.3 State Standards for Non-Federally-Regulated Appliances

…[skipping (a)-(j)]

(k) Lamps

(1) **State-Regulated Incandescent Reflector Lamps.** The average lamp efficacy of state-regulated incandescent reflector lamps manufactured on or after January 1, 2008, shall be not less than the applicable values shown in Table K-~~9~~10.

Table K-~~9~~10
Standards for State-Regulated Incandescent Reflector Lamps

…[skipping re-numbered table K-10]

(2) Standards for State-Regulated General Service Incandescent Lamps, General Service Lamps, ~~and~~ Modified Spectrum Incandescent Lamps, and State-Regulated LED Lamps. The energy consumption rate of state-regulated general service incandescent lamps, general service lamps, ~~and~~ modified spectrum general service incandescent lamps, and state-regulated LED lamps manufactured on or after the effective dates shown in Tables K-1~~0~~1, K-1~~1~~2, ~~and~~ K-1~~2~~3, and K-14 shall meet the standards shown in these ables.

Table K- 1~~0~~1
Standards for State-Regulated General Service Incandescent Lamps - Tier I

…[skipping re-numbered table K-11]

Table K- 1~~1~~2
Standards for State-Regulated General Service Lamps -Tier II

…[skipping re-numbered table K-12 and subsections (A) and (B)]

Table K- 1~~2~~3
Standards for State-Regulated Modified Spectrum General Service Incandescent Lamps - Tier I

…[skipping re-numbered table K-13]

(C) State-regulated LED lamps with lumen output of 150 lumens or greater and manufactured on or after January 1, 2017 shall have:

(i) a color point with a Duv that is:

(1) No less than -0.0033

(2) No greater than 57700 x $(1/T)^2$ – 44.6 x (1/T)+0.00854 where T means the measured correlated color temperature.

(ii) A CRI (Ra) of 82 or greater

(iii) Individual color scores of R1, R2, R3, R4, R5, R6, R7, and R8 of 72 or greater

(iv) A power factor of 0.7 or greater

(v) A rated life of 10,000 hours or greater as determined by the lumen maintenance and time to failure test procedure.

(vi) State-regulated LED lamps that have an ANSI standard lamp shape of A shall meet the omnidirectional light distribution requirements of ENERGY STAR's Product Specification for Lamps Version 1.1. State-regulated LED lamps that have an ANSI standard lamp shape of B, BA, C, CA, F, or G shall meet the decorative light distribution requirements of ENERGY STAR's Product Specification for Lamps Version 1.1

(D) In addition to the requirements in 1605.3(k)(2)(C), state-regulated LED lamps manufactured on or after January 1, 2019 shall have a standby mode power of 0.2 watts or less.

Table K-14
Standards for State-regulated LED Lamps

Effective Date	*Minimum Compliance Score*	*Minimum Efficacy Lumens Per Watt*
January 1, 2017	277	65
January 1, 2019	297	80
The compliance score shall be calculated as the sum of the efficacy and 2.3 times the CRI of a lamp.		

(3) State-regulated Small Diameter Directional Lamps. State-regulated small diameter directional lamps manufactured on or after January 1, 2018 must have a rated life of 25,000 hours or greater as determined by the lumen maintenance and time to failure test procedure and meet one of the following requirements:

(A) have luminous efficacy of ≥80 lumens per watt.

(B) have a minimum luminous efficacy of 70 lumens per watt or greater and a minimum compliance score of 165 or greater, where compliance is calculated as the sum of the luminous efficacy and CRI.

(4) **GU-24 Base Lamps.** GU-24 base lamps shall not be incandescent lamps.

(5) See Section 1605.1(k) for energy efficiency standards for federally-regulated lamps.

…[skipping (l)-(m)]

(n) Luminaires and Torchieres.

