



Technical Guidelines
on Code of Practice for
Energy Efficiency of
Building Services
Installation



2015

EMSD 

Code of Practice for
Energy Efficiency of
Building Services
Installation



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Documents Released

Issue Date	Document	Technical Circular Ref.
11 Dec 2015	BEC 2015, EAC 2015	2/2015
10 June 2016	EE-SU; EE-LG, EE-AC, EE-EL, EE-LE; EE-EAes	1/2016
30 June 2016	TG-BEC 2015	2/2016
12 August 2016	TG-EAC 2015; EE-PB 2015	3/2016

TG-BEC2015 Compliance Process

Effective Dates of the BEC 2015

Submission	Date
Stage One Declaration	11 June 2016 <i>(Signed by the developer on or after 11.06.2016)</i>
Form of Compliance	11 September 2016 <i>(Signed by the REA on or after 11.09.2016)</i>



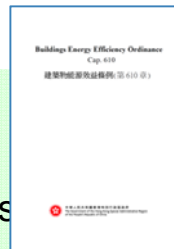
Maintain the Standards in the COCR and FOC

- ✓ Building owner / Responsible person to **maintain** the BSI to the standard applied in the COCR and FOC
- ✓ Renovation works (MRW or not MRW) should also apply
- ✓ **Newly completed buildings with COCR**
- ✓ **Newly Completed Buildings with FOC**



TG-BEC2015 Contents

- 10 sections
 - 1 - Introduction
 - 2 - Interpretations & Abbreviations
 - 3 - Application
 - 4 - Technical Compliance with BEEO

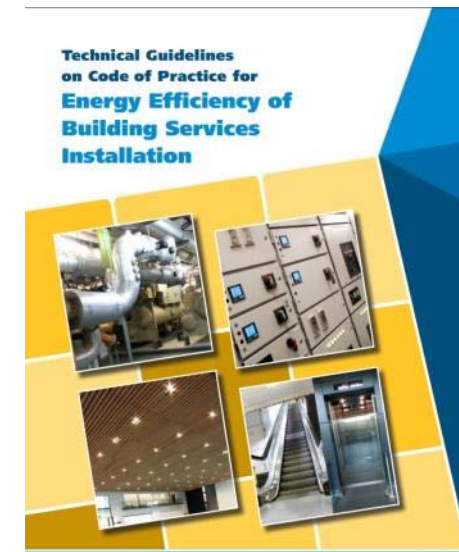


Overview & explanation of BEEO compliance process

- 5 - Lighting
- 6 - Air-conditioning
- 7 - Electrical
- 8 - Lift & Escalator
- 9 - Performance-based Approach
- 10 - **Major Retrofitting Works (MRW)**



Explanations of BEC's technical requirements with examples



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BEC2015 Requirements on Air-conditioning Installation

Air-Side System

- a. CAV and VAV with low-speed operation
- b. VAV static pressure control
- c. Automatic Shut off Damper Control
- d. Isolation of Zone
- e. Demand Control Ventilation
- f. System fan power requirement for MV

Water-side System

- a. Chiller Isolation
- b. Piping Frictional Loss

Components

- a. Chiller COP at 75% load
- b. Open-circuit cooling tower fan power requirement
- c. Energy Metering
- d. Direct Digital Control (DDC)

