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NZS 4243.2:2007
ENERGY EFFICIENCY – LARGE BUILDINGS – PART 2: LIGHTING
AMENDMENT NO. 1

13 April 2018

REVISED TEXT

EXPLANATORY NOTE

The purpose of this amendment to NZS 4243.2 is to update the lighting power density limits (LPDLs) of the standard, and other subsequent areas of the standard that relate to the updated LPDLs, update the terminology and definitions to align with current accepted practices, and remove all references to the calculation method within the standard. The calculation method determined a limit to the power of the fixed lighting for a whole building on the maintained illuminance recommended for the purposes of each area within the building; this method is no longer used in current practice.

APPROVAL

Amendment No. 1 was prepared by the P4243 Committee. The membership of the committee was approved by the New Zealand Standards Approval Board and appointed by the New Zealand Standards Executive under the Standards and Accreditation Act 2015.

The committee consisted of representatives of the following nominating organisations:

BRANZ Ltd
Building System Performance, Ministry of Business, Innovation and Employment
CoreNet Global New Zealand
Energy Efficiency and Conservation Authority
Energy Management Association of New Zealand
Illuminating Engineering Society of Australia and New Zealand
Lighting Council New Zealand
Massey University
Property Council New Zealand
Universities New Zealand

Amendment No. 1 was approved on 3 April 2018 by the Standards Approval Board to be an amendment to NZS 4243.2:2007.

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CONTENTS (page 3)

Delete 3.3 and 3.4 and **substitute:**

3.3 Power density limits method 10

Delete from Table:

1 Building purpose lighting power density limits 11
2 Control factors 12
3 Minimum circuit efficacies 12
4 Minimum utilisation factors 13
5 Lamp lumen maintenance factors 13
6 Luminaire maintenance factors 14
7 Minimum room surface maintenance factors 14
8 Modifier for illuminance requirements 15
A1 Example of schedule method 16
A2 Example of calculation method – Factors to be applied 17
A3 Example of calculation method – Application of equation 3 18
A4 Example of calculation method – Applied to a floor without lighting controls 18

Add to Table:

1 General spatial functions lighting power density limits 10
2 Building type lighting power density limits 11
A1 Example A 13
A2 Example B 14

(Amendment No. 1, April 2018)

REFERENCED DOCUMENTS (page 4)

Under NEW ZEALAND STANDARDS

Delete:

NZS 6703:1984 Code of practice for interior lighting design

Under JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

Delete the AS/NZS 1680 references and **substitute:**

AS/NZS 1680:---- Interior and workplace lighting
Part 1:2006 General principles and recommendations
Part 2.1:2008 Specific applications – Circulation spaces and other general areas
Part 2.2:2008 Specific applications – Office and screen-based tasks
Part 2.3:2008 Specific applications – Educational and training facilities
Part 2.4:2017 Industrial tasks and processes
AS/NZS 1680:---- Interior lighting
Part 2.5:1997 Hospital and medical tasks

Under AUSTRALIAN STANDARDS

Delete the AS/NZS 1680 references.

(Amendment No. 1, April 2018)

FOREWORD (page 5)

Delete Foreword and **substitute:**

This lighting Standard is a companion to NZS 4243.1:2007 *Energy efficiency – Large buildings: Part 1 – Building thermal envelope*.

Over the last decade there have been major changes in lighting equipment, with the emergence of solid state lighting (SSL) LED light sources and luminaires as the predominant technology.

The scope of this amendment includes changes and improvements to:

(a) Accommodate SSL LED technology;
(b) Revise and tighten lighting power density limits;
(c) Provide a more detailed range of spatial functions;
(d) Remove the redundant calculation method;
(e) Update terms and definitions;
(f) Simplify application.

