Greenhouse and Energy Minimum Standards (LED Lamps) Determination 2025

I, Josh Wilson, Assistant Minister for Climate Change and Energy, make the following determination.

Dated 26 February 2025

Josh Wilson
Assistant Minister for Climate Change and Energy

Contents

COPYRIGHT

Part 1—Preliminary

1 Name

This instrument is the *Greenhouse and Energy Minimum Standards (LED Lamps) Determination 2025.*

2 Commencement

(1) Each provision of this instrument specified in column 1 of the table commences, or is taken to have commenced, in accordance with column 2 of the table. Any other statement in column 2 has effect according to its terms.

Commencement information		
Column 1	**Column 2**	**Column 3**
Provisions	**Commencement**	**Date/Details**
1. The whole of this instrument	The day after the end of the period of 12 months beginning on the day this instrument is registered.	

(2) Any information in column 3 of the table is not part of this instrument. Information may be inserted in this column, or information in it may be edited, in any published version of this instrument.

(3) To avoid doubt, for the purposes of paragraph 34(b) of the Act, this instrument comes into force on the day specified by column 2 of the table.

3 Authority

This instrument is made under section 23 of the *Greenhouse and Energy Minimum Standards Act 2012*.

4 Definitions—standards and other instruments referred to in this instrument

(1) In this instrument:

AS/NZS 5341 means *Australian/New Zealand Standard 5341:2021 – LED lamps – Test methods – Energy and functional performance*.

AS/NZS 62471 means *Australian/New Zealand Standard 62471:2011 – Photobiological safety of lamps and lamp systems.*

CIE S 025 means *CIE S 025/E:2015 – Test Method for LED Lamps, LED Luminaires and LED Modules*, published by the Commission Internationale de L'Eclairage (CIE).

Civil Aviation Safety Regulations means the *Civil Aviation Safety Regulations 1998*.

Defence Aviation Safety Authority Regulation (DASR) 139 – Aerodromes means the *Defence Aviation Safety Regulation (DASR) 139 – Aerodromes*, published by the Australian Government Defence Aviation Safety Authority (DASA).

Defence Aviation Safety Design Requirements Manual means the *Defence Aviation Safety Design Requirements Manual*, published by the Australian Government Defence Aviation Safety Authority (DASA).

IEC 62776 means *International Electrotechnical Commission Standard IEC 62776:2014 Double-capped LED lamps designed to retrofit linear fluorescent lamps – Safety specifications.*

IEC 62931 means *International Electrotechnical Commission Standard IEC 62931:2017 GX16t-5 capped tubular LED lamp – Safety specifications.*

IEC TR 61547-1 means *International Electrotechnical Commission Standard IEC TR 61547-1:2020 – Equipment for general lighting purposes – EMC immunity requirements – Part 1: An objective light flickermeter and voltage fluctuation immunity test method.*

IEC TR 62778 means *International Electrotechnical Commission Technical Report 62778:2014 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires.*

IEC TR 63158 means *International Electrotechnical Commission Technical Report 63158:2018 Equipment for general lighting purposes – Objective test method for stroboscopic effects of lighting equipment.*

IEV-845 means IEC 60050-845:2020 Ed.2, *International Electrotechnical Vocabulary* (IEV) – Part 845: Lighting, published by the International Electrotechnical Commission (IEC).

ILV means the International Lighting Vocabulary (ILV), 2nd Edition, published by Commission Internationale de L'Eclairage (CIE).

Part 139 (Aerodromes) Manual of Standards means *Part 139 (Aerodromes) Manual of Standards 2019*, made under regulation 139.005 of the Civil Aviation Safety Regulations.

Note: At the time this instrument commences, the texts of instruments mentioned in this section were available as follows:

- AS and AS/NZS standards—at www.standards.org.au;
- CIE standards—from the Commission Internationale de L'Eclairage (International Commission on Illumination) at www.cie.co.at;
- IEC standards—from the International Electrotechnical Commission at https://webstore.iec.ch/;
- DASA instruments—at https://dasa.defence.gov.au;
- Commonwealth regulations and instruments made under them—at www.legislation.gov.au.

(2) Each reference to a document in subsection (1) is taken to be a reference to that document as in force or existing on the day this instrument commences.

5 Definitions—other expressions used in this instrument

Note 1: A number of expressions used in this instrument are defined in section 5 of the Act, including the following:

- category A product;
- covered by;
- family of models;
- GEMS;
- GEMS labelling requirements;
- GEMS level requirements;
- model;
- product classes.

Note 2: Many of the following definitions are based on ILV (the International Lighting Vocabulary) or IEV-845 (the part of the International Electrotechnical Vocabulary that deals with lighting). Where the definition of an expression below differs from the ILV or IEV definition, the definition in this instrument takes precedence.

(1) In this instrument:

Act means the *Greenhouse and Energy Minimum Standards Act 2012*.

average luminance, in relation to an LED lamp, means the average luminance over a light-emitting area where the luminance is more than 50% of the peak luminance (cd/mm^2).

beam angle of a directional LED lamp:

(a) means the angle between 2 imaginary lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the LED lamp and through points at which the luminous intensity is 50% of the centre beam intensity; and

(b) for LED lamps that have different beam angles in different planes—refers to the largest beam angle; and

(c) for LED lamps with a user-controllable beam angle—refers to the beam angle as measured in the reference control settings.

Note: The beam angle is a full angle measure, not a half angle measure, and is expressed in degrees (°).

cap means that part of a lamp which provides a connection to the power supply by means of a lamp-holder or lamp connector and, in most cases, also serves to retain the lamp in the lamp-holder.

Note 1: The standard code for identifying cap types can be found in IEC 60061.1: Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps.

Note 2: The term 'base' is equivalent to 'cap'. The term 'cap' is used in this instrument.

CCT: see ***correlated colour temperature***.

centre beam intensity means the value of luminous intensity measured on the optical beam axis.

chromaticity means the property of a colour stimulus defined by:

(a) its chromaticity coordinates (u′ and v′), or (x and y); or

(b) its dominant or complementary wavelength and purity taken together.

CLL: see ***connected LED lamp***.

colour consistency means the maximum deviation of the initial, spatially averaged chromaticity coordinates (x and y), or (u′ and v′), of an LED lamp from the rated chromaticity centre point (cx and cy) or (cu′ and cv′), expressed as the step size of:

(a) the MacAdam ellipse formed around the rated chromaticity centre point (cx and cy); or

(b) the Δu′v′ circle formed around the rated chromaticity centre point (cu′ and cv′).

colour rendering index or ***CRI*** means the measure of the degree to which the psychophysical colour of an object illuminated by the test illuminant conforms to that of the same object illuminated by the reference illuminant, suitable allowance having been made for the state of chromatic adaptation.

colour-tuneable LED lamp means an LED lamp that can be set to emit light with a large variety of colours outside the range defined in paragraph 10(4)(a), but can also be set to emit white light within that range.

Note: The following kinds of lamps are not considered colour-tuneable:

(a) tuneable-white LED lamps that can only be set to emit light with different correlated colour temperatures within the range defined in paragraph 10(4)(a);

(b) dim-to-warm LED lamps that shift their white light output to a lower correlated colour temperature when dimmed, simulating the behaviour of incandescent lamps.

connected LED lamp or ***CLL*** means an LED lamp in which the data-connection parts that are necessary to maintain the reference control settings are physically or functionally inseparable from the light-emitting parts.