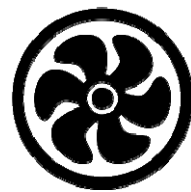


TG-BEC2015 Requirements on Air-conditioning

Vary of Airflow to System Load

CAV and VAV with **low-speed operation**

VAV System



Fan Speed

50%



Fan Power

≤30%

CAV System



Fan Speed

66%



Fan Power

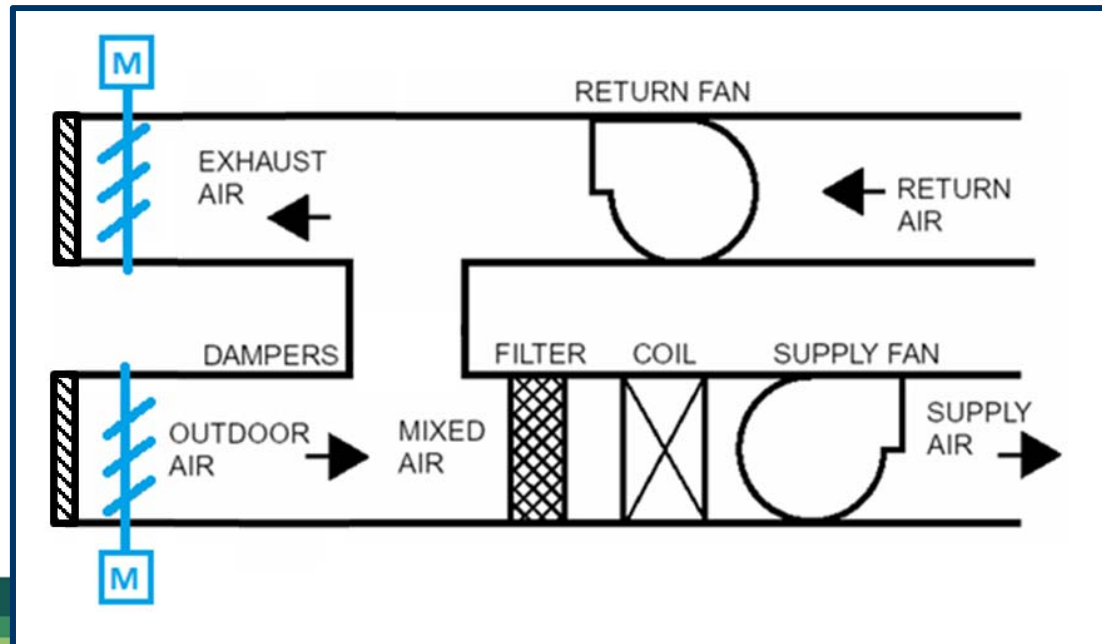
≤40%

** Not applicable to PAU



TG-BEC2015 Requirements on Air-conditioning

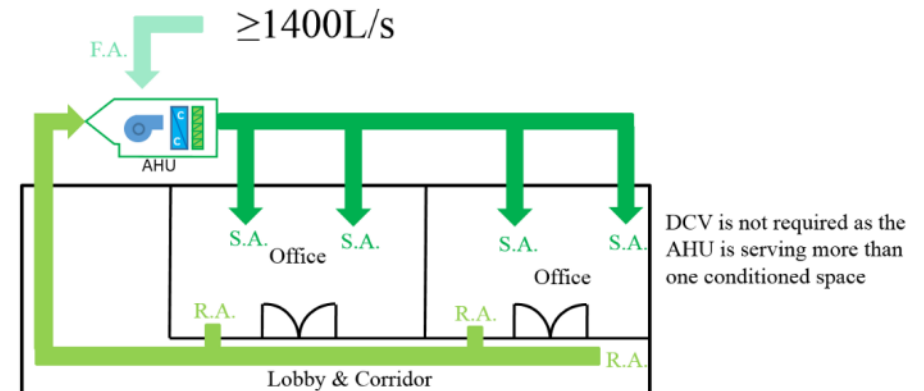
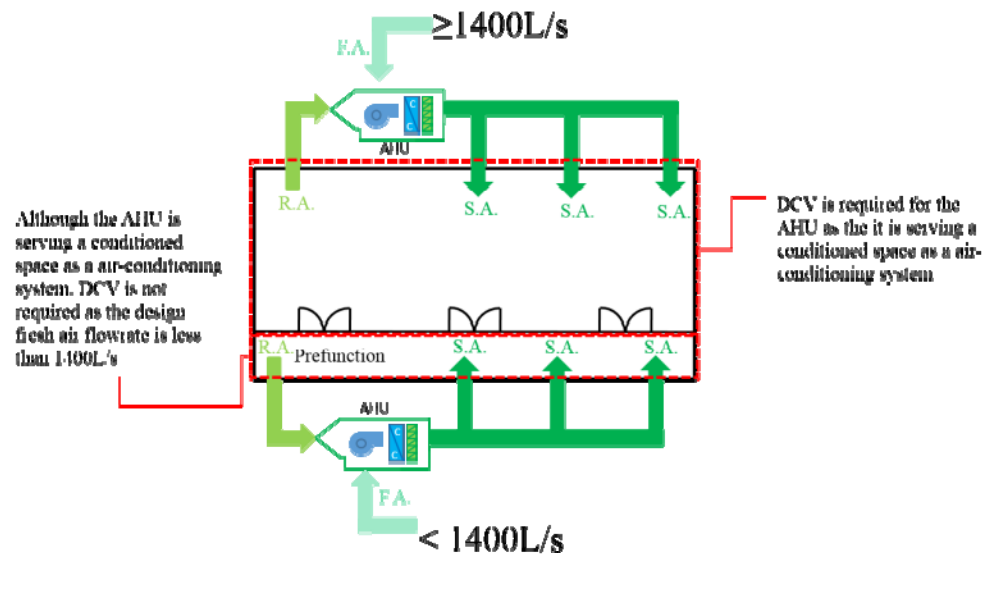
System Control - Automatic Shutoff Damper



