

## 5. Energy Efficiency Requirements for Lighting Installation

### 5.1 Scope of Application

5.1.1 All lighting installations, unless otherwise specified, in a prescribed building should be in accordance with the energy efficiency requirements of this Section.

5.1.2 For the avoidance of doubt, the following lighting installations in a building are not regarded as lighting installations to which the Ordinance is applicable –

- (a) lighting installation exterior to a building such as façade lighting installation, outdoor lighting installation, and lighting installation underneath canopy over a pavement or road;
- (b) lighting installation not of fixed type, and connected to power supply via flexible cable with plug and socket;
- (c) lighting installation integral to an equipment or instrumentation that is not a luminaire and with separate control switch;
- (d) lighting installation integral to a signage;
- (e) lighting installation owned by the electricity supplier and installed in a consumer's substation; and
- (f) lighting installation included in the installations specified in Schedule 2 of the Ordinance.

### 5.2 General Approach

The requirements for energy efficient design of lighting installations are for the purposes of –

- (a) reducing lighting power through imposing maximum allowable lighting power density in a space; and
- (b) reducing energy use through proper lighting control.

### 5.3 Definitions

The definitions of terms applicable to lighting installations are given in Section 2 of this BEC.

### 5.4 Lighting Power Density

5.4.1 The lighting power density (LPD) of a space of a type classified in Table 5.4 should not exceed the corresponding maximum allowable value given in Table 5.4, unless the total electrical power consumed by the complete fixed lighting installations in the space does

not exceed 70W.

**Table 5.4 : Lighting Power Density and Automatic Lighting Control for Various Types of Space**

Type of Space	Maximum Allowable LPD (W/m <sup>2</sup> )	Automatic Lighting Control Required (Yes / No)
Activity Room / Children play area / Music Room / Recreational Facilities Room	9.5	Yes
Atrium / Foyer with headroom over 5m	17.0	Yes
Babycare Room / Breastfeeding Room / Lactation Room	9.7	Yes
Bar / Lounge	10.0	No
Banquet Room / Function Room / Ball Room	12.7	No
Canteen	9.5	No
Car Park	3.0	Yes, at parking spaces only
Changing Room/ Locker Room	8.1	Yes
Classroom / Training Room	9.1	Yes
Clinic	12.4	No
Common Room/ Break Room	8.0	Yes
Computer Room / Data Centre	12.5	Yes
Conference / Seminar Room	10.6	Yes
Confinement Cell	12.0	No
Copy/ Printing Room, Photocopy Machine Room	10.0	Yes
Corridor	6.0	Yes
Court Room	15.0	Yes
Covered Playground (underneath building)/ Sky Garden	12.0	Yes
Dormitory	6.1	Yes
Entrance Lobby	10.0	Yes
Exhibition Hall / Gallery	12.0	Yes
Fast Food / Food Court	12.0	No
Guest room in Hotel or Guesthouse	9.9	No
Gymnasium / Exercise Room	9.5	Yes
Indoor Swimming Pool, for recreational or leisure purposes	15.0	No
Kitchen	11.5	No
Laboratory	10.4	No
Lecture Theatre	13.0	Yes
Library – Reading Area or Audio Visual Centre	10.2	Yes
Library – Stack Area	12.7	Yes
Lift Car	11.0	Yes
Lift Lobby(*)	7.5	Yes
Loading & Unloading Area	8.0	Yes
Long Stay Ward for elderly	12.9	No
Medical Examination Room	12.3	No
Nurse Station	13.0	No

**Table 5.4 : Lighting Power Density and Automatic Lighting Control for Various Types of Space**

Type of Space	Maximum Allowable LPD (W/m <sup>2</sup> )	Automatic Lighting Control Required (Yes / No)
Office, enclosed (with internal floor area at or below 15m <sup>2</sup> )	9.0	Yes
Office, with internal floor area above 15m <sup>2</sup> and of or below 200m <sup>2</sup>	8.5	Yes
Office, with internal floor area above 200m <sup>2</sup>	7.2	Yes
Pantry	8.5	Yes
Passenger Terminal Building		
● Arrival Hall / Departure Hall, with headroom not exceeding 5m	14.0	No
● Arrival Hall / Departure Hall, with headroom over 5m	18.0	No
● Passenger circulation area	13.0	No
Patient Ward / Day Care	11.2	No
Pharmacy Area	17.0	No
Plant Room / Machine Room / Switch Room (with internal floor area at or below 15m <sup>2</sup> )	9.5	No
Plant Room / Machine Room / Switch Room (with internal floor area above 15m <sup>2</sup> )	8.4	No
Porte Cochere	13.0	No
Porte Cochere with headroom over 5m	15.0	No
Public Circulation Area	9.9	Yes
Railway Station		
● Concourse / Platform / Entrance / Adit / Staircase, with headroom not exceeding 5 m	14.0	No
● Concourse / Platform / Entrance / Adit / Staircase, with headroom over 5 m	18.0	No
Refuge Floor	11.0	Yes
Report Room (Police Station)	8.9	No
Restaurant	12.0	No
Retail	11.1	No
School hall	12.5	Yes
Seating Area inside Theatre / Cinema / Auditorium / Concert Hall / Arena	10.0	No
Security Room / Guard Room	9.0	No
Spa Room / Massage Room	13.0	No
Server Room / Hub Room	8.2	No
Sports Arena, Indoor, for recreational purpose (with internal floor area at or below 1,000m <sup>2</sup> )	16.0	Yes
Sports Arena, Indoor, for recreational purpose (with internal floor area above 1,000 m <sup>2</sup> )	17.0	Yes