Note: This includes an LED lamp for which the data-connection parts, while physically separate, are marketed with the lamp as a single product.

control gear, in relation to an LED lamp, means a unit that:

(a) includes a control unit; and
(b) is inserted between the power supply and the lamp; and
(c) supplies the lamp with its rated voltage or rated current; and
(d) may consist of one or more separate components; and
(e) may include a power supply converter.

Note 1: The control gear may be partly or totally integrated in the LED lamp.

Note 2: Control gear is commonly referred to as 'controlgear' in IEC standards.

connected control gear, in relation to an LED lamp, means control gear that includes data-connection capability that is necessary to maintain the reference control settings.

Note: Connected control gear may include means for igniting, dimming, colour changing, and further control functions.

control mode, in relation to an LED lamp, means the condition of lighting control parts in which those parts:

(a) are connected to the lamp; and
(b) are performing their functions in such a way that:
  (i) a control signal can be internally generated or a remotely initiated trigger can be received, by wire or wirelessly; and
  (ii) the control signal can be processed to lead to a change in the light emission of the lamp.

control signal means an analogue or digital signal transmitted to an LED lamp by wire or wirelessly, either via:

(a) voltage modulation in separate control cables; or
(b) a modulated signal in the supply voltage.

Note: The signal transmission is not through a network but, for example, from an internal source or from a remote control delivered with the product.

correlated colour temperature or ***CCT*** means the temperature of a Planckian radiator having the chromaticity nearest the chromaticity associated with the given spectral distribution on a modified 1976 UCS diagram, where u′, 2/3v′ are the coordinates of the Planckian locus and the test stimulus.

cos φ_1: see ***displacement factor***.

CRI: see ***colour rendering index***.

data-connection parts means parts that perform one or more of the following functions:

(a) receiving or transmitting, and processing, wired or wireless data signals;
(b) sensing and processing such signals;
(c) a combination of the above.

Note: The signals mentioned in paragraphs (a) and (b) may be used to control the light emission function.

declared value means the value for a parameter relating to an LED lamp that is:

(a) established (measured or derived from measurements) under the applicable test conditions set out in section 22; and

(b) provided in an application to register the relevant model of lamp under the Act.

Note: This definition is relevant where, for instance, this instrument refers to parameters such as voltage, CCT, or CRI of an LED lamp when these are required to be measured. Declared values are those sourced from test reports whereas rated values are those used for consumer information (which can be declared values rounded off to typical nominal values). For example, declared CCT is established through measurement as 2680 K whereas the rated CCT may be the nominal value of 2700 K.

DF: see ***displacement factor***.

DLL: see ***directional LED lamp***.

directional LED lamp or ***DLL*** means:

(a) an LED lamp for which at least 80% of total luminous flux falls within a solid angle of π sr (corresponding to a cone with angle of 120°); or

(b) an LED lamp with a beam angle no greater than 100° in at least one plane through the lamp axis when luminous flux is measured using all forward-facing lumens.

displacement factor, ***DF*** or ***cos φ_1*** means a factor expressed by $\cos(\varphi_1)$, where φ_1 is the phase angle between the fundamental of the mains supply voltage and the fundamental of the mains current, and is calculated from the ratio of the absolute value of the fundamental active power (P_1) to the fundamental apparent power (S_1), as follows

$$cos(\varphi_1) = \frac{|P_1|}{S_1}$$

as measured:

(a) at full-load, in the reference control settings (where applicable); and

(b) with:

(i) any lighting control parts in control mode; and

(ii) any non-lighting parts disconnected, switched off or set to minimum power consumption according to the manufacturer's instructions.

double-capped lamp means a lamp with 2 separate caps.

Note: This includes double-capped retrofit LED lamps and double-capped conversion LED lamps, as defined in IEC 62776:2014, clauses 3.1 and 3.2.

excitation purity or ***p_e*** means the quotient NC/ND of the following two collinear distances on the chromaticity diagram of the CIE 1931 or 1964 standard colorimetric systems:

(a) the distance between the point C representing the colour stimulus considered and the point N representing the specified achromatic stimulus;

(b) the distance between the point N and the point D on the spectrum locus at the dominant wavelength of the colour stimulus considered;

leading to the following expressions:

$$p_e = \frac{y - y_n}{y_d - y_n}$$

and

$$p_e = \frac{x - x_n}{x_d - x_n}$$

where (x, y), (x_n, y_n), (x_d, y_d) are the x, y chromaticity coordinates of the points C, N and D respectively.

Note 1: In the case of purple stimuli, the monochromatic stimulus is replaced by a stimulus the chromaticity of which is represented by a point on the purple boundary.

Note 2: The formulae in x and y are equivalent, but greater precision is given by the formula which has the greater value in the numerator.

Note 3: The excitation purity has unit one.

flicker:

(a) means the perception of visual unsteadiness induced by a light stimulus the luminance or spectral distribution of which fluctuates with time, for a static observer in a static environment; and

(b) is expressed in the metric 'P_{st}^{LM}', where 'st' stands for short term and 'LM' for light flickermeter method, as defined in IEC TR 61547-1.

Note 1: The fluctuations of the light stimulus with time include periodic and non-periodic fluctuations and can be induced by the lamp itself, the power source or other influencing factors.

Note 2: A value $P_{st}^{LM} = 1$ means that the average observer has a 50% probability of detecting flicker.

full-load means the condition of an LED lamp, within the rated operating conditions, in which it emits the maximum (undimmed) luminous flux.

HLLL: see ***high-luminance LED lamp***.

high-luminance LED lamp or ***HLLL*** means an LED lamp with an average luminance greater than 30 cd/mm^2 in the direction of peak intensity.

initial, in relation to the measurement of a characteristic, means the characteristic as measured at the end of the:

(a) ageing period (if any), within the meaning of clause 3.2 of AS/NZS 5341; and

(b) stabilisation time, within the meaning of clause 4.4 of CIE S 025.

I_v: see ***luminous intensity***.

inorganic light emitting diode means an LED in which the p-n junction is composed of inorganic material.

$L_{70}B_{50}$ lifetime, for a model of an LED lamp, means the time in hours between the start of its use and the time at which, for 50% of a tested population of LED lamps of that model, the luminous flux of those lamps which were still emitting light had degraded to a value below 70% of the initial luminous flux.

Note: The $L_{70}B_{50}$ lifetime parameter relates only to the reduction of light output. Lamps in the relevant population which cease to emit light during the testing period are not included in the calculation of $L_{70}B_{50}$ lifetime.

LED or ***light emitting diode*** means a solid-state device embodying a p-n junction, emitting incoherent optical radiation when excited by an electric current.

Note 1: This definition is independent from the existence of enclosure(s) and terminals.

Note 2: The term 'LED' represents the LED die (or chip), or LED package.

LED lamp means an electric lamp based on LED technology.

Note: An LED lamp can be an integrated (LEDi lamp), a semi-integrated (LEDsi lamp) or a non-integrated (LEDni lamp). An LED lamp can incorporate at least one LED module.

light means radiation within the spectral range of visible radiation.

lighting control parts of an LED lamp means parts to which all of the following apply:

(a) the parts are either:
  (i) integrated in the lamp; or
  (ii) physically separate from but marketed together with the lamp, or with separate control gear (including separate connected control gear), as a single product;

(b) the parts are not strictly necessary for the lamp to emit light at full-load, or for the separate control gear (including separate connected control gear) to supply the electric power that enables the lamp to emit light at full-load;

(c) the parts enable manual or automatic, direct or remote control of luminous intensity, chromaticity, correlated colour temperature, light spectrum or beam angle.

