

# THORN

## Building Code of Australia

A Contractor's Guide





## Fast Facts

1. Building Code J6 has been part of State and Territory Building Law since November 2006 and will be in force till 2013.
2. Building's certificate of occupancy will not be issued until compliance has been approved by inspector.
3. Failure to comply with building code J6 may incur rectification costs. This may include the cost of replacement light fittings, cost of labour and any other costs incurred in rectifying non compliance.
4. 'Luminaire circuit watts hot' is not just lamp wattage and ballast losses separate; but combined and operating.
5. Building code J6 (Lighting) is only one BCA component affecting electrical contractors. Also refer to part J5 (Air conditioning) and part J7 (Hot water). Australian Standards AS1680 for interior lighting also applies.
6. Building Code J6 applies to all refurbishments and new works, excluding residential.
7. **LIKE DOES NOT MEAN SAME.** Similar products can greatly differ in their real performance and power consumption - compare manufacturer's details.
8. 'Green' products do not automatically ensure compliance - buyer beware!

## What is the building code?

The Building Code of Australia (BCA) is produced and maintained by the Australian Building Codes Board on behalf of the Australian, State and Territory Governments. The BCA is given legal effect by building regulatory legislation in each State and territory. The legislation consists of an Act of Parliament.

BCA is a uniform set of the technical provisions for the design and construction of buildings and other structures throughout Australia.

It is the first time that Part J6, which relates to Artificial Lighting and Power, has been included in the building code. The core aim of these provisions is to ensure that all new constructions and refurbishments meet a minimum efficiency level.

For more information contact the Australian Building Codes Board directly or visit [www.abcb.gov.au](http://www.abcb.gov.au).

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This handbook has been designed as a general guide only. It only includes extracts from the BCA (Part J6.2b). For detailed information on Part J6 of the BCA please contact the Australian Building Codes Board directly or visit [www.abcb.gov.au](http://www.abcb.gov.au). Note that other regulations may also apply. Examples used in this document show how to apply good lighting design principles. These design examples are indicative only and cannot replace a layout produced by a professional lighting designer.

## Introduction

Lighting is an essential part of the modern society, allowing us to turn night into day, which allows us to do more each day. Our patterns of work and leisure are made possible through our ability to control our environment and supply light on demand.

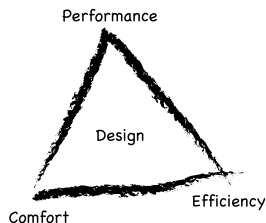
But the use of light is constantly challenging us. It is no longer enough to ensure good task visibility, or a comfortable environment. We need to achieve all of these, but also in a way that minimises harm to the environment.

Thorn is already doing its part by focusing on its PEC approach. PEC – Performance, Efficiency, Comfort – is the dynamic, results orientated programme that underpins Thorn's approach to lighting design and implementation. PEC reconciles the need for low direct and environmental costs with the need to deliver workplace and public lighting that promotes efficiency, safety, a healthy environment and productivity. With statutory and environmental pressures increasing, PEC offers Thorn customers the ability to provide optimum lighting solutions for people and places while conserving energy, cash and raw materials.

In Australia the Building Code of Australia (BCA) sets the technical provisions for the design and construction of buildings and other structures throughout Australia.

This booklet has been put together to help people in the lighting industry better understand the requirements outlined under part J6.2b of the BCA.

It is important to note that this booklet only covers part J6.2b of the BCA, which is only aimed at commercial, retail and industrial type buildings, ie. class 4, 5, 6, 7, 8, 9a and 9b. Furthermore, it is recommended that further information is obtained from the Australian Building Codes Board to ensure compliance with any requirements.



## When Does J6.2b Affect You?

### When a client contracts or tenders a building project under the design and construct method.

Electrical Contractors must ensure they do not exceed the maximum illuminated power densities as set out in Part J6 Table 6.2b of the Building Code of Australia.

OR

### When the electrical contractor substitutes a light fitting specified by an electrical engineer or architect.

#### Basic Watts per/m<sup>2</sup> Calculations

TOTAL WATTS OF ALL  
LIGHTING LUMINAIRES

÷

AREA (m<sup>2</sup>)

=

WATTS/m<sup>2</sup> X Adjustment factors\*

\* Adjustment factors are used to improve the Watts/m<sup>2</sup> output of an application. Refer to page 10 for further details on adjustment factors.

## Understanding Part J6.2b

The following table provides an index of the recommended lux level in different applications.

