



IALDANZ

Lighting industry Guide

National Construction Code 2019 (Energy efficiency rules)

Tips to make the most of the new rules

December 2019

Introduction

Implementing imaginative, resourceful and welcoming lighting installations may become more of a challenge for designers and installers under the revised energy efficiency provisions (i.e. Part J6) of Volume One of the National Construction Code (NCC) 2019. However, there are a number of aspects of the new Code that can be utilised to enable higher levels of lighting power to be applied in order to achieve the outcomes expected in quality architectural schemes.

Good lighting schemes require lighting designers to be innovative in order to meet the functional, operational, health and aesthetic demands of contemporary architecture. Satisfying these complex challenges is increasingly difficult as the power density stipulations become more constrictive. Skilled lighting designers apply a diverse range of techniques to make environments more effective, more visually appealing and better fit for purpose than rudimentary lighting methods. Applications such as wall-washing, up-lighting, integrated light sources, contrast and glare control are part and parcel of the lighting designer's expertise. But these valuable techniques typically use more energy than delivering direct light on a horizontal plane by basic downlighting.

The following tips are highlighted to make the most of the NCC 2019 allowances.

Compliance paths

Two conformance paths are available to comply with the requirements of the NCC. One is *deemed-to-satisfy* (by calculation, which practitioners will be very familiar with). The other is the *performance solution* path.

Performance solutions

While *deemed-to-satisfy* is a formulaic compliance as simply stated, a *performance solution* for lighting may utilise various strategies to achieve compliance. For example, a designer may be able to demonstrate that a particular building management system can achieve overall lower energy usage compared with the *deemed-to-satisfy* provisions even though the watts per square metre used by lighting may be more than the *deemed-to-satisfy* provisions.

Alternatively, trading increased energy savings in other building service areas (i.e. through the installation of a more efficient HVAC system) would allow for more energy to be utilised for lighting.

From a practical perspective, it would be easiest to undertake a *performance solution* if the complete building design is being handled by the one design company. Otherwise, unless a deal is agreed between the building owner and all building services designers early in the project, a *performance solution* may be difficult to negotiate and achieve.

Performance solutions will require consultation with the building certifier at the start of the project to agree the process and identify the evidentiary documentation in advance. It should be noted that *performance solutions* may require documentation that shows compliance in a less conventional way.

While *performance solutions* are commonly used in other technical service areas, they are not typical for lighting design and so are likely to require additional input, coordination and consulting skills. Lighting designers will need to demonstrate that the *performance solution* provides benefits without compromising the intent of efficient use of power in the building.

Deemed-to-satisfy compliance (Section J6 requirements and allowances)

General application of NCC Part J6

The energy efficiency rules of NCC J6 allow a baseline lighting power allowance for various space types. Additional allowances can be included for:

- Room Aspect Ratio (a function of the physical shape of the room);
- Two different control device allowances can apply to each space (e.g. motion detection, dimming, daylight sensing and dynamic lighting control);
- Lighting colour and quality (i.e. two different lighting quality allowances can be applied. E.g. colour temperature and colour rendering index).

Therefore, a maximum of five additional adjustment factors can be applied to increase the baseline power allowance for a particular space.

Application date

It is likely that most designs will be completed under the *deemed-to-satisfy* provisions of NCC 2019. In this case it is important to remember that Part J of NCC 2019 will only be mandatory to apply after 1 May 2020. Up until that date, either Part J6 of NCC 2016 or Part J6 of NCC 2019 can be used. This delayed implementation will allow for designers to become familiar with the new provisions and the new lighting calculator.

Lighting Calculator

The Australian Building Codes Board has launched a beta version of their *Lighting Calculator* to enable designers to check and prove compliance against the provisions of NCC 2019. The calculator can be downloaded at <https://www.abcb.gov.au/Resources/Tools-Calculators/lighting-calculator-ncc-2019-volume-one>

Under the *deemed-to-satisfy* path lighting designers will be able to demonstrate to building certifiers that a design is compliant using output from the calculator.

Importantly, the lighting power allowed to be used in each space type (including additional allowances for room aspect ratio, controls, lighting colour and quality) is aggregated to determine a total lighting allowance for the entire project. To determine compliance, the installed lighting power consumption must be equal to or less than the total lighting power allowance.

Designers should note that any lighting power allowance not utilised in one space is able to be utilised in another space.

To maximise the lighting power allowed to be used in a building it is important to include all additional allowances for all separate spaces.

Track lighting change

The previous edition of the National Construction Code (i.e. NCC 2016) imposed onerous requirements on track lighting. This proved to be a disincentive to including track lighting in designs, even though track systems are a practical way to light areas that change over time.

The NCC 2019 provisions treat the lighting installed on track systems like any other lighting. That is, the lighting load installed on track systems when the installation is certified is the lighting that is assessed. This is a reasonable and practical approach.

Key exemptions in NCC 2019

NCC 2019 Section J6.2 (c) includes the following exemptions¹ (i.e. the lighting from these areas is not included in installed lighting power):

- Emergency lighting;
- Signage, display lighting within cabinets and display cases that are fixed in place;
- Light heaters (i.e. such as those used in bathrooms)
- Lighting of a specialist process such as in a surgical operating theatre, fume cupboard or clean workstation;
- Lighting of performances such as theatrical or sporting;
- Lighting of art or objects in a museum or art gallery other than for retail sale.
- Lighting to provide indoor plant growth on *Green Walls* and the like.