Example: Dimmers are lighting control parts.

lumen maintenance factor or X_{LMF} means the ratio, for specified operating conditions, of the luminous flux of an LED lamp at a given time in its operational life to its initial luminous flux.

Note 1: In IEC standards, 'lumen maintenance' is also commonly used with the same meaning.

Note 2: In CIE standards, 'luminous flux maintenance factor' is used with the same meaning.

Note 3: The lumen maintenance factor has unit one and is usually expressed in per cent.

luminance or L_v: see subsection (2).

luminous efficacy or η_{lamp}: see subsection 13(2).

luminous flux or Φ_V:

(a) means the change in luminous energy with time:

$$\Phi_V = \frac{dQ_v}{dt}$$

where Q_v is the luminous energy emitted, transferred or received, and t is time; and

(b) for LED lamps that can be tuned to emit different light spectra or different maximum light intensities—refers to the luminous flux as measured in the reference control settings.

Note: The luminous flux is expressed in lumen (lm).

luminous intensity or I_v means the density of luminous flux with respect to a solid angle in a specified direction, calculated as follows:

$$I_V = \frac{d\Phi_V}{d\Omega}$$

where Φ_v is the luminous flux emitted in a specified direction, and Ω is the solid angle containing that direction.

Note: The luminous intensity is expressed in candela ($cd = lm \cdot sr^{-1}$).

mains, ***mains voltage*** or ***MV*** means the electricity supply of 230 (+10% to -6%) volts of alternating current at 50 Hz.

mains LED lamp or ***MLL*** means an LED lamp that can be operated directly on the mains electricity supply.

Note: This includes such a lamp whether or not it can also operate indirectly on the mains using a separate control gear (including separate connected control gear) that includes a power supply converter.

mains voltage: see ***mains***.

MLL**:** see ***mains LED lamp***.

MV: see ***mains***.

NDLL: see ***non-directional LED lamp***.

network means an architecture (a communication infrastructure with a topology of links), and includes the physical components, organisational principles, communication procedures and formats (protocols).

networked standby mode means the condition of a CLL in which:

(a) the lamp is connected to the power supply; and
(b) the lamp is intentionally not emitting light; and
(c) the lamp or separate connected control gear is awaiting a control signal via a digital network to return to a state with light emission; and
(d) the lighting control parts are in their control mode; and
(e) where this can be done without disassembling the lamp—when the manufacturer's instructions are followed:
    (i) the non-lighting parts are disconnected from electric power or switched off; or
    (ii) the power consumption of those parts is minimised.

networked standby power or P_{net} means the electric power consumption of a CLL in networked standby mode.

Note: Networked standby power is expressed in watts (W).

NMLL: see the definition of ***non-mains LED lamp***.

non-mains LED lamp or ***NMLL*** means an LED lamp that requires a separate power supply converter inserted between the power supply and lamp to operate.

non-directional LED lamp or ***NDLL*** means an LED lamp that is not a directional LED lamp.

non-lighting parts of an LED lamp means parts that are:

(a) either:
    (i) integrated in the lamp or a separate control gear; or
    (ii) physically separated from but marketed together with the lamp, or separate control gear (including separate connected control gear), as a single product; and

(b) not necessary for the lamp to emit light at full-load, or for the separate control gear (including separate connected control gear) to supply the electric power that enables the lamp to emit light at full-load; and

(c) not lighting control parts.

Example: Speakers (audio), cameras, repeaters for communication signals to extend the range (eg, WiFi), parts supporting grid balance (switching to own internal batteries when necessary), battery charging, visual notification of events (mail arriving, doorbell ringing, alert), and use of Light Fidelity (Li-Fi, a bidirectional, high-speed and fully networked wireless communication technology).

Note: 'Non-lighting parts' also include data-connection parts used for functions other than controlling the light emission function.

on-mode power or $\boldsymbol{P_{on}}$:

(a) means the electric power consumption of an LED lamp in full-load, with:

(i) all lighting control parts and non-lighting parts disconnected; or

(ii) if the parts mentioned in subparagraph (i) cannot be disconnected—the parts switched off, or their power consumption minimised in accordance with the manufacturer's instructions; and

(b) for a non-mains LED lamp (NMLL) that requires a separate control gear (including separate connected control gear) to operate—can be:

(i) measured directly on the input to the LED lamp; or

(ii) determined using a separate control gear (including separate connected control gear) with known efficiency, the electric power consumption of which is subsequently subtracted from the measured mains power input value.

Note: On-mode power is expressed in watts (W).

$\boldsymbol{P_e}$: see ***excitation purity***.

$\boldsymbol{P_{net}}$: see ***networked standby power***.

$\boldsymbol{P_{on}}$: see ***on-mode power***.

$\boldsymbol{P_{sb}}$: see ***standby power***.

$\boldsymbol{P_{st}}^{\mathbf{LM}}$: see paragraph (b) of the definition of ***flicker***.

photosynthetic photon efficacy means the rate of flow of photons within the photosynthetically active radiation waveband of 400 – 700 nm from a radiation source.

Note: Photosynthetic photon efficacy is measured in µmol/Joule.

projected light-emitting surface area of an LED lamp means the surface area in mm^2 (square millimetres) of the view in an orthographic projection of the light-emitting surface from the direction with the highest light intensity, where the light-emitting surface area is:

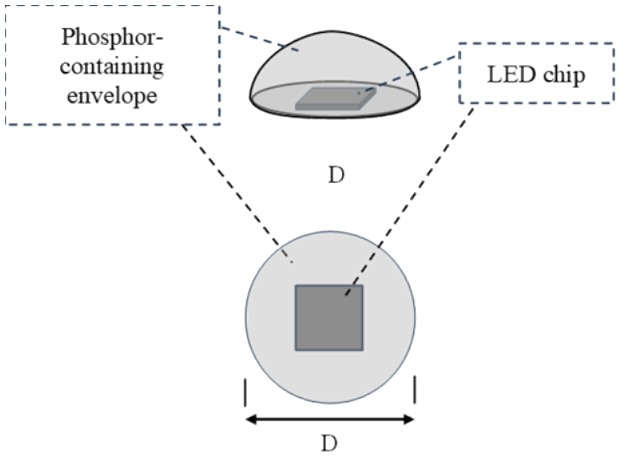
(a) for lamps with a non-clear envelope or with anti-glare shield—the entire area through which light leaves the lamp; or

(b) for lamps containing more than one light emitter—the projection of the smallest gross volume enveloping all emitters; or

(c) otherwise—the surface area of the lamp that emits light with the rated optical characteristics.

Example 1: For the purposes of paragraph (c), the light-emitting surface area of an LED chip encapsulated by a flat or semi-spherical phosphor containing envelope would be the surface area of that envelope, not the surface area of the chip. When the LED chip produces light, it is the phosphor-containing envelope which emits light with the rated optical characteristics, when energised by the light

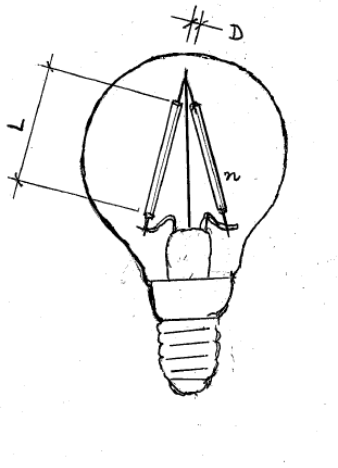
produced by the chip. This is illustrated by the following diagram (showing both side and top views):



projected light-emitting surface area = ¼ πD^2

where D is the diameter of the phosphor containing envelope (and not the dimensions of the rectilinear LED chip beneath the phosphor-coated envelop).