(1) Energy Efficiency Standard for Metal Halide Luminaires. Metal halide luminaires rated at least partially within the range of 150 to 500 watts shall not have probe-start ballasts and shall comply with Section 1605.3(n)(1)(A) as applicable:

…[skipping subsections (A), (B) and section (2)]

(3) **Portable Luminaires.**

(A) Portable luminaires manufactured on or after January 1, 2010 shall meet one or more of the following requirements:

…[skipping subsections (1) and (2)]

(3) Be an LED luminaire or a portable luminaire with an LED light engine with integral heat sink, and comply with the minimum requirements shown in Table N-~~3~~2;

Table N-2
Minimum Requirements for Portable LED Luminaires and Portable Luminaires with LED Light Engines with Integral Heat Sink

Criteria	Requirement
Light Output	≥ 200 lumens (initial)
Minimum LED Luminaire Efficacy	29 lumens/W
Minimum LED Light Engine Efficacy	40 lumens/W
Color Correlated Temperature (CCT)	2700 K through 5000 K
Minimum Color Rendering Index (CRI)	75
Power Factor (for luminaires labeled or sold for residential use)	≥ 0.70

(4) Be equipped with an E12, E17, or E26 screw-based socket and be prepackaged and sold together with one screw-based compact fluorescent lamp or screw-based LED lamp for each screw-based socket on the portable luminaire. The compact fluorescent or LED lamps which are prepackaged with the portable luminaire shall be fully compatible with the luminaire controls, meaning that portable luminaires having a dimmer control shall be prepackaged with dimmable compact fluorescent or LED lamps, and portable luminaires having 3-way controls shall be prepackaged with 3-way compact fluorescent or LED lamps. The compact fluorescent lamps which are prepackaged with the luminaires shall also meet the minimum energy efficiency levels established by ENERGY STAR® for compact fluorescent lamps in effect on December 31, 2008. The LED lamps required to be packaged with the luminaire shall comply with the minimum requirements ~~shown in Table N-2~~ for state-regulated LED lamps in sections 1601 through 1607 of this article;

…[skipping through (w)]

The following documents are incorporated by reference in Section 1605.3.

Number	*Title*

...[skipping Federal Requirements through American National Standards Institute (ANSI)]

EPA ENERGY STAR Program Requirements Product Specification for Lamps (Light Bulbs) Version 1.1 (August 2014)

ENERGY STAR (R) Program Requirements for CFLs

Copies available from:	US EPA Climate Protection Partnership ENERGY STAR Programs Hotline & Distribution (MS-6202J) 1200 Pennsylvania Ave NW Washington, DC 20460 WWW.ENERGYSTAR.GOV
Copies available from:	Superintendent of Documents U.S. Government Printing Office Washington, DC 20402 http://ecfr.gpoaccess.gov

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Section 1606. Filing by Manufacturers; Listing of Appliances in Database.

…[skipping (a)(1)-(3) and sections A-J) of Table X]

Table X Continued - Data Submittal Requirements

	Appliance	Required Information	Permissible Answers
	All Appliances	* Manufacturer's Name	
		* Brand Name	
		* Model Number	
		Regulatory Status	Federally-regulated consumer product, federally-regulated commercial and industrial equipment, non-federally-regulated
		…	
K	State-regulated small diameter directional lamps	Base Type	GU 11, GU 5.3, GUX 5.3, GU8, GU 4 and medium screw base
		Lamp Type (examples PAR-16, MR-11, MR-16, or R)	
		Lamp Power (Watts)	
		Lamp Output (Lumens)	
		Beam Angle	
		Center Beam Candle Power (CBCP)	
		Lumens Per Watt	
		Minimum lamp efficacy (LPW)	
		Color Rendering Index (CRI)	
		Combined CRI + Efficacy	
		Correlated Color Temperature	
		Rated Life (hours)	
	State-regulated medium screw base general service ~~Light Emitting Diode (LED) lamps, and~~ Organic LED (OLED) lamps	Rated lumens	
		Rated lamp wattage	
		Average lamp efficacy	
	State-regulated Light Emitting Diode (LED) lamps	Base Type	E12, E17, E26, GU-24, retrofit kit
		Lamp Shape	
		Light Distribution	Directional, Omnidirectional, Decorative, Spot, Recessed Can
		Dimmable	Yes, no
		Minimum dimming level (%)	