Building Space	Watts/m <sup>2</sup> Table J6.2b BCA 2008	Recommended Lux Level AS1680 Series
Auditorium, Church & Public Hall	10	240
Board Room	8	240
Carpark	6	40
Carpark - Entry Zone	25	800
Circulation Space and Corridors	8	40-80
Control Room - Switch Room	10	240-320
Courtroom	12	320
Entry Lobby	15	160
Factory - Industrial tasks	17	160-400
Farm Building	7	160
Farm-Shearing & Dairying	15	240-400
Health care - Examine	20	500-600
Health care - Patient	10	320
Health care - Children's	15	320
Laboratory	15	400
Library-General	12	240
Library-Reading Room	10	320
Museum & Gallery Circulation Spaces	8	80
Office lit to 200lux or more	10	320
Office lit to 200 lux or less	7	160
Plant Room	5	80

## Understanding Part J6.2b

Continued...

Building Space	Watts/m <sup>2</sup> Table J6.2b BCA 2008	Recommended Lux Level AS1680 Series
Kitchen and Food Prep	8	240
Public Toilet	5	80
Restaurant Café Bar	20	160
Retail Space	25	400
School General Purpose Area	10	240
Service Locker Area Staff Room	3	40-80
Storage with shelving no higher than 75% of aisle lighting	8	160
Storage with shelving higher than 75% of aisle lighting	10	160
Wholesale Storage and Display Area	10	160

### Areas not listed above

Less than 160 lux - 13 Watts/m<sup>2</sup>  
 160 lux to 600 lux - 16 Watts/m<sup>2</sup>  
 600 lux plus - 20 Watts/m<sup>2</sup>

Note: Above table is an extract from the BCA.  
 Other applications may also apply.

## Adjustment Factors (J6.2c)

The following table provides a list of adjustment factors that may apply.

Item	Description	Illumination Power Density
<b>Motion Detector</b>	Where: 75% of floor space is controlled by one or more motion detectors  An area of less than 200m <sup>2</sup> is switched as a block by one or more detectors	<b>0.9</b>
	Where up to six lights area switched by one or more detectors	<b>0.7</b>
	Where an area of a carpark of less than 500m <sup>2</sup> is switched as a block by one or more detectors.	<b>0.7</b>
	Where up to 2 lights are switched as a block by one or more detectors	<b>0.55</b>
<b>Daylight Sensor and Dynamic Lighting Control Device</b>	Lights within the space adjacent to windows equal to the depth of the floor to window head height	<b>0.5</b>
	Where the total area of the roof lights is less than 10% of the floor area	<b>0.6</b>
	Where total area of the roof lights is 10% more of the floor area	<b>0.5</b>
<b>Fixed Dimming</b>	Where at least 75% of the floor area is controlled by fixed dimmers that reduce the overall lighting level and the power consumption of the lighting	<b>% of full power to which the dimmer is set x 0.95</b>

## Adjustment Factors (J6.2c)

Continued...

Item	Description	Illumination Power Density
<b>Dynamic Dimming</b>	Automatic Compensation for lumen depreciation	<b>The design lumen depreciation factor; and  (i) with fluorescent lights, no less than 0.9;  or  (ii) with high pressure discharge lights, no less than 0.8</b>
<b>Room Size</b>	Room Index (RI) Value not more than 0.7	<b>0.5</b>
	+0.7 < 1.5	<b>0.7</b>
	+1.5 < 3.0	<b>0.9</b>
	Room index more than 3.0	<b>1.0</b>

$$\text{ROOM INDEX (RI)} = \frac{L \times W}{MH \times (L + W)}$$

**L** = Length of room  
**W** = Width of room  
**MH** = Height that the luminaire is mounted above the work surface

Note: Only applies to the light controlled and excludes tungsten or incandescent sources.

The above table is an extract from the BCA. Other adjustment factors may also apply.

## Benefits of Electronic Systems

With the demand for energy efficient lighting increasing rapidly and the regulation becoming tougher, a simple step that can be taken to improve the efficiency of the lighting solution is to move to light fittings that use electronic ballasts and lighting controls eg. dimming.

Not only are electronic ballasts more energy efficient but the technology also presents a number of other advantages. Electronic ballasts extend the life of a lamp, offering further cost savings. They also operate fluorescent lamps at a much higher frequency than magnetic ballasts, reducing the flicker effect as well as the humming noise. Reducing these factors can have a health benefit as flickering lights has been known to cause headaches for some people.