Example 2: For the purposes of paragraph (c), the light emitting surface of an LED filament lamp encapsulated in a clear bulb would be the combined surface areas of LED filaments, not the surface area of the bulb. This is illustrated by the following side view diagram:



projected light-emitting surface area = L.D.n

where L and D respectively are the length and the width of a single LED filament, and n is the number of filaments visible (some may be obstructed) from viewing direction.

rated, in relation to a value for a parameter relating to an LED lamp, means a value:

(a) that is provided for specification purposes by a person mentioned in subsection 43(3) of the Act; and

(b) that is based on the declared value; and

(c) that is specified on, or can be ascertained by following instructions (such as a quick reference code or web link) on, the packaging supplied with the lamp.

Note: This definition is relevant where, for instance, this instrument refers to 'rated optical characteristics' or 'rated voltage' of an LED lamp. Rated values are those typically used for consumer information (which can be the declared values rounded off to typical nominal values). For example, the rated CCT may be specified as the nominal value of 2700 K whereas declared CCT (derived from the measurements) is 2680 K.

ripple-free means an r.m.s. ripple voltage that is not more than 10% of the direct current component and whose maximum peak value does not exceed:

(a) 140 volts for a nominal 120 volts ripple-free direct current system; and

(b) 70 volts for a nominal 60 volts ripple-free direct current system.

reference control settings: see section 6.

remotely initiated trigger means a signal that comes from outside the LED lamp via a network.

r.m.s. means root mean square.

separate connected control gear, in relation to an LED lamp, means a connected control gear that is physically separate from the LED lamp.

Note 1: Separate connected control gear may have physically integrated data-connection parts in a single inseparable housing or may be combined with physically separate data-connection parts placed on the market together with the separate control gear as a single product.

Note 2: Separate connected control gear includes communication gateways.

Note 3: Separate connected control gear is also known as 'connected independent control gear'.

separate control gear, in relation to an LED lamp, means a control gear that is physically separate from the LED lamp.

SF: see ***survival factor***.

specific effective radiant ultraviolet power means the effective power of the ultraviolet radiation of an LED lamp weighted according to the spectral correction factors and related to its luminous flux.

Note: The specific effective radiant ultraviolet power is expressed in milliwatts per kilolumens (mW·klm-1).

standby mode means the condition of an LED lamp in which:

(a) the lamp is connected to the power supply; and

(b) the lamp is intentionally not emitting light; and

(c) the lamp or separate control gear is awaiting a non-networked control signal to return to a state with light emission; and

(d) the lighting control parts enabling the standby function are in their control mode; and

(e) where this can be done without disassembling the lamp—when the manufacturer's instructions are followed:

(i) the non-lighting parts are disconnected from electric power or switched off; or

(ii) the power consumption of those parts is minimised.

standby power or $\boldsymbol{P_{sb}}$ means the electric power consumption of an LED lamp in standby mode.

Note: The standby power is expressed in watts (W).

stroboscopic effect:

(a) means a change in motion perception induced by a light stimulus, the luminance or spectral distribution of which fluctuates with time, for a static observer in a non-static environment; and

(b) is represented in this instrument by the metric 'SVM' (stroboscopic effect visibility measure), as defined in IEC TR 63158.

Note 1: The fluctuations can be periodic or non-periodic, and may be induced by the LED lamp itself, the power source or other influencing factors.

Note 2: SVM = 1 represents the visibility threshold (50% probability of detection) for an average observer.

survival factor or ***SF*** means the fraction of the total number of LED lamps that continue to operate at a given instant under defined conditions and switching frequency.

Note: The lamp survival factor has unit one.

SVM: see paragraph (b) of the definition of ***stroboscopic effect***.

tested: a ***tested*** value or amount is one that is:

(a) determined in accordance with a test conducted in accordance with the testing requirements of this instrument; or

(b) calculated on the basis of values or amounts that have been determined in accordance with paragraph (a).

useful luminous flux or $\boldsymbol{\Phi_{use}}$ means the part of the luminous flux of an LED lamp that is considered when determining its energy efficiency, as follows:

(a) for non-directional LED lamps—the total luminous flux emitted in a solid angle of 4π sr (corresponding to a 360° sphere), Φ_{360};

(b) for directional LED lamps with beam angle ≥ 90° (except where paragraph (d) applies)—the luminous flux emitted in a solid angle of π sr (corresponding to a cone with angle of 120°), Φ_{120};

(c) for directional LED lamps with beam angle < 90° (except where paragraph (d) applies)—the luminous flux emitted in a solid angle of 0.586π sr (corresponding to a cone with angle of 90°), Φ_{90};

(d) for directional LED lamps where all forward-facing lumens are measured—the luminous flux emitted from the forward face of the lamp (corresponding to a cone with angle of 180°), Φ_{180}.

Note: Where paragraph (d) applies, a different luminous efficacy factor will apply when calculating the minimum required luminous efficacy of the LED lamp, as specified in subsection 13(3).

(2) ***Luminance*** or $\boldsymbol{L_v}$ means the density of luminous intensity with respect to the projected light-emitting surface area in a specified direction at a specified point on a real or imaginary surface, calculated as follows:

$$L_v = \frac{dI_v}{dA}\frac{1}{\cos\alpha}$$

where:

$\boldsymbol{I_v}$ is luminous intensity.

A is area.

α is the angle between the normal to the surface at the specified point and the specified direction.

Note: The luminance is expressed in candela per metre squared ($cd.m^2$).

6 Definition—reference control settings

(1) Subject to subsection (7), for a model of LED lamp with control features that allow the end user to adjust lamp characteristics that are capable of impacting on the energy performance of that model, a reference in this instrument to the ***reference control settings*** is a reference to the settings specified in this section.

Note 1: The control might be manual or automatic, direct or remote.

Note 2: LED lamps without control features that allow end users to adjust lamp characteristics that are capable of impacting on energy performance do not have reference control settings.

(2) For the purposes of subsection (1), without limiting that subsection, a model of LED lamp with control features that allow the end user to adjust any of, or any combination of, the following characteristics of the model is taken to be a model of LED lamp with control features that are capable of impacting on the energy performance of that model:
  (a) the electrical power consumption;
  (b) the luminous intensity of the emitted light;
  (c) the chromaticity of the emitted light;
  (d) the correlated colour temperature;
  (e) the spectrum of the emitted light;
  (f) the beam angle of the emitted light.

(3) Subject to subsections (4), (5) and (6), the reference control settings are the settings:
  (a) defined by the manufacturer as the factory default settings; and
  (b) encountered by the user upon first installing the lamp.

(4) If the installation procedure for the lamp provides for an automatic software update before the first use, or the user has the option to perform such an update, the reference control settings are the settings following that update.

Note: Software includes firmware.

(5) Despite subsections (3) and (4), if there are settings for the lamp characteristics mentioned in subsection (1) for a model of an LED lamp that:
  (a) are specified, and described as reference control settings, on the product packaging; or
  (b) if paragraph (a) does not apply—are so specified and described in technical documentation that is accessible by following instructions on the product packaging; or
  (c) if neither paragraph (a) or (b) applies—are so specified and described in technical documentation that is supplied with the lamp;

the reference control settings are the settings so specified.