- Prevent moisture migration
- Fresh air intake, exhaust air discharge locations i.e. potential sources of moisture ingress
- Damper automatically actuated
- Applicable also to an a/c system serving several conditioned spaces



TG-BEC2015 Requirements on Air-conditioning Demand Control Ventilation (DCV) in Air-conditioned Space





TG-BEC2015 Requirements on Air-conditioning

U-A/C & VRF System

Table 6.12a (Part 1): Minimum Coefficient of Performance for Unitary Air-conditioner at Full Load					
Type of Cooling	Air-cooled				Water-cooled
Capacity range (kW)	7.5 kW & below of types outside the scope of Room Air Conditioners in the labelling scheme specified in clause 6.12.2	Above 7.5 kW & below 40 kW	40 to 200 kW	Above 200 kW	All Ratings
Minimum COP at cooling mode (free air flow ^{@1})	2.6 for split type 2.3 for non-split type	2.5	3 (@2)	2.6 3.1 (@2)	3.3
Minimum COP at heating mode (heat pump) (free air flow ^{@1})	2.7	3.1	3.1	3.1	3.4

Table 6.12a (Part 2): Minimum Coefficient of Performance for Variable Refrigerant Flow System at Full Load				
Type of Cooling	Air-cooled (@3)			Water-cooled (@3)
Capacity range (kW)	7.5 kW & below 40 kW	40 to 200 kW	Above 200 kW	All Ratings
Minimum COP at cooling mode	3.3	3.3	3.3	4.3

Unitary Air- Conditioner (U-A/C)

Variable Refrigerant Flow (VRF) System



BEC2015 Requirement on Electrical Installation

- 1) **Motor Efficiency**
- 2) Motor Sizing
- 3) Power Distribution Loss
- 4) Power Quality
- 5) **Energy Metering**





BEC2015 Requirement on Electrical Installation

Table 7.5.1 Minimum Nominal Full-Load Motor Efficiency

	<u>BEC 2012</u>	<u>BEC 2015</u>	% of change
7.5 to 18.5 kW	88.7 – 91.2	90.4 – 92.6	1.9 – 1.5
22 to 45 kW	91.6 – 93.1	93.0 – 94.2	1.5 – 1.2
55 to 75 kW	93.5 – 94.0	94.6 – 95.0	1.2 – 1.1
90 kW or above	94.2 – 95.1	95.2 – 96.0	1.1 – 0.9
	(IE2 Motors)	(IE3 Motors) (IE2 < 7.5 kW)	