Although using a light fitting with electronic ballasts doesn't mean that minimum standards will be automatically met; it does allow you to make an application more energy efficient, which will assist with meeting the minimum requirements outlined in the BCA.

**To find out more about the benefits of switching to electronic systems, contact a Thorn representative on 1300 139 965.**

## Project Example

Bill's Builders requests Sparky Sparks to design and construct the electrical and lighting for a new office and Warehouse storage complex.

Bill's Builders went through a simple process to ensure that they were meeting building code J6.2b standards.

### **Step 1: Find out what Building Class applies (refer to page 20 for information on building classes):**

Office: Class 5

Warehouse storage (with shelving 75% of the height of the aisle): Class 7

*Note: This booklet only covers Part J6.2b of the BCA, which concentrates on building classes 4, 5, 6, 7, 8, 9a and 9b.*

### **Step 2: Go to Table J6.2 b (refer to page 8 & 9) and find out the maximum illumination power density allowed according to the project:**

Office: 10 Watts/m<sup>2</sup>

Warehouse storage: 10 Watts/m<sup>2</sup>

### **Step 2.1: If no application listed, select the maximum illumination power density based on the lighting level required (refer to page 9).**

### **Step 3: Work out the area of the room:**

**Length x Width = m<sup>2</sup>**

Office: 20m x 5m = 100m<sup>2</sup>

Warehouse storage: 20m x 10m = 200m<sup>2</sup>

### **Step 4: Using the manufacturer's instructions, work out the quantity of luminaries required:**

Office: 20 of 2x36 Watt standard t-bar troffer fittings

Warehouse storage: 10 of 400 Watt MV Hi-bay fittings

### **Step 5: Add up the total wattage including ballast losses of all the luminaries:**

Standard (2 x 36 Watts x 20) t-bars: 1800 Watts total

Hi-bays: (440 Watts ea x 10) = 4400 Watts total

## Project Example

### Step 6: Divide the area (m<sup>2</sup>) into the total Watts/Watts/m<sup>2</sup>:

Office area = 18 Watts/m<sup>2</sup>

Warehouse storage = 22 Watts/m<sup>2</sup>

Result: ..... **FAIL** ❌

### Select a more efficient light fitting and recalculate using steps 4, 5 & 6:

Office: 1x36 Watt Royal Electronic fitting with high performance – 36 watts loss each

Warehouse storage: 250 Watt Metal Halide High Bay - 270 Watts loss each

### Recalculate using Steps 5 & 6:

Office: 7.2 Watts/m<sup>2</sup> ..... **PASS** ✅

Warehouse storage: 13.5 Watts/m<sup>2</sup> ..... **FAIL** ❌

### Step 7: Adjustment factors

In order to ensure that the Warehouse storage complies with minimum standards, adjustment factors such as daylight sensors need to be applied. A maximum of two illumination power density adjustment factors can be applied to an area using the following formula:

$$A \times (B + [(1-B) \div 2])$$

where A is the lowest applicable adjustment factor and B is the second lowest adjustment factor.

#### Example:

A = Daylight sensors - 0.7 (refer table J6.2c)

B = Motion detector - 0.9 (refer table J6.2c)

#### Therefore:

Adjustment factor =  $0.7 \times (0.9 + [(1-0.9)/2]) = 0.665$

#### Hence:

13.5Watts/m<sup>2</sup> x 0.665 = 9 Watts/m<sup>2</sup> ..... **PASS** ✅

## Thorn Luminaire Matrix

Using the below application as an example we have outlined different Thorn products that will enable building code J6.2b compliance.

### Sample Office

Area: 19.2m x 13.8m

Ceiling height: 2.7m

Work plane height: 0.7m AFFL

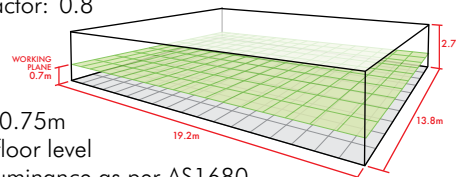
Reflectance:

Ceiling: 80%

Walls: 50%

Floor: 20%

Maintenance Factor: 0.8



Eh Desk height 0.75m above finished floor level

- maintained illuminance as per AS1680

Part J6.2b compliance required (refer to table J6.2b): 10 watts/m<sup>2</sup>

### HAWK

#### HAWK MAGNETIC BALLAST

HAWK 2x36W T26 HPF K12  
1200x300 W840

SAP code: 96039135

Spacing: 2.4m x 3.3m

Eh: 428 lux

Watts/m<sup>2</sup>: 10.3 ❌

Min/Ave: 0.66

#### HAWK ELECTRONIC BALLAST

HAWK 2x36W T26 HF K12 1200x300 W840

SAP code: 96058619

Spacing: 2.4m x 3.3m

Eh: 428 lux (avg)