Note: This subsection might apply because, for example, the manufacturer has set the factory default values at a lower power than the intended reference control settings for safety reasons.

(6) Despite subsections (3) and (4), if:
  (a) subsection (5) does not apply; and
  (b) the approved form for application for registration of the model of LED lamp under section 41 of the Act requires or permits the applicant to specify the reference control settings; and
  (c) the applicant has specified such settings;

the reference control settings are the settings specified in the application form.

(7) Settings will only be considered reference control settings if:
  (a) the lamp, when in those settings, is covered by this instrument; and
  (b) the lamp obtains full-load condition when in those settings; and
  (c) for the settings mentioned in paragraph (3)(a)—the lamp will revert to those settings when restored to factory default.

7 Families of models

(1) For the purposes of section 28 of the Act, for a particular product class covered by this instrument, 2 or more models are in the same family of models if:

(a) they are members of a family that has been declared to the GEMS Regulator; and

(b) the requirements of this section are satisfied in relation to the models and the family.

(2) For the purposes of paragraph (1)(b):

(a) the models must be in the same product class; and

(b) subject to subsection (3)—evidence of a test report documenting the results of the testing required in accordance with section 22 must have been provided for at least one model in the family at the time an application was made for registration for the models under section 41 of the Act; and

(c) the models must be either all non-mains LED lamps (NMLL) or all mains LED lamps (MLL); and

(d) the models must all have a rated CRI of one of the following:

(i) no less than 70 but less than 80;

(ii) no less than 80 but less than 90;

(iii) no less than 90; and

(e) for single-capped lamps—the models must all have a rated $L_{70}B_{50}$ lifetime of one of the following:

(i) no greater than 15,000 hours;

(ii) greater than 15,000 hours but no greater than 30,000 hours;

(iii) greater than 30,000 hours; and

(f) for double-capped G13 and G5 LED lamps—the models must all have a rated $L_{70}B_{50}$ lifetime of one of the following:

(i) no greater than 30,000 hours;

(ii) greater than 30,000 hours but no greater than 60,000 hours;

(iii) greater than 60,000 hours; and

(g) for double-capped G13 and G5 LED lamps—the models must have the same cap size; and

(h) the models must have the same reference control settings (if applicable); and

(i) in relation to the following design features:

(i) for dimmability—the models must be either all dimmable or all non-dimmable;

(ii) for light direction—the models must be either all directional or all non-directional;

(iii) for utilisation of LED filaments—the models must either all be designed with LED filaments or without LED filaments;

(iv) for CRI—models with CRI less than 80 must meet the requirements under item 1 of the table in section 19.

Note: Test reports and other evidence of performance of models can be provided at the time of registration on a voluntary basis.

(3) For the purposes of paragraph (2)(b):

(a) the model used for UV hazard testing (where required) must be the model with the highest UV radiant power in the relevant family; and

(b) the model used for Blue Light hazard testing (where required) must be the model with the highest CCT in the relevant family; and

(c) the model used for all other testing must be the model with the lowest luminous efficacy (lm/W) in the relevant family, when measured in the reference control settings.

Note: Subsection 20(1) contains UV and Blue Light hazard requirements. Subsections 20(4) and (5) set out circumstances in which UV and Blue Light hazard testing is not required.

(4) Despite subsections (2) and (3), an applicant under section 41 of the Act may, in their application, declare a family for the purposes of this subsection (a ***special purpose family***) consisting of up to 10 models within a particular product class, provided that:

(a) no more than 1 special purpose family is declared in any product class; and

(b) a test report, documenting the results of the testing required in accordance with section 22 of this instrument, was provided for every model in the family, subject to the qualifications in subsections 20(4) and 20(5) of this instrument, at the time the application was made.

Note: This provision caters for products which are low volume specialist lamps, which are unlikely to be otherwise able to be grouped together in a family and for which individual registration might otherwise be cost prohibitive.

(5) For the purposes of paragraph (1)(b), a family must not contain more than 100 models.

8 Product categories

For the purposes of section 29 of the Act, the products covered by this instrument are category A products.

Part 2—Products covered by this instrument

9 Purpose of this Part

For the purposes of subsections 23(1) and (2) of the Act, this Part specifies:

(a) one or more classes of products that are covered by this instrument; and

(b) one or more classes of products that are not covered by this instrument.

10 Classes of products that are covered by this instrument

Classes of products covered by this instrument

(1) This instrument covers LED lamps that:

(a) satisfy the general conditions in subsection (4); and

(b) are of a type covered by:

(i) subsection (5) (single-capped lamps); or

(ii) subsection (6) (double-capped lamps).

(2) The following are separate product classes:

(a) LED lamps that satisfy subsection (4) and are covered by subsection (5);

(b) LED lamps that satisfy subsection (4) and are covered by subsection (6).

Instrument covers LED lamps regardless of whether they are in a containing product

(3) This instrument covers LED lamps that fall within subsection (1), whether or not they are placed on the market in a containing product.

General conditions

(4) The general conditions for an LED lamp are the following:

(a) it has chromaticity coordinates x and y in the range:

$$0.270 < x < 0.530$$

and

$$-2.3172\,x^2 + 2.3653\,x - 0.2199 < y < -2.3172\,x^2 + 2.3653\,x - 0.1595$$

(b) it has an initial luminous flux of < 500 lumen per mm^2 of projected light-emitting surface area;

(c) it has an initial luminous flux between 100 and 82,000 lumens;

(d) it contains one or more inorganic LEDs.

Single-capped LED lamps

(5) This subsection covers lamps with LED light sources of all shapes with a single cap of one of the following types:

(a) BA15d, B15d, B22d, E11, E12, E13, E14, E17, E26, E27, E39, E40, GU10, GZ10, GX10, GU24, GX53, G9;

(b) Bi-pin lamp caps G4, GU4, GY4, GZ4, GU5.3, GX5.3, G6.35, GY6.35, GU7, G53.

Double-capped LED lamps

(6) This subsection covers double-capped LED lamps with a nominal length of 550 mm to 1500 mm, including:

(a) double-capped LED retrofit lamps and double-capped conversion LED lamps (as defined in clauses 3.1 and 3.2 of IEC 62776) with G5 and G13 caps, intended for replacing fluorescent lamps with the same caps; and

(b) double-capped LED lamps (as defined in IEC 62931) with GX16t-5 caps.

(7) In this section:

containing product, in relation to an LED lamp, means a different and larger product within which the lamp is supplied.

Note: For an LED lamp that falls within subsection (1) that is supplied within a refrigerator, the refrigerator is the containing product. For an LED lamp that falls within subsection (1) that is supplied in a luminaire, the luminaire is the containing product.

11 Classes of products that are not covered by this instrument

This instrument does not apply to LED lamps specified in Schedule 1.

Part 3—GEMS level requirements

12 Purpose of this Part

For the purposes of paragraph 24(1)(a) of the Act, this Part specifies GEMS level requirements in accordance with section 25 of the Act for the product classes covered by this instrument.

13 Ecodesign requirements—energy efficiency

Minimum required luminous efficacy of an LED lamp

(1) The luminous efficacy (η_{lamp}) of an LED lamp must not be less than the minimum required luminous efficacy ($\eta_{\text{lamp.min}}$), measured in lm/W.