Based on the above, lighting provided for art (that is not for sale) is exempt as long as the wall or space where the art is displayed is classified as a gallery. Likewise, lighting within all fixed display cases and cabinets is exempt. Also, the lighting provided for green walls, plant growth and specialist processes is exempt.

Baseline illumination power density

Table J6.2a should be titled 'Baseline illumination power density' instead of 'Maximum illumination power density' as additional allowances are able to increase the figures obtained from this table.

The NCC 2019 has reduced the amount of power able to be used by different spaces within commercial buildings by between 20% and 88%. Some space types such as auditoria, retail, cafés/restaurants/bars/hotels, lobby areas, corridors and areas where food and drinks are served (e.g. event or multi-function spaces) have higher lighting power allowances to enable designers to implement indirect or architectural lighting designs in those spaces. So, the classification of a particular space is important and those classified as above would attract higher power allowances than typical.

Some spaces are multi-function and could be classified in a number of different ways. For example, if food or drink will be served in a space then that space is eligible to use 14W/m² as a baseline allowance. Also, open plan areas may contain a number of different classifications depending on how each part of the floor plan will be utilised.

¹ See National Construction Code 2019 J6.2(c) for the complete list of exemptions.

The following space types and their baseline illumination power densities are worth noting:

- Restaurants, cafes, bars, hotel lounges and any space for the serving of food or drinks is allowed 14W/m². Many multi-function spaces in commercial buildings are used for various purposes including events or functions where food and drinks will be consumed.
- Retail spaces are allowed 14W/m².
- Carpark entry zones (first 15m of travel) are allowed 11.5W/m².
- An entry lobby from outside the building is allowed 9W/m².
- Corridors are allowed 5W/m² (compared with office areas that are allowed 4.5W/m²).

Where a space type is not defined in Table J6.2a, use the notes to table 6.2a and determine the illuminance based on the task and illuminance recommendations in AS/NZS 1680.

Room Aspect Ratio additional allowance

The room aspect ratio (RAR) allows additional lighting power based on the physical parameters of the room (e.g. area, height, perimeter). Many common shaped rooms and spaces obtain a significant additional lighting allowance due to the room aspect ratio allowance.

For example, a square shaped room with side wall lengths less than six times the height of the room will be able to claim higher lighting power allowance under the RAR allowance.

A rectangular room (e.g. with one side half the length of the other) with side wall lengths less than 4.5 and 9 times the height of the room will qualify for a RAR allowance.

Large open area spaces with relatively low ceilings are unlikely to qualify for a RAR allowance. However, it has been demonstrated that large warehouses with their higher ceiling heights can easily qualify for an RAR allowance.

It is recommended each room is checked using the RAR formula in note 2 of table J6.2a or the *lighting calculator* will automatically calculate.

Lighting controls allowances

Control devices such as motion detectors, dimming devices and systems, and daylight sensing/dynamic lighting control devices that comply with *Specification J6* can be used to gain an additional lighting allowance.

Up to two control devices can be utilised. Where two control devices are utilised, the formula in Note 1 of Table J6.2b or the *lighting calculator* can be used to determine the total additional control device allowance.

Lighting quality (colour temperature and colour rendering index allowances)

Referring to table J6.2c of NCC 2019, up to two additional allowances for lighting quality can be utilised in each space. For example, lower colour temperature lighting (i.e. equal to or less than 3500K) would attract an additional 25% lighting power allowance. This reflects the

slightly lower efficacy of such light sources due to the use of greater amounts of phosphors used in their manufacture.

Also, high colour rendering index (CRI) lighting (i.e. equal to or greater than CRI 90) would allow an additional 11% lighting power allowance.

The colour rendering index of a light source quantifies its ability to reveal the colours of an object faithfully in comparison with natural light or an incandescent light source. LED light sources for indoor applications now typically have a CRI value of 80 or greater. LED light sources with CRI of 90 and greater are also available.

Additional requirements

NCC 2019 also includes a number of additional requirements for switching and fire stairs. Some examples are:

- All artificial lighting must be operated by a switch, control device or both.
- Lighting in fire stairs/ passageways/ramps must be controlled by a motion detector.
- In foyers, corridors and circulation spaces lighting of more than 250W that is adjacent to windows must be controlled by a daylight sensor / dynamic lighting control device.
- Lighting in the first 19m of a carpark must be controlled by a daylight sensor (800 lx in daytime and 160 lx at night time).

Section J6.3 contains the complete detail.

Exterior lighting compliance

Lighting attached to or directed at the façade of a building must satisfy NCC 2019 requirements.

Simply installing LED lighting for 90% or more of the exterior lighting load will satisfy the exterior lighting requirements.

Task lighting is exempt

Lighting that is plugged in to a general-purpose socket outlet is not included in the installed lighting power.

Designers should note that sophisticated stand-alone task lighting luminaires are becoming available. Such luminaires can include built-in motion sensors to switch luminaires off when desks are not occupied, dimming to control illuminance levels and split up/down lighting to reduce glare.

Lighting Council Australia

Lighting Council Australia is the peak body for Australia's lighting industry. Its members include manufacturers and suppliers of luminaires, lighting control devices, lamps, solid state lighting and associated technologies. Lighting Council's goal is to encourage the use of environmentally appropriate, energy efficient, quality lighting systems.

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International Association of Lighting Designers (IALD)

Founded in 1969 and based in Chicago, IL, USA, the International Association of Lighting Designers (IALD) is an internationally recognized organization dedicated solely to the concerns of independent, professional lighting designers. The IALD strives to set the global standard for lighting design excellence by promoting the advancement and recognition of professional lighting designers.

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