As a result of technological advancements the power requirements of lighting schemes have significantly reduced in recent times and thus the limits in this Standard are lower, resulting in lighting schemes, and buildings, with significantly improved energy efficiency. Lighting design is covered by the AS/NZS 1680 series. This recommends a maintained illuminance value for each type of installation, being the minimum average illuminance that can be tolerated. Using maintained illuminance levels ensures adequate illuminance even at the end of the effective life of the light source. NZS 4243.2 addresses requirements for the efficiency of artificial lighting that is used when daylight is not available or is insufficient. While the use of daylight is recognised as being the most efficient form of lighting, and is strongly encouraged, its provision is not covered by this part Standard. Guidance on the use of daylight is included in AS/NZS 1680.1, while reference should be made to building regulations for any statutory requirements for daylight within buildings.

It should be noted that this Standard provides guidance on lighting power density limits (LPDL) (W/m^2). This is not the same as energy use. Energy use (Wh or kWh) is determined when the lighting power load of a space is multiplied by the time span of operation (h).

The use of lighting control systems is an effective way of adjusting both lighting power load and time span of operation to reduce overlighting and consequently to reduce energy use. The application of modern control systems is beyond the scope of this Standard, but the effective use of control systems is encouraged.

(Amendment No. 1, April 2018)

1.1.2 (page 7)

Delete clause and **substitute:**

This Standard provides a method of demonstrating compliance. This power density limits method applies a limit to the power density of the fixed lighting for each area of a building depending on the spatial function of that area.

(Amendment No. 1, April 2018)

1.2 Definitions (page 7)

Delete the following terms and their definitions:

CIRCUIT EFFICACY

COLOUR RENDERING

ILLUMINANCE, INITIAL

MAINTENANCE FACTOR

ROOM INDEX

UTILISATION FACTOR

(Amendment No. 1, April 2018)

1.2 Definitions (page 7)

Delete the following definitions and **substitute:**

FLOOR AREA. The area of floor within the spatial function.

ILLUMINANCE, MAINTAINED. The defined level below which the average illuminance of a specified surface shall not fall. It is the minimum illuminance at which maintenance operations, such as replacing light sources and cleaning the luminaires, windows, roof lights and room surfaces, are to be carried out.

LIGHTING POWER DENSITY LIMIT (LPDL). The limit that the lighting circuit load shall not exceed. It is set in terms of watts per square metre of lit area and based on recommended maintained illuminances and other factors.

LIT AREA. The floor area of a building within the spatial function, including partitions but excluding lift wells and service shafts.

(Amendment No. 1, April 2018)

1.2 Definitions (page 7)

Add the following definitions:

ANCILLARY GEAR. Technology used to control lighting electrical loads over and above lighting switches, such as daylight switches, movement detectors, control electronics for switching relays and any equipment associated with monitoring the status of the complete lighting system.

CIRCULATION AREA. The area for pedestrian circulation including corridors, stairs, lobbies and foyers.

MULTIPLE or ALTERNATIVE USES. A building space or area that can be used for more than one function or purpose.

NATURAL LIGHT AVAILABLE. An area where daylight is available from an outside window or roof light, or some other means.

PREDOMINANT USE. The primary activity that mainly occurs within the designated building floor area.

SPATIAL FUNCTION. The function or purpose of a building space or area.

(Amendment No. 1, April 2018)

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2 Compliance requirements (page 9)

Delete clause and **substitute:**

All large buildings shall meet the lighting requirements to comply with this Standard. The lighting power density shall be obtained by dividing the total electrical load by the lit area under consideration. To achieve an adequate level of energy efficiency, the lighting power density for each spatial function in a building shall not exceed the limit determined using the method in 3.3.

Compliance with this Standard is based on lighting design in accordance with the AS/NZS 1680 series. The lighting electrical load, for the purposes of this Standard, shall be the total power required to operate the lighting circuits, including light source wattage, control gear losses and losses from other ancillary gear. For areas or spaces that may have multiple or alternative uses the predominant use shall be selected for the spatial function.