(2) For the purposes of subsection (1), for a lamp requiring reference control settings, ***luminous efficacy*** of an LED lamp is the luminous efficacy tested in the reference control settings (in accordance with section 24) and is calculated using the useful luminous flux (Φ_{use}) and the on-mode power (P_{on}), as follows:

$$\eta_{\text{lamp}} = \frac{\Phi_{\text{use}}}{P_{\text{on}}}$$

(3) For the purposes of subsection (1), the ***minimum required luminous efficacy*** is a function of the useful luminous flux (Φ_{use}) (in lm) and the colour rendering index (CRI), as follows:

$$\eta_{\text{lamp.min}} = \left(\frac{F \times \eta}{C \times R}\right) \times \left[1 - \frac{(L \times F \times \eta)}{(L \times F \times \eta) + \Phi_{\text{use}}}\right]$$

where:

η, the threshold luminous efficacy, is 120 lm/W.

L, the end loss factor, is 2.0 W for a CLL and 1.5 W otherwise.

C, the correction factor, is defined in subsection (4).

F, the luminous efficacy factor, is:

(a) for non-directional LED lamps (NDLL) using total flux—1.00; and

(b) for directional LED lamps (DLL):

(i) using flux in a cone with an angle of 90° or 120°—0.85; or

(ii) using measurement of forward-facing lumens (corresponding to a cone with an angle of 180°)—as follows:

Beam angle (BA)	F value
0 < BA < 90	0.95
90 ≤ BA < 120	1.00

R, the CRI factor, is (CRI+80)/160 for CRI ≥ 70, with both R and CRI rounded to two decimal places.

(4) For the purposes of subsection (3), the correction factor for an LED lamp is:

(a) for an LED lamp other than a directional LED lamp (DLL)—the sum of the following values set out in the table:

(i) the basic C value for the relevant type of lamp;

(ii) each applicable additional C value; and

(b) for a directional LED lamp (DLL)—the sum of the following values set out in the table:

(i) the basic C value for the relevant type of lamp;

(ii) each applicable additional C value, other than the value in item 7 of the table.

Table: Correction factor C for an LED lamp

Item	Column 1 **LED lamp type**	Column 2 **Basic C value**
1	Non-directional (NDLL) not operating on mains (NMLL)	1.00
2	Non-directional (NDLL) operating on mains (MLL)	1.08
3	Directional (DLL) not operating on mains (NMLL)	1.15
4	Directional (DLL) operating on mains (ML)	1.23
	Special LED lamp features	**Additional C value**
5	Colour-tuneable LED lamp	+0.10
6	Directional (DLL) with anti-glare shield	+0.2
7	High-luminance LED lamps (HLLL)	+0.0058 x L_V - 0.0167 where L_V is the luminance of a High-luminance LED lamp

Maximum standby power and networked standby power

(5) The standby power (P_{sb}) of an LED lamp must not exceed 0.5 W.

(6) The networked standby power (P_{net}) of a connected LED lamp must not exceed 0.5 W.

(7) In determining the standby power and networked standby power of an LED lamp for the purposes of subsections (5) and (6), the allowable values for P_{sb} and P_{net} must not be added together.

Part 4—GEMS labelling requirements

14 Purpose of this Part

For the purposes of paragraph 24(1)(b) of the Act, this Part specifies GEMS labelling requirements in accordance with section 26 of the Act for the product classes covered by this instrument.

15 Information to be displayed on the LED lamp itself

(1) Subject to subsection (2), an LED lamp must have displayed in a legible font on its surface:
  (a) the rated value and physical unit of the useful luminous flux (lm) and correlated colour temperature (expressed in K) of the lamp; and
  (b) for a directional LED lamp—the rated beam angle (expressed in °).

(2) If there is insufficient room on the surface to include all of the values required without unduly obstructing the light emission:
  (a) if there is room for one value—the rated useful luminous flux must be displayed; and
  (b) if there is room for two values—the rated useful luminous flux and correlated colour temperature must be displayed.

16 Information to be visibly displayed on the packaging

Lamps to which this section applies

(1) This section applies to an LED lamp that is supplied or offered for supply in packaging containing information that will be visibly displayed at a point of sale prior to its purchase.

Labelling requirements

(2) The information set out in column 1 of the table in subsection (4):
  (a) must be clearly and prominently displayed on the packaging; and
  (b) must comply with any specific formatting or accuracy requirements set out in column 1 or 2 of the table; and
  (c) without limiting the form in which the information may be displayed—may be represented with assistance from graphs, drawings or symbols.

Note: Column 3 of the table sets out non-binding guidance notes about the information to be included.

(3) For an LED lamp that can be set to emit light with different characteristics, the requirements of an item in column 1 of the table in subsection (4) are satisfied in relation to values that vary with those characteristics if the packaging does one or both of the following:
  (a) specifies those values as obtained when the lamp is in the reference control settings;
  (b) sets out a range of values that can be obtained, provided that the values obtained when the lamp is in the reference control settings fall within that range.

(4) The following table has effect:

Table: Information to be visibly displayed on LED lamp packaging

Item	Column 1 Information required on packaging	Column 2 Accuracy of values displayed on packaging	Column 3 Guidance notes
1	The following: (a) the model identifier; and (b) the bar code number (if any).		The model identifier will be entered on the GEMS register. It is recommended that this information also be displayed on the lamp itself.
2	The rated useful luminous flux (Φ_{use}), displayed in a font no smaller than the display of the rated on-mode power (P_{on}).	The initial useful luminous flux of each individual LED lamp in a measured sample of 10 lamps must not vary from the displayed rated useful luminous flux by more than ±10%. However, the initial useful luminous flux of each lamp in the sample may be up to 20% more than the displayed rated useful luminous flux if the displayed rated value is one of the following: (a) 100 lm; (b) 150 lm; (c) 250 lm; (d) 350 lm; (e) 500 lm; (f) 650 lm; (g) 800 lm; (h) 1000 lm; (i) 1250 lm; (j) 1500 lm; (k) 2000 lm; (l) 2500 lm; (m) 3000 lm; (n) 3500 lm. The average useful luminous flux of the LED lamps in a measured sample of 10 lamps must not be less than 92.5% of the displayed rated useful luminous flux.	The luminous flux marking may also specify if it refers to the flux: (a) in a sphere (360°), Φ_{360}; or (b) in a forward-facing lumens (180°), Φ_{180}; or (c) in a wide cone (120°), Φ_{120}; or (d) in a narrow cone (90°), Φ_{90}.
3	If non-directional incandescent or halogen lamp equivalence is claimed—the rated incandescent or halogen power equivalence.	The initial luminous flux of each individual non-directional LED lamp in a measured sample of 10 lamps must not be less than the minimum luminous flux listed for the claimed power of the	

Table: Information to be visibly displayed on LED lamp packaging			
Item	**Column 1** **Information required on packaging**	**Column 2** **Accuracy of values displayed on packaging**	**Column 3** **Guidance notes**
		equivalent non-directional incandescent or halogen lamp, as set out in Schedule 2. Note: Claiming equivalence of directional LED lamps to incandescent or halogen directional lamps is without conditions under this instrument.	
4	The rated luminous efficacy, expressed in lumens per watt.	The average luminous efficacy of the LED lamps in the measured sample must not be less than 95% of the displayed rated efficacy.	
5	Either: (a) the rated correlated colour temperature, rounded to the nearest 100 K; or (b) the range of rated correlated colour temperatures that can be set (expressed in K).	The average correlated colour temperature of the LED lamps in a measured sample of 10 lamps must not vary by more than 10% from the displayed rated correlated colour temperature.	
6	For a directional LED lamp: (a) the rated beam angle in degrees; or (b) the range of rated beam angles that can be set.	The tested value of the beam angle must be within ± 25% of the displayed rated beam angle.	
7	Cap type.		The cap will be one of the types mentioned in subsection 10(5) or (6).
8	The rated $L_{70}B_{50}$ lifetime, expressed in hours.	The displayed rated value must not be more than the value declared in the application to register the relevant model of lamp under the Act.	
9	The rated on-mode power (P_{on}) expressed in watts to the first decimal place.	The initial power consumed by each individual LED lamp in a measured sample of 10 lamps must not exceed the displayed rated on-mode power by more than 10%. The average of initial power consumed by the LED lamps in the measured sample must not exceed the displayed rated	