**Table 5.4 : Lighting Power Density and Automatic Lighting Control for Various Types of Space**

Type of Space	Maximum Allowable LPD (W/m <sup>2</sup> )	Automatic Lighting Control Required (Yes / No)
Staircase	5.6	No
Storeroom / Cleaner (with internal floor area at or below 15m <sup>2</sup> )	7.4	Yes
Storeroom / Cleaner (with internal floor area above 15m <sup>2</sup> )	6.3	Yes
Toilet / Washroom / Shower Room(*)	9.0	Yes
Workshop	9.4	No
<u>Multi-functional Space</u>	<u>See below</u>	
<p>LPD of each combination of function-specific luminaires should not exceed the maximum allowable value corresponding to the type of space illuminated by that combination of luminaires, detailed as follows:</p> <p style="text-align: center;"><math>LPD_{F1}</math> not to exceed <math>LPD_{S1}</math> , <math>LPD_{F2}</math> not to exceed <math>LPD_{S2}</math> ,....., <math>LPD_{Fn}</math> not to exceed <math>LPD_{Sn}</math></p> <p>where <math>LPD_{F1}</math> , <math>LPD_{F2}</math> ,....., <math>LPD_{Fn}</math> respectively refers to the lighting power density corresponding to function F1, F2, ...., Fn, and</p> <p><math>LPD_{S1}</math> , <math>LPD_{S2}</math> ,....., <math>LPD_{Sn}</math> respectively refers to the maximum allowable value of lighting power density corresponding to the classified Space S1, S2,....., Sn based on the respective function F1, F2, ....., Fn.</p>		
<p>Remarks:</p> <p>The specified type of space with (*) are allowed to adopt simplified trade-off scheme as stipulated in clause 5.7</p>		

5.4.2 The lighting power of the lighting installations stated in clause 5.1.2 will be excluded in the LPD calculation. The clarification of the Director should be sought in case of uncertainty on whether a lighting installation may be excluded in the LPD calculation.

5.4.3 Two or more neighbouring spaces segregated by floor-to-ceiling height walls should be regarded as separate individual spaces, irrespective of whether or not they serve the same function, and each of these individual spaces is governed by the requirement in clause 5.4.1.

## 5.5 Lighting Control Point

5.5.1 A single lighting control point in any of the spaces that is not classified as an office should control no more than 250m<sup>2</sup>, unless the total electrical power consumed by the complete fixed lighting installations in the space does not exceed 70W. The minimum

number of lighting control points for an office should comply with requirements given in Table 5.5.

<b>Table 5.5 : Minimum Number of Lighting Control Points for Office Space</b>	
<b>Space Area A (m<sup>2</sup>)</b>	<b>Minimum No. of Lighting Control Points (N : integer)</b>
$15 \times (N - 1) < A \leq 15 \times N$	$0 < N \leq 10$
$30 \times (N - 6) < A \leq 30 \times (N - 5)$	$10 < N \leq 20$
$50 \times (N - 12) < A \leq 50 \times (N - 11)$	$N > 20$

5.5.2 In an office space with actual lighting power density value lower than the corresponding value in Table 5.4, fewer no. of control points can be provided, the percentage reduction of which should not be more than the ratio given by the difference between allowable LPD and actual LPD to the allowable LPD.

5.5.3 For each functional activity in a multi-functional space, separate lighting control points should be provided to operate the luminaires for that activity, such that the operation of these luminaires should be independent of the operation of the luminaires not for the activity.

5.5.4 Lighting control points for the lighting installations to which the Ordinance is applicable should be independent from those for the other lighting installations to which the Ordinance is not applicable, such that these two categories of lighting installation may be switched on/off independently.

5.5.5 For any space, other than carpark, with lighting installation designed for 24 hours a day and 7 days a week operation, the requirements in clause 5.5.1 should not be applicable.

## 5.6 Automatic Lighting Control

### 5.6.1 The Basic Provision

5.6.1.1 Automatic lighting control should be provided to the space given in Table 5.4 unless the total electrical power consumed by the complete fixed lighting installations in the space does not exceed 150 W. The control should be able to shut off or reduce the general lighting power by at least 50% automatically of the lighting zone being controlled.