Watts/m<sup>2</sup>: 8.7

Min/Ave: 0.66 ✅

## Thorn Luminaire Matrix

### SUSTAIN WITH SATINBRITE LOUVRE

#### **SUSTAIN 1x28W T16 HF DSB 1200x300 W840**

**SAP code: 96058929**

Spacing: 2.4m x 2.4m  
Eh: 383 lux (average)  
Watts/m<sup>2</sup>: 6.9  
Min/Ave: 0.81



### SEISMIC WITH SATINBRITE LOUVRE

#### **SEISMIC 1x28W T16 HF DSB 1200x300 W840**

**SAP code: 96058951**

Spacing: 2.4m x 1.8m  
Eh: 350 lux (avg)  
Watts/m<sup>2</sup>: 8.0  
Min/Ave: 0.79



#### **SEISMIC 2x28W T16 HF DSB 1200x300 W840**

**SAP code: 96058954**

Spacing: 2.4m x 3.0m  
Eh: 404 lux (avg)  
Watts/m<sup>2</sup>: 9.5  
Min/Ave: 0.86



### ROYAL WITH K19 DIFFUSER

#### **ROYAL 1x28W T16 HF 1200x300 BODY W840**

**SAP code: 96041730**

#### **Plus K19 Diffuser**

**SAP code: 96032678**

Spacing: 2.4m x 2.1m  
Eh: 363 lux (avg)  
Watts/m<sup>2</sup>: 8.0  
Min/Ave: 0.79



#### **ROYAL 1x36W T16 HF 1200x300 BODY W840**

**SAP code: 96034310**

#### **Plus K19 Diffuser**

**SAP code: 96032678**

Spacing: 2.4m x 2.7m  
Eh: 367 lux (avg)  
Watts/m<sup>2</sup>: 5.35  
Min/Ave: 0.72



## Thorn Luminaire Matrix

### COLLEGE (FORMERLY DIFFUSALUX)

#### **COLLEGE 1x36W HF PC CL** **SAP code: 96205771**

Spacing: 2.4m x 2.5m  
Eh: 396 lux (avg)  
Watts/m<sup>2</sup>: 6.5  
Min/Ave: 0.80



#### **COLLEGE 2x28W HF PC CL** **SAP code: 96205778**

Spacing: 2.8m x 3.0m  
Eh: 490 lux (avg)  
Watts/m<sup>2</sup>: 9.5  
Min/Ave: 0.85



### MAXIBATTEN

#### **MAXIBATTEN 136** **DIFFUSED HF FUSED W840** **SAP code: 96039525**

Spacing: 2.4m x 2.5m  
Eh: 355 lux (avg)  
Watts/m<sup>2</sup>: 6.5  
Min/Ave: 0.85



#### **MAXIBATTEN 228** **DIFFUSED WIDE FUSED W840** **SAP code: 96040265**

Spacing: 2.8m x 3.0m  
Eh: 455 lux (avg)  
Watts/m<sup>2</sup>: 9.5  
Min/Ave: 0.85



### JUPITER WITH SATINBRITE LOUVRE

#### **JUPITER II 1x28w HF** **SAP code: 96232937**

**Plus 1x28 DSB louvre**  
**SAP code: 96233017**  
Spacing: 2.0m x 2.8m  
Eh: 325 lux (avg)  
Watts/m<sup>2</sup>: 5.8  
Min/Avg: 0.80



#### **JUPITER II 2x28w HF** **SAP code: 96232938**

**Plus 2x28 DSB louvre**  
**SAP code: 96233018**  
Spacing: 2.7m x 3m  
Eh: 467 lux (avg)  
Watts/m<sup>2</sup>: 8.06  
Min/Avg: 0.80



### CHALICE DOWNLIGHT

#### **CHALICE 190 REC HOR** **218 TC-D FP L/L** **SAP code: 96039308**

Spacing: 2.4m x 2.5m  
Eh: 194 lux (avg)  
Watts/m<sup>2</sup>: 7.3  
Min/Avg: 0.70



#### **CHALICE 190 REC HOR** **126 TC-DEL HF FP L/L** **SAP code: 96039303**

Spacing: 2.4m x 2.4m  
Eh: 194 lux (avg)  
Watts/m<sup>2</sup>: 5.25



## Types of Building Classes

**Note:** This booklet only covers part J6.2b of the BCA, which is only aimed at commercial, retail and industrial type buildings, ie. class 4, 5, 6, 7, 8, 9a and 9b.