Table: Information to be visibly displayed on LED lamp packaging

Item	Column 1 Information required on packaging	Column 2 Accuracy of values displayed on packaging	Column 3 Guidance notes
		on-mode power by more than 7.5%.	
10	Unless the value is zero—the rated standby power (P_{sb}), expressed in watts and rounded to the second decimal place.	The average standby power (P_{sb}) of the LED lamps in a measured sample of 10 lamps must not exceed the displayed rated standby power (P_{sb}) by more than 0.10W.	
11	Unless the value is zero—the rated networked standby power (P_{net}) for a CLL, expressed in watts and rounded to the second decimal place.	The average networked standby power (P_{net}) of the LED lamps in a measured sample of 10 lamps must not exceed the displayed rated standby power (P_{net}) by more than 0.10W.	
12	Either: (a) the rated general colour rendering index, Ra, rounded to the nearest integer; or (b) the range of rated CRI-values that can be set.	The tested CRI value of each individual LED lamp in a measured sample of 10 lamps must be no less than the displayed rated CRI value minus 2.0.	
13	If the CRI is ≥ 70 and < 80, and meets the requirements of item 1 in the table of section 19, a clear indication that the LED lamp is intended for use in outdoor applications or industrial applications.		
14	Where the LED lamp cannot be dimmed, or can be dimmed only with specific dimmers or specific wired or wireless dimming methods: (a) a warning to that effect; and (b) where the LED lamp can only be dimmed with specific dimmers or dimming methods—details of where a list of compatible dimmers or dimming methods can be found.		For paragraph (b)—this may include reference to technical documentation included with the package, an internet address, a QR code, or other available technical documentation.

Note: The accuracy values in column 2 of the table are applicable only for the purposes of determining compliance with the requirements of this section. They are not relevant to determining compliance with the requirements of other aspects of this determination (e.g. the GEMS level requirements specified in Part 3 for the purposes of paragraph 24(1)(a) of the Act).

17 Impact of replacement determination

A GEMS labelling requirement of this instrument (the ***revoked requirement***) is taken to be complied with if:

(a) this instrument is revoked in accordance with paragraph 35(1)(a) of the Act; and

(b) another GEMS determination (the ***replacement determination***) is made in accordance with paragraph 35(1)(b) of the Act; and

(c) a transitional GEMS labelling requirement (the ***replacement requirement***) of the replacement determination provides that, if the replacement requirement is complied with, the revoked requirement is taken to be complied with; and

(d) the replacement requirement is complied with.

Part 5—Other requirements

18 Purpose of this Part

For the purposes of subsection 24(2) of the Act, this Part specifies other requirements in accordance with section 27 of the Act for product classes covered by this instrument.

19 Other requirements—performance requirements

For the purposes of paragraph 27(1)(b) of the Act, the performance requirements for an LED lamp in a product class covered by this instrument are as follows:

Table: Performance requirements for LED lamps

Item	Column 1 Attribute	Column 2 Performance requirements
1	Colour rendering	The general colour rendering index must be Ra ≥ 70 for lamps that have the following features: (a) cap types E40 or E27; (b) initial luminous flux > 2,000 lumens; (c) the capacity to operate on control gear designed for high intensity discharge lamps. Otherwise, the general colour rendering index must be Ra ≥ 80.
2	Displacement factor (DF, cos φ_1) at power input P_{on} for MLL	The following: (a) no limit at $P_{on} \leq 5$ W; (b) DF ≥ 0.5 at 5 W < $P_{on} \leq 10$ W; (c) DF ≥ 0.7 at 10 W < $P_{on} \leq 25$ W; (d) DF ≥ 0.9 at 25 W < P_{on}.
3	Lumen maintenance factor	The lumen maintenance factor (X_{LMF}) after endurance testing in accordance with AS/NZS 5341 must be at least $X_{LMF,MIN}$, calculated as follows: $X_{LMF,MIN} = 100 \times e^{\frac{(3000 \times \ln(0.7))}{L_{70}}}$ where L_{70} is the rated $L_{70}B_{50}$ lifetime (in hours). If the calculated value for $X_{LMF,MIN}$ exceeds 96.0 %, the $X_{LMF,MIN}$ value of 96.0 % must be used.
4	Survival factor	Following endurance testing in accordance with clause 6.2 of AS/NZS 5341, at least 9 LED lamps out of a test sample of 10 must remain operational by way of emitting light.
5	Colour consistency	Variation of chromaticity coordinates must fall within a six-step MacAdam ellipse, or six-step u′v′ circle centred on the coordinates rated as the centre.

20 Other requirements—impact on human health

(1) For the purposes of paragraph 27(1)(c) of the Act, the health requirements for an LED lamp in a product class covered by this instrument are as follows:

Table: Health requirements for LED lamps		
Item	**Column 1** **Attribute**	**Column 2** **Health requirements**
1	Flicker	P_{st}^{LM} must be ≤ 1.0 at full-load.
2	Stroboscopic effect for MLL	The SVM must be ≤ 0.9 at full-load. However, there is no SVM requirement for lamps with all of the following features: (a) cap types E40 or E27; (b) initial luminous flux > 2,000 lumens; (c) the capacity to operate on control gear designed for high intensity discharge lamps.
3	UV and Blue Light hazard	For LED lamps of ≤ 50V a.c. r.m.s. or ≤ 120 V ripple-free d.c.: (a) the UV hazard must be RG0; and (b) the Blue Light hazard must be either RG0 or RG1 unlimited.

Related testing requirements

(2) For the purposes of paragraph 27(1)(e) of the Act, where an LED lamp is tested to determine whether it complies with the requirements of subsection (1), the testing must be carried out in accordance with AS/NZS 5341, subject to the qualifications in subsections (3) to (5).

(3) Compliance with subsection (1) may be demonstrated using the results of testing either the LED lamp or an LED module contained in the lamp.

(4) A UV hazard test is not required if the LED lamp does not contain an LED chip with a peak wavelength emission of less than 400 nm.

(5) Blue Light hazard testing is not required if:

(a) the blue light hazard weighted radiance, $L_{B,}$ is < 10,000 $W.m^{-2}.sr^{-1}$ (as defined in clause 4.3.3 of AS/NZS 62471); or

(b) the maximum luminance of the visible light-emitting surface of the LED lamp does not exceed the limit specified in the following table:

Table: maximum luminance limits	
Maximum CCT (K)	**Maximum Luminance ($Mcd.m^{-2}$)**
CCT ≤ 2,350	40.0
2,350 < CCT ≤ 2,850	18.5
2,850 < CCT ≤ 3,250	14.5
3,250 < CCT ≤ 3,750	11.0
3,750 < CCT ≤ 4,500	8.5
4,500 < CCT ≤ 5,750	6.6
5,750 < CCT ≤ 8,000	5.0

Note: This is Table C.1 of IEC TR 62778.