Only 4-pole motor shown as illustration



Update on Requirement of Metering and Monitoring Facilities

BEC 2012

Clause 7.7.1 & 7.7.2

Metering Provision is required for:-

- 1) Main circuit at or above 400A
- 2) Feeder or sub-main circuit exceeding 200A

BEC 2015

Clause 7.7.1 & 7.7.2

Metering Provision is required for:-

- 1) Main circuit at or above 400A
- 2) Feeder or sub-main circuit exceeding 200A

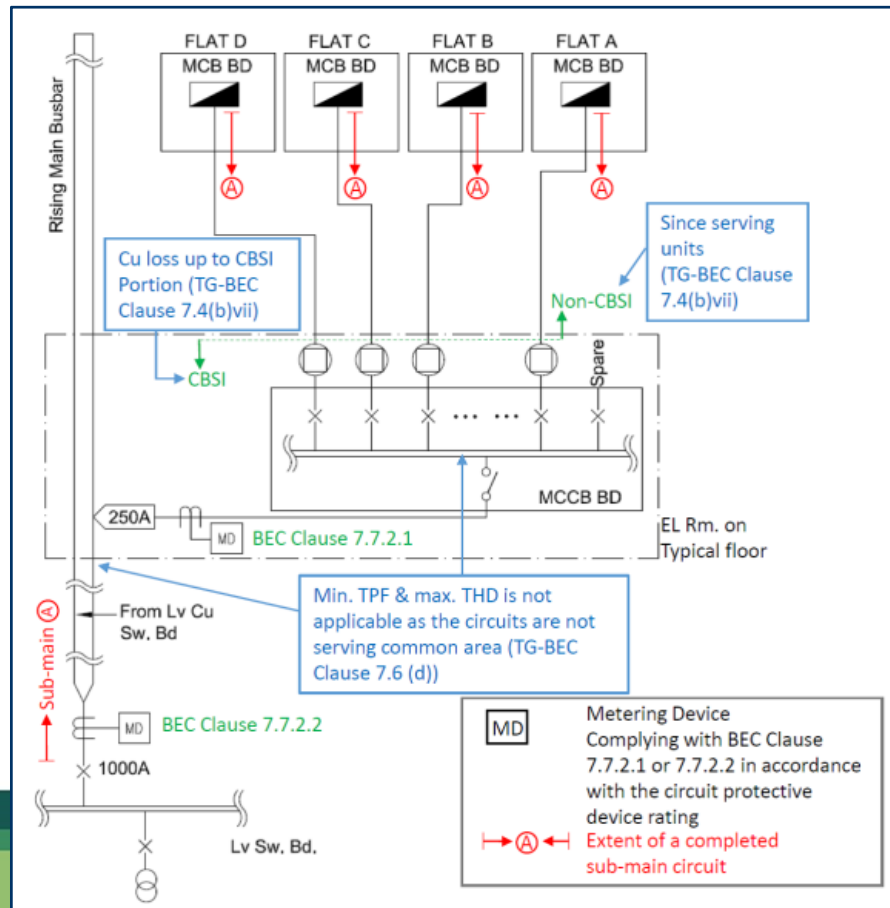
Clause 7.7.3 (New Requirement)

- 3) Additional requirement to provide separate metering devices **for each of the CBSI** (i.e. entire chiller plant, entire heat pump plant, all lifts and escalators or passenger conveyors)