(Amendment No. 1, April 2018)

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3 Compliance methods (page 9)

Delete clause 3.1.1, 3.1.2, and 3.1.3 and **substitute:**

3.1.1 Compliance shall be demonstrated by using the power density limits method. Appendix A provides examples of the determination of lighting power density limits.

3.1.2 The lighting power density limit requirements apply to general and area lighting. They do not apply to:

(a) Security lighting;
(b) Emergency lighting (unless it also forms part of the general lighting);
(c) Display lighting that is supplied from sub-circuits separate from those for other lighting and that is controlled separately from other lighting;
(d) Exterior lighting, except for porticos;
(e) Lighting for sports events or stage shows;
(f) Special purpose lighting requiring illuminance on the task of 500 lux or more;
(g) Lighting in lifts;
(h) Places of detention;
(i) Hospital clinical areas;
(j) Backlit surfaces or luminous surface areas designed to be decorative, lit features. However, backlit surfaces that contribute to the general lighting shall fall within specific spatial functions of LPDL.

(Amendment No. 1, April 2018)

3.1.4 (page 10)

Delete clause title and **substitute:**

3.1.3

(Amendment No. 1, April 2018)

3.2 Lighting controls (page 10)

Delete 3.2.2 and **substitute:**

3.2.2 Local manual switching (when required) should be located in the proximity of the controlled area. The area controlled by local manual switching shall be selected having regard to the spatial function of the area, its likely pattern of partial occupancy, and the type of luminaire/s.

(Amendment No. 1, April 2018)

3.3 Schedule method (page 10)

Delete title and **substitute:**

3.3 POWER DENSITY LIMITS METHOD

Delete 3.3.1 and 3.3.2 and **substitute:**

3.3.1 All spatial functions in the building shall be considered. Lighting power density limits for general spatial functions are provided in table 1. Table 2 describes the spatial functions found in various building types. Where the specific spatial function is not identified in table 1 or table 2, the unspecified spatial function limit shall be used.

3.3.2 Generally, circulation spaces may be included as part of the lit area of the main spatial function in their vicinity unless the designer has reason to consider them individually.

Delete 3.3.3.

Delete 3.3.4.

(Amendment No. 1, April 2018)

Table 1 – Building purpose lighting power density limits (page 11)

Delete Table 1 and **substitute:**

Table 1 – General spatial functions lighting power density limits

Category	General spatial function	LPDL (W/m^2)
1a	Commercial laundry	9
1b	Circulation area	7
1c	Data/IT server/security room	7
1d	Entrance/portico	13
1e	Goods loading bay	6
1f	Kitchen/kitchenette/common room	10
1g	Lounges/breakout room	11
1h	Main reception/lift lobby/concierge	10
1i	Plant room/boiler room	10
1j	Private car parking (indoor)	2
1k	Public car parking (indoor)	3
1l	Public rest room/staff toilet/shower facilities	7
1m	Storeroom	5

Under Table 1 **add** new table:

Table 2 – Building type lighting power density limits

Category	Building type	Spatial function	LPDL (W/m^2)
2	Café/restaurant/fast food outlet	Unspecified spatial function	9
2a		Commercial kitchen/food prep	10
2b		Self-serve food counter	9
2c		Seated/dining area	10
3	Assembly service	Unspecified spatial function	8
3a		Seated area – town hall/church/ events centre/whare rūnanga	10
3b		Ticketing hall	8
3c		Train concourse/platform	7
3d		Arrival/departure halls ≤ 5 m height	9
3e		Arrival/departure halls ≥ 5 m height	11
3f		Exhibition hall/gallery	8
3g		Museum	9
3h		Movie theatre	9
3i		Indoor swimming pool	9
4	Educational	Unspecified spatial function	9
4a		Classroom/science/technology	10
4b		Lecture theatre	11
4c		Gymnasium/fitness centre/auditorium	10
5	Emergency	Unspecified spatial function	9
5a		First response/emergency vehicle bay	9
6	General office	Unspecified spatial function	7
6a		Individual office[a]/meeting room (no natural light available)	9
6b		Individual office[a]/meeting room (natural light available)	7
6c		Open office (no natural light available)	9
6d		Open office (natural light available)	9
7	Healthcare	Unspecified spatial function	10
7a		Aged-care facility[b]	18
7b		Examination room	10
7c		Patient ward	5
7d		Ward lounge/whānau room	8
7e		Ward admin/office	10