(6) For the purposes of assessing the criteria mentioned in paragraph (5)(b), the manufacturer's rated CCT and rated luminance may be used as a basis for this assessment.

Part 6—Testing requirements

21 Purpose of this Part

This Part sets out testing requirements for the purposes of paragraphs 25(b), 26(1)(c) and 27(1)(e) of the Act.

22 Testing requirements—general

If a product is tested to determine whether it complies with the requirements of this instrument, the testing must be done in accordance with:

(a) AS/NZS 5341; or

(b) in the case of AS/NZS 5341 providing that testing can be carried out in accordance with an alternative standard as an acceptable equivalent test method—that alternative standard; or

(c) a standard that, in respect of the matter to be tested, imposes substantially identical testing requirements to AS/NZS 5341.

23 Use of reference control settings

For LED lamps where reference control settings are required, the lamp must be tested under reference control setting conditions.

24 Testing in reference control settings

(1) Subject to subsection (2), if an LED lamp is tested in its reference control settings to determine whether it complies with the requirements of this instrument, that testing must be conducted:

(a) if it is possible to switch off or disconnect the lighting control parts or non-lighting parts of the lamp—with those parts switched off or disconnected; or

(b) otherwise—with the parts mentioned in paragraph (a) operated at minimal power.

Note: A number of requirements for products in this instrument relate to values of characteristics of those products measured in the reference control settings.

(2) Subsection (1) does not apply if the lamp is not able to obtain full-load conditions with the parts mentioned in that subsection switched off, disconnected or operated at minimal power (as relevant).

25 Circumvention of testing

(1) Circumvention devices must not be used in connection with any tests conducted for the purposes of demonstrating compliance with this instrument.

(2) In this section:

circumvention device means any control, control device, software, component or part that alters the operating characteristics of a product during any test procedure, resulting in measurements that are unrepresentative of the true characteristics that the product may exhibit during normal use under comparable conditions.

Note: Generally, circumvention devices save energy during an energy test, but not during normal use.

26 Lamp ageing and lamp operating orientation

The lamp ageing and lamp operating orientation requirements for conducting testing in accordance with section 22 on LED lamps in product classes covered by this instrument are as follows:

Table: Requirements for lamp test conditions

Item	Column 1 Lamp test conditions	Column 2 AS/NZS 5341 default conditions	Column 3 Guidance notes
1	Lamp ageing	0 hours	The AS/NZS 5341 default requirements apply unless the technical documentation provided at product registration advises otherwise. Note: AS/NZS 5341 allows ageing up to 1,000 hours.
2	Lamp operating orientation	Single-capped lamp: Vertical base up orientation Double-capped lamp: Major lamp axis in horizontal orientation	The AS/NZS 5341 default requirements apply unless the technical documentation provided at product registration advises otherwise.

Schedule 1—Products not covered by this instrument

Note: See section 11.

1 Aeronautical lamps

Aircraft lights

(1) This instrument does not cover LED lamps that:
  (a) are designed to operate on an aircraft; and
  (b) satisfy the requirements of:
    (i) the airworthiness standards in subregulations 23.001(1), 25.001(1), 27.001(1) and 29.001(1) of the Civil Aviation Safety Regulations; or
    (ii) section 3, Chapter 7 (Lighting Systems) of the Defence Aviation Safety Design Requirements Manual.

Note 1: The provisions of the Civil Aviation Safety Regulations mentioned in subparagraph (b)(i) refer to the European Aviation Safety Agency certification specifications and US Federal Aviation Administration airworthiness standards for aircraft.

Note 2: The GEMS Regulator may request evidence that such lamps comply with the approval requirements mentioned in paragraph (b) (among other things).

Aeronautical ground lights

(2) This instrument does not cover LED lamps that:
  (a) are designed as aeronautical ground lights (within the meaning of Part 139 (Aerodromes) Manual of Standards); and
  (b) meet the requirements that apply to such lights under either or both of the following:
    (i) Part 139 (Aerodromes) Manual of Standards;
    (ii) Defence Aviation Safety Authority Regulation (DASR) 139 – Aerodromes.

Note: The GEMS Regulator may request evidence that aeronautical ground lights comply with the requirements specified in paragraph (b) (among other things).

2 Other exclusions

(1) This instrument does not cover the following:
  (a) LED lamps with:
    (i) specific effective ultraviolet power > 2mW/klm; or
    (ii) peak radiation between 180 and 280 nm;
  (b) LED lamps for which the radiation power emitted within the range of 400 to 480 nm is 40% or more of the total radiation power emitted within the range of 250 to 800 nm;
  (c) LED lamps:
    (i) that have a photosynthetic photon efficacy of > 2.5 μmol/J; or
    (ii) for which the radiation power emitted within the range of 700 to 800 nm is 25% or more of the total radiation power emitted within the range of 250 to 800 nm;
  (d) LED lamps with a fixed beam angle of less than 10°;
  (e) colour-tuneable LED lamps, other than LED lamps that contain phosphor materials for light conversion, that:
    (i) can be set to at least the colours listed in the table in subclause (2); and

(ii) have, for each of those colours, measured at the dominant wavelength, the minimum excitation purity set out in that table.

Example 1: For paragraph (a)—some LED lamps designed for use in applications requiring high UV-content.

Example 2: For paragraph (b)—some LED lamps designed for coral zooxanthellae symbioses.

Example 3: For paragraph (c)—some LED lamps designed for use in horticulture.

Example 4: For paragraph (d)—some LED lamps designed for spot-lighting applications requiring a very narrow light-beam.

(2) The following table has effect:

Table: Colour-tuneable LED lamps

Colour	Dominant wavelength	Minimum excitation purity
Blue	440 nm – 490 nm	90%
Green	520 nm – 570 nm	65%
Red	610 nm – 670 nm	95%

Schedule 2—Incandescent or halogen lamp equivalence claims

1 Incandescent or halogen lamp equivalence claims—non-directional LED lamps

(1) For the purposes of item 3, column 2 of the table in subsection 16(4), the minimum luminous flux for the claimed power of an equivalent incandescent or halogen lamp is:

(a) if the claimed equivalent lamp power is equal to a value set out in column 1 (for an incandescent lamp) or column 2 (for a halogen lamp) for an item of the table in subclause (2)—the value set out in column 3 for that item; or

(b) if the claimed equivalent lamp power is between two values set out in column 1 (for an incandescent lamp) or column 2 (for a halogen lamp) for 2 successive items—calculated by linear interpolation of the values in column 3 for those 2 items (rounded to the nearest 1 W).

Example: A person claims an equivalent halogen lamp power of 47 W for a halogen lamp. This falls between the values in column 2 for items 4 and 5 of the table in subclause (2). The LED lamp minimum luminous flux for the purposes of item 3, column 2 of the table in subsection 16(4) is 900 lm, calculated by interpolating the values listed in column 3 for items 4 and 5 of the table.

(2) The following table has effect:

Table: Incandescent and halogen lamp equivalence claims

Item	Column 1 Claimed equivalent incandescent lamp power (W)	Column 2 Claimed equivalent halogen lamp power (W)	Column 3 LED lamp minimum luminous flux (lm)
1	15	11	135
2	25	18	245
3	40	28	470
4	60	42	800
5	75	52	1,000
6	100	70	1,500
7	150	105	2,450
8	200	140	3,450