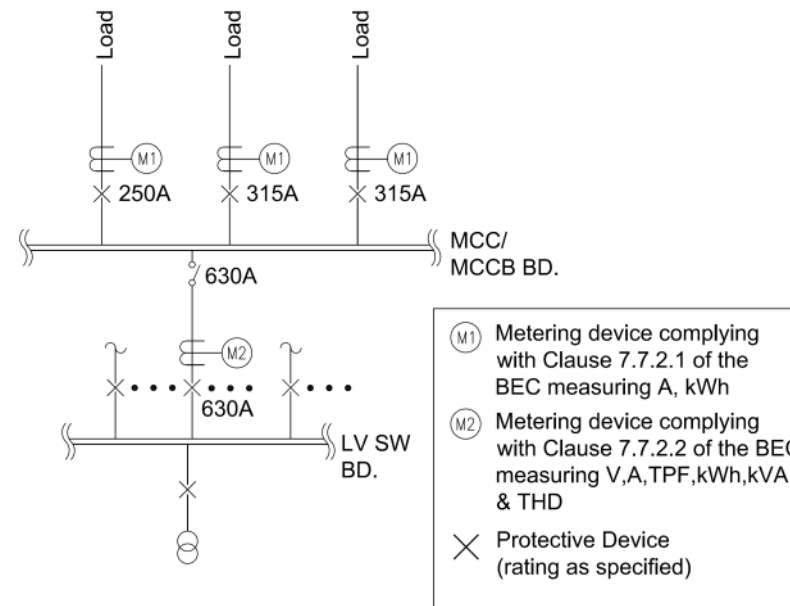
TG-BEC2015 - Requirements on Electrical

Sub-Circuit Serving Units

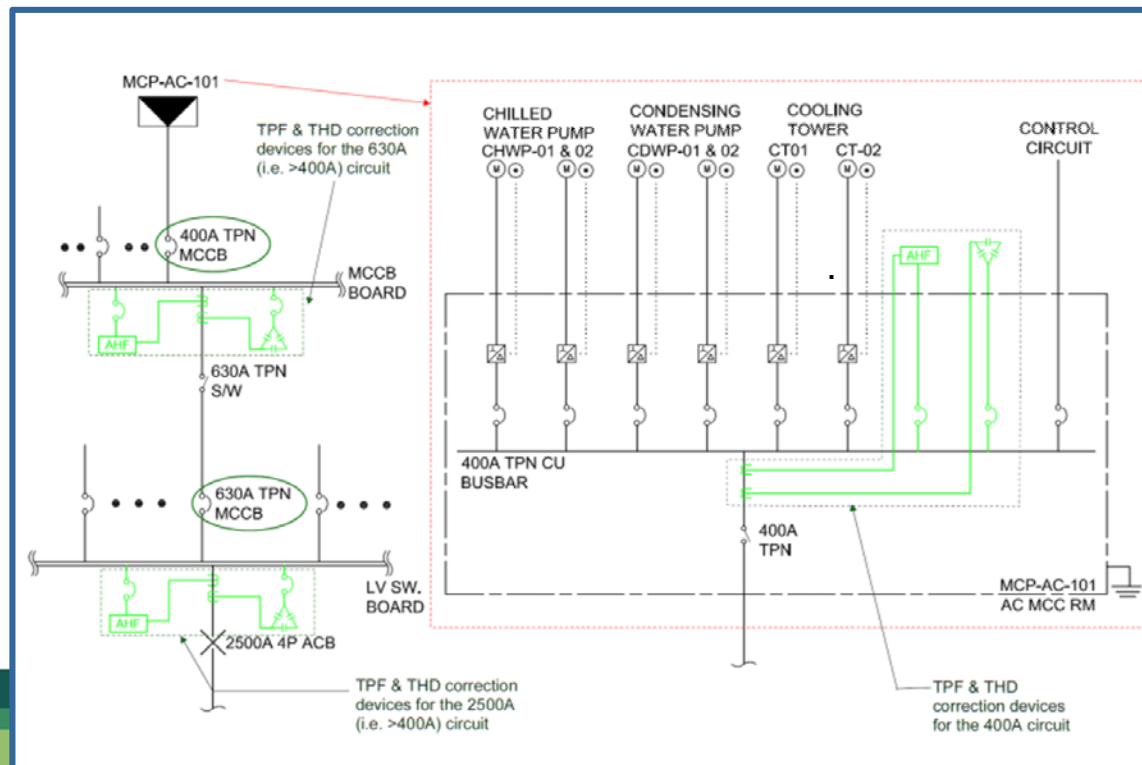


- TG Clause 7.6(d) & TG Clause 7.4(b)vii) - Residential & Industrial buildings' common area
- CBSI vs Non-CBSI.
- Cu Loss covers CBSI portion
- Metering devices at the CBSI portion
- TPF & THD - Not Applicable

TG-BEC2015 - Requirements on Electrical Sub-Circuit Metering Device



TG-BEC2015 - Requirements on Electrical Power Quality



Clause 7.6.1 – Total Power Factor

Clause 7.6.2 – Total Harmonic Distortion



BEC2015 Requirement on Lighting Installation

- 1) Lighting Power Density (W/m²)
- 2) Lighting Control Point
- 3) Automatic Lighting Control





BEC2015 Requirement on Lighting Installation

Lighting Power Density (LPD) – Clause 5.4

'lighting power density (LPD) (unit : W/m²)' means the maximum circuit wattage consumed by fixed lighting installations per unit floor area of an illuminated space.

(In equation form, the definition of LPD is given by:

$$\text{LPD} = \frac{\text{Total circuit wattage of the fixed lighting installations}}{\text{Internal floor area of that space}}$$

, where the total circuit wattage should be taken at the full lighting output condition.)

Circuit wattage:

counting also the loss from driver, dimmer and step-down Tx.

Full lighting output:

Dim-and-fix **not** permissible.

TG-BEC2015 Requirements on Lighting



Lighting Power Density (LPD)

- Lighting serving both decoration and as general lighting – LPD requirement applicable