		Reduced Flicker Operation	Yes, no
		Correlated Color Temperature	
		Duv	
		Rated Lifetime (hours)	
		Lifetime test environment temperature	Ambient, Elevated
		Lamp Power (Watts)	
		Lumen Output (Lumens)	
		Efficacy (Lumens per watt)	
		Color Rendering Index (R_a)	
		Compliance Score	
		Power Factor	
		Standby Power (watts)	
		R_1	
		R_2	
		R_3	
		R_4	
		R_5	
		R_6	
		R_7	
		R_8	
		R_9 [2]	
		Meets applicable luminous intensity distribution requirements	ENERGY STAR Omnidirectional, ENERGY STAR Decorative, California Quality Specification Recessed Can Housing Retrofit Kit, California Quality Specification Spotlight, California Quality Specification Floodlight, none.
		Warranty Length (years) [2]	
		Audible Noise at 100% output (decibels)	
		Audible Noise at 20% output (decibels)	
		Start Time [2]	
		6000 hour lumen maintenance [2]	
		6000 hour survival rate [2]	
		Projected time to L70?[2]	
		Dimming Control Compatibility	Forward, Phase cut control, reverse phase cut, powerline carrier, digital, 0-10 VDC, other.
		NEMA SSL 7A Compatible? [2] (If compatible with forward phase cut dimmer control answer "Yes," If not answer "No.")	Yes, no
		Marked in accordance with Title 24 JA-8 [2]	Yes, no
		Meets the Voluntary California Quality Specification 2.0 requirements applicable to the lamp type	Yes, no

* "Identifier" information as described in Section 1602(a).
1 = Voluntary for federally-regulated appliances
2 = Voluntary for state-regulated appliances

…[skipping remainder of table X and section 1606]

The following documents are incorporated by reference into section 1606.

CALIFORNIA ENERGY COMMISSION

California Energy Commission Voluntary California Quality Light-Emitting Diode (LED) Lamp Specification (December 2014)

California Title 24, Part 6, Joint Appendix 8 JA-8 -- 2015	Qualification Requirements for High Efficacy Light Sources
Copies available from:	California Energy Commission Energy Hotline 1516 Ninth Street, MS-25 Sacramento, California 95814 Phone: (916) 654-5106 FAX: (916) 654-4304

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA SSL 7A (2013)	Qualification Requirements for High Efficacy Light Sources
Copies available from:	National Electric Manufacturers Association 1300 N. 17th Street, Suite 1847 Rosslyn, VA 22209 www.nema.org Phone: (703) 841-3200 Fax: (703) 841-3300

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

1607 Marking of Lamps.

...[skipping (a)-(c)]

(d) Energy Performance Information

…[skipping (1)-(11)]

(12) State regulated LED lamps shall meet the criteria below before making any of the relevant claims in marketing materials, including retail packaging or on the lamp itself.

(A) The following shall be demonstrated before making a claim of being "dimmable."

(i) The lamp shall be dimmable to 10 percent of its full light output.

(ii) The lamp shall be reduced flicker operation;

(iii) Shall not produce noise in excess of 24 A-weighted decibels at 100 percent and 20 percent of full light output.

(iv) If the product cannot be reduced flicker operation using a standard phase-cut dimmer, but can be reduced flicker operation using another type of dimmer, references to dimmability shall be qualified with the phrase "dimmable with LED dimmer." These lamps shall include instructions on or inside the retail packaging that describe, or contain an internet link to a description of, the type of dimmers that are compatible or recommended for use with the lamp.

(B) State regulated LED lamps shall meet all of the following requirements before including comparisons to incandescent lamps, including wattage equivalencies:

(i) The lamp shall have a color correlated temperature of 3000k or less.

(ii) The lamp shall be "dimmable" as described in 1607(d)(12)(A).

(iii) The lamp shall have a lumen output of 310 lumens or greater for medium-screw base lamps or 150 lumens or greater for intermediate and candelabra bases.

(iv) Claims of incandescent wattage equivalence shall have lumen outputs in the respective ranges contained in Table K-15.

Table K-15
Incandescent Equivalences for State-regulated LED Lamps

Incandescent equivalence	Lumen minimum
Medium screw-base and GU-24 base omnidirectional lamps	
40 W	310
60 W	750
75 W	1050
100 W	1490
150 W	2500

(C) A lamp that is certified with a light output of less than 150 lumens for candelabra bases, or less than 200 lumens for other bases, shall be labeled as "for decorative purposes."

(D) Lamps shall certify that each and every portion of the California Quality LED Lamp Specification is met before making any marketing, label, or mark regarding a model's qualification for the specification.

…[skipping *documents incorporated by reference*]

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).