- 5.6.1.2 For any space requiring automatic lighting control, the requirements on daylight responsive control are applicable when the space is provided with fenestrations on exterior wall or overhead skylight.
- 5.6.1.3 The control devices or system should provide independent control which –
- (a) control the lighting for an area of no more than 250 m<sup>2</sup>;
  - (b) include no more than one floor except for spaces at multiple floors with similar configurations, lighting layouts and the lighting installations are under the same ownership; and
  - (c) cater for weekend and holidays operation pattern except the lighting installation designed for such a space is required of 24 hours a day and 7 days a week operation.
- 5.6.1.4 Any manual control installed to provide override of the automatic lighting control by the occupant of the space should not turn the lighting on for more than two hours per activation and should not control more than 250 m<sup>2</sup>.
- 5.6.1.5 For space deploying occupant sensors, the reduced lighting power control should activate within 15 minutes (10 minutes for carpark) of all occupants leaving the space.
- 5.6.1.6 The requirement on automatic lighting control should not be applicable to any space to be occupied in the manner of 24 hours a day and 7 days a week.
- 5.6.1.7 The exception on automatic lighting control as given in clause 5.6.1.1 should not be applicable to the lighting installation in lift car.
- 5.6.2 Daylight responsive control for daylight through fenestrations on exterior wall
- 5.6.2.1 A space having one or more side window fenestrations, of or adding up to 5 m<sup>2</sup> or above, should have one or more portions within the space assigned as a lighting zone or lighting zones. Each lighting zone should be provided with daylight responsive control under a separate control device. The control should be able to shut off or reduce the lighting zone's lighting power automatically to 50% or less of the lighting zone being controlled in response to available daylight.
- 5.6.2.2 The area of a lighting zone, in fulfilling the requirement under daylight responsive control through fenestrations on exterior wall, should be:
- (a) not less than twice the fenestration area for a discrete fenestration;

- (b) not less than twice the sum of the areas of the fenestrations for a series of fenestrations; or
- (c) the lighting space's internal floor area if such is so exceeded based on the computed area of the fenestration or the series of fenestrations.

5.6.2.3 A discrete fenestration may cater for a single lighting zone.

5.6.2.4 Fenestrations on the same orientation of the building when being separated by opaque wall section of 2m wide or less should be regarded as a series of fenestrations and to cater for a single lighting zone.

5.6.2.5 The requirement on daylight responsive control as given in clause 5.6.2.1 to clause 5.6.2.4 should not be applicable -

- (a) when the glazing in the fenestration is of non-see-through type;
- (b) when the general lighting completely or partially within a lighting zone does not exceed 150W; or
- (c) to any of the lighting zone's overlapped area which is already assigned under other lighting zone using daylight responsive control through overhead skylight.

5.6.2.6 A single daylight responsive control device is permissible to serve the lighting zones at multiple floors provided that the concerned spaces are with similar configuration, lighting layout, daylight factor and the lighting installations are under the same ownership.

5.6.3 Daylight responsive control for daylight through overhead skylight

5.6.3.1 A space having one or more skylight fenestrations, of or adding up to 5 m<sup>2</sup> or above, should have one or more portions within the space assigned as a lighting zone or lighting zones. Each lighting zone should be provided with daylight responsive control under a separated control device. The control should be able to shut off or reduce the lighting zone's lighting power automatically to 50% or less in response to the available daylight.

5.6.3.2 The area of a lighting zone, in fulfilling the requirement under daylight responsive control through overhead skylight, should be:

- (a) not less than 5 times the fenestration area for a discrete fenestration;
- (b) not less than 5 times the sum of the areas of the fenestrations for a series of fenestrations; or

- (c) the lighting space's internal floor area if such is so exceeded based on the computed area of the fenestration or the series of fenestrations.

5.6.3.3 A discrete fenestration of skylight may cater for a single lighting zone.

5.6.3.4 Fenestrations on the same skylight when being separated by opaque roof section of 2m wide or less should be regarded as a series of fenestrations and to cater for a single lighting zone.

5.6.3.5 The requirement on daylight responsive control as given in clause 5.6.3.1 to clause 5.6.3.4 should not be applicable -

- (a) when the glazing in the fenestration is of non-see-through type;
- (b) when the general lighting completely or partially within a lighting zone does not exceed 150W; or
- (c) to any of the lighting zone's overlapped area which is already assigned under other lighting zone using daylight responsive control through fenestration on exterior wall.

## 5.7 Simplified Trade-off Scheme for Lighting Power Density

5.7.1 The requirement of the simplified trade-off scheme are for the purpose of -

- (a) reducing energy consumption in the designed building through the focus on its total lighting power in same designated types of spaces; and
- (b) providing an alternative approach for compliance with the energy efficiency requirements given in Table 5.4

5.7.2 The trade-off of the lighting power density, in fulfilling the requirement under the trade-off scheme, should be:

- (a) only adopted in the specified type of space as highlighted in Table 5.4;
- (b) only applicable to same type of space with same operation schedule as well as the same thermal conditions;
- (c) limited to a maximum 50% of the surplus lighting power compared to the total achieved reduction in lighting power for the specific type of space;
- (d) the LPD for the designed lighting space should not exceed 25% of the maximum allowable LPD in Table 5.4;
- (e) the lighting space and lighting installations involved in the trade-off should be under the same ownership.