### Buildings are classified as follows:

**Class 1:** One or more buildings which in association constitute

- (a) Class 1a: a single dwelling being -
  - (i) a detached house; or
  - (ii) one of a group of two or more attached dwellings, each being a building, separated by a fire resisting wall, including a row house, a terrace house, town house or villa unit; or
- (b) Class 1b: a boarding house, guest house, hostel or the like -
  - (i) With a total area of all floors not exceeding 300m<sup>2</sup> measured over the enclosing walls of the Class 1b; and
  - (ii) In which not more than 12 residents would ordinarily be resident

**Class 2:** a building containing 2 or more sole occupancy units each being a separate dwelling

**Class 3:** a residential building, other than Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons, including

- (a) a boarding house, guest house, hostel, lodging house or backpackers accommodation; or
- (b) a residential part of hotel motel; or
- (c) a residential part of a school; or
- (d) accommodation for the aged, children, or people with disabilities; or
- (e) a residential part of a health-care building which accommodates members of staff; or
- (f) a residential part of a detention centre

**Class 4:** a dwelling in a building that is Class 5,6,7,8 or 9 if it is the only dwelling in the building

**Class 5:** an office building used for professional or commercial purposes, excluding buildings of Class 6,7,8 or 9.

**Class 6:** a shop or other building for the sale of goods by retail or the supply of services direct to the public, including:

- (a) an eating room, café, restaurant, milk or soft-drink bar; or
- (b) a dining room, bar, shop or kiosk part of a hotel or motel or
- (c) a hairdresser's or barber's shop, public laundry, or undertakers establishment or
- (d) market or sale room, showroom or service station

**Class 7:** a building which is:

- (a) Class 7a – a carpark; or
- (b) Class 7b – for storage, or display of goods or produce for sale by wholesale

**Class 8:** a laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale or gain

**Class 9:** a building of a public nature:

- (a) Class 9a – a health care building, including those parts of the building set aside as a laboratory; or
- (b) Class 9b – an assembly building, including a trade workshop, laboratory or the like in a primary or secondary school, but excluding any other parts of the building that are of another class
- (c) Class 9c – Aged care building

**Class 10:** a non-habitable building or structure

- (a) Class 10a – a non habitable building being private garage, carport, shed or the like; or
- (b) Class 10b – a structure being a fence, mast, antenna, retaining or free standing wall, swimming pool or the like.

## Other Australian Standards

A number of different standards may apply to a project. Below are some of the standards that may also apply.

### Luminaire Manufacture

**ASNZS60598** Safety Compliance verified by self-certification based on in-house or NATA report

**ASNZS CISPR15** Compliance with Electromagnetic Radiation standard as in C-Tick

### Interior Lighting Standards

**AS1680.1** General Principles and Recommendations

**AS1680.2.1** Circulation Spaces and other General Areas

**AS1680.2.2** Office and Screen based tasks

**AS1680.2.3** Educational and Training Facilities

**AS1680.2.4** Industrial Tasks and Purposes

**AS1680.2.5** Hospital and Medical Tasks

## Glossary of Terms Standards

### Light Output Ratio (LOR)

The ratio of the total light output of the luminaire to the output of the lamp(s), under stated conditions.

### Lumen (lm)

The unit of luminous flux or the rate of flow of light from a source or received by a surface. When a ray of light hits a solid surface, the process is known as illumination.

### Luminaire

Modern term for “light fitting” or “fixture”. A complete lighting unit that controls the distribution of light given by a lamp(s) and includes components for fixing and protecting the lamp(s) and for connecting them to the supply circuit. Luminaires for road lighting are often known as lanterns.

### Ballast

Ballast are devices used with fluorescent or high intensity discharge (HID) lamps to supply sufficient voltage to start and operate the lamp and then to limit the current during operation.

### Digital Serial Interface (DSI)

A lighting control protocol created by the Zumtobel Group, for applications where the addressing feature of DALI is not required.

### Digital Addressable Lighting Interface (DALI)

A lighting control protocol set out in the technical standard IEC.

### Eh

Illuminance on a horizontal plane.

### AFFL

Above finished floor level.

# THORN

Lighting people and places

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To discuss your next project,  
contact a local Thorn representative in your area.

**1300 139 965**

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