Table 2 – Building type lighting power density limits (continued)

Category	Building type	Spatial function	LPDL (W/m^2)
8	Hotel/motel/hostel	Unspecified spatial function	10
8a		Bar/lounge/casino area	10
8b		Banquet room/conference room/ function room/ballroom	10
8c		Hotel rooms/suites	6
9	Judicial/correctional	Unspecified spatial function	9
9a		Courtroom	14
10	Laboratory	Unspecified spatial function	11
11	Library	Unspecified spatial function	12
12	Retail bank/post office	Unspecified spatial function	10
13	Retail shopping/mega centre	Unspecified spatial function	13
13a		Pharmacy/convenience/general store	14
13b		Food court	10
13c		Supermarket	13
13d		Mega/furniture store	14
13e		Hardware/DIY store	13
14	Warehousing	Unspecified spatial function	8
14a		General storage	8
14b		Logistics/sorting	8
14c		Cold storage	8
15	Workshop	Unspecified spatial function	10
15a		Rough task (such as heavy equipment)	6
15b		Medium task (such as bench tasks)	9
15c		Fine task (such as inspection tasks)	12

a Individual offices means an office of one-person occupancy.

b Aged-care facility refers to facilities whose primary function is senior long-term care, adult day care, senior support, or people with special visual needs (applies within the spatial function areas of these building types). For interior general spatial functions where the visually impaired circulate multiply the LPDL by a factor of 1.5.

(Amendment No. 1, April 2018)

3.4 Calculation method (page 11)

Delete clause, including Tables 2 to 8.

(Amendment No. 1, April 2018)

Appendix A **Worked examples – Lighting** (page 16)

Delete A2 and A3 and **substitute:**

A2 EXAMPLE A

Consider the floor of an office building that uses a combination of artificial and natural light. The floor area is 650 m^2 (not counting the lift well and service ducts), and contains individual offices and meeting rooms (150 m^2) and open-plan offices (380 m^2). Staff toilets (50 m^2) and circulation areas (70 m^2) make up the rest of the floor area. The circulation areas are adjacent to the open-plan offices.

From tables 1 and 2, the relevant lighting power density limits are shown in table A1.

Table A1 – Example A

Spatial function	**Area** (m^2)	**Category**	**LPDL** (W/m^2)
General office, individual office/ meeting room (natural light available)	150	6b	7
General office, open office (natural light available) (includes circulation area (see 3.3.2))	380 + 70 = 450	6d	9
Staff toilet	50	1l	7

A3 EXAMPLE B

A building has shops on the ground floor, two floors of public car parking, four floors of naturally lit open-plan office accommodation, and one floor of classrooms for a language school.

Each floor has an area of 600 m^2, excluding the lift well and service ducts but including staff toilets of 50 m^2 per floor.

From tables 1 and 2, the relevant lighting power density limits are shown in table A2.

Table A2 – Example B

Spatial function	**Area** (m^2)	**Category**	**LPDL** (W/m^2)
Retail shopping, unspecified spatial function	600 – 50 = 550	13	13
Public car parking (indoor)	2 × (600 – 50) = 1,100	1k	3
General office, open office (natural light available)	4 × (600 – 50) = 2,200	6d	9
Educational, classroom	600 – 50 = 550	4a	10
Staff toilet	8 × 50 = 400	1l	7

(Amendment No. 1, April 2018)