Pendent light



Indirect light



Lighting besides mirror



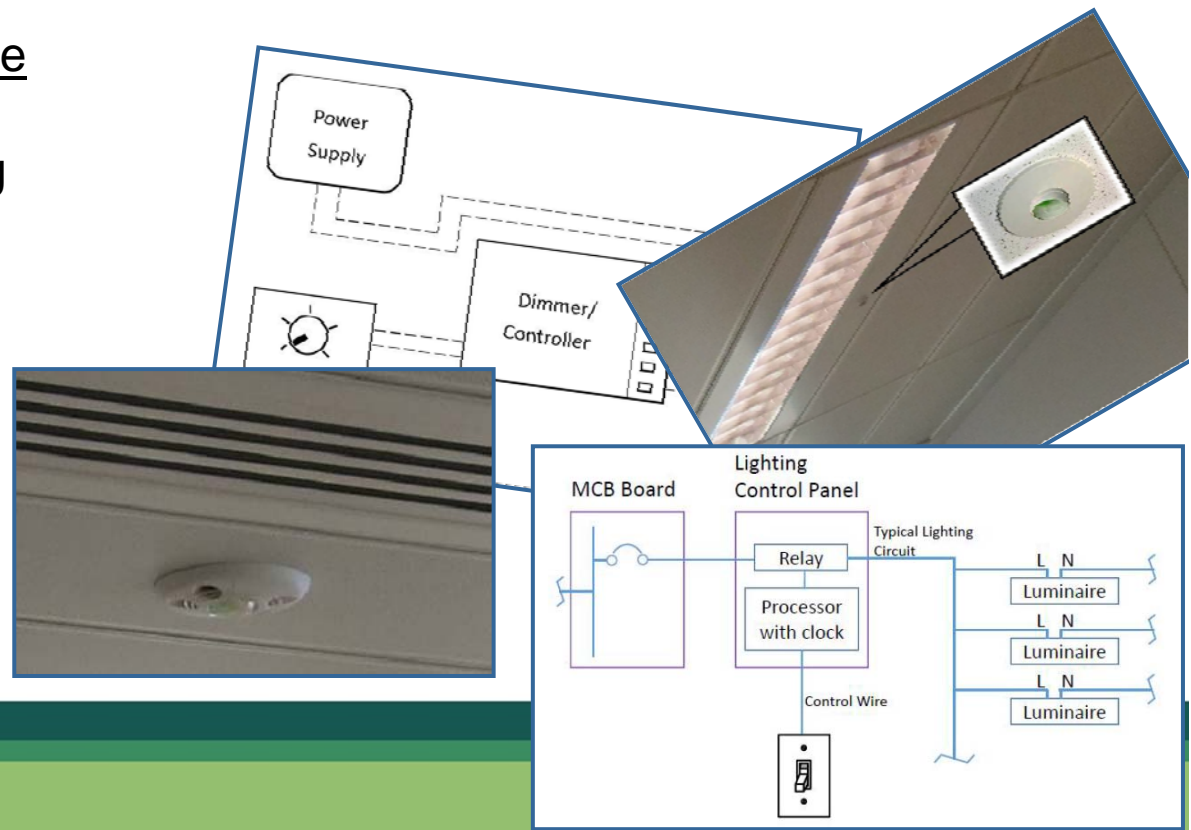
Cove Lighting

TG-BEC2015 Requirements on Lighting

Automatic Lighting Control (ALC)

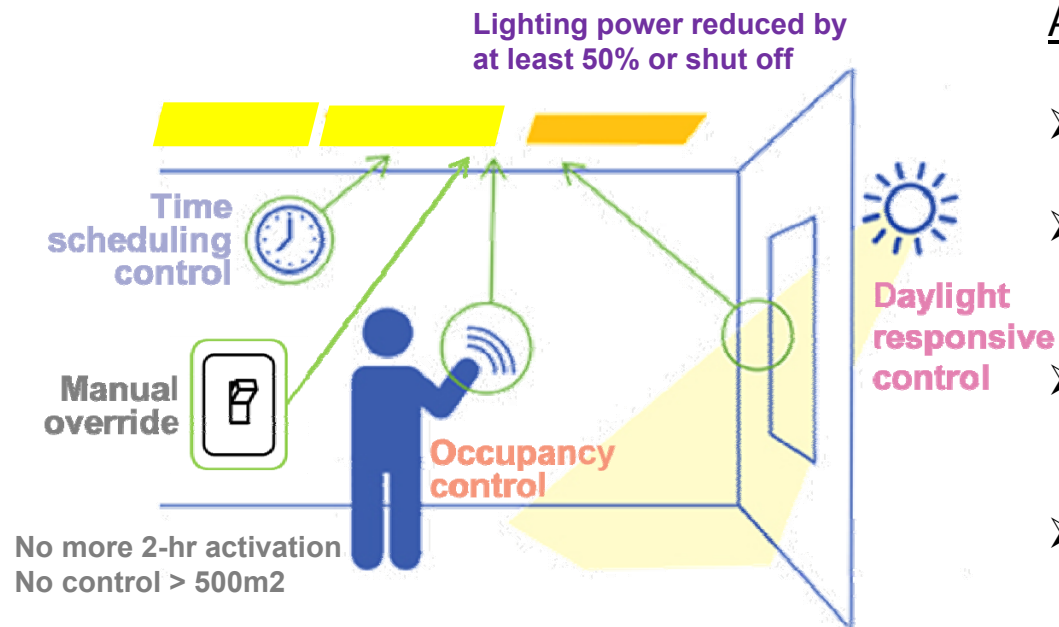
Common Technology Available

- Automatic Time Scheduling
- Occupant sensor
- Photo sensor
- Dimmer
- Combination of devices



TG-BEC2015 Requirements on Lighting

Automatic Lighting Control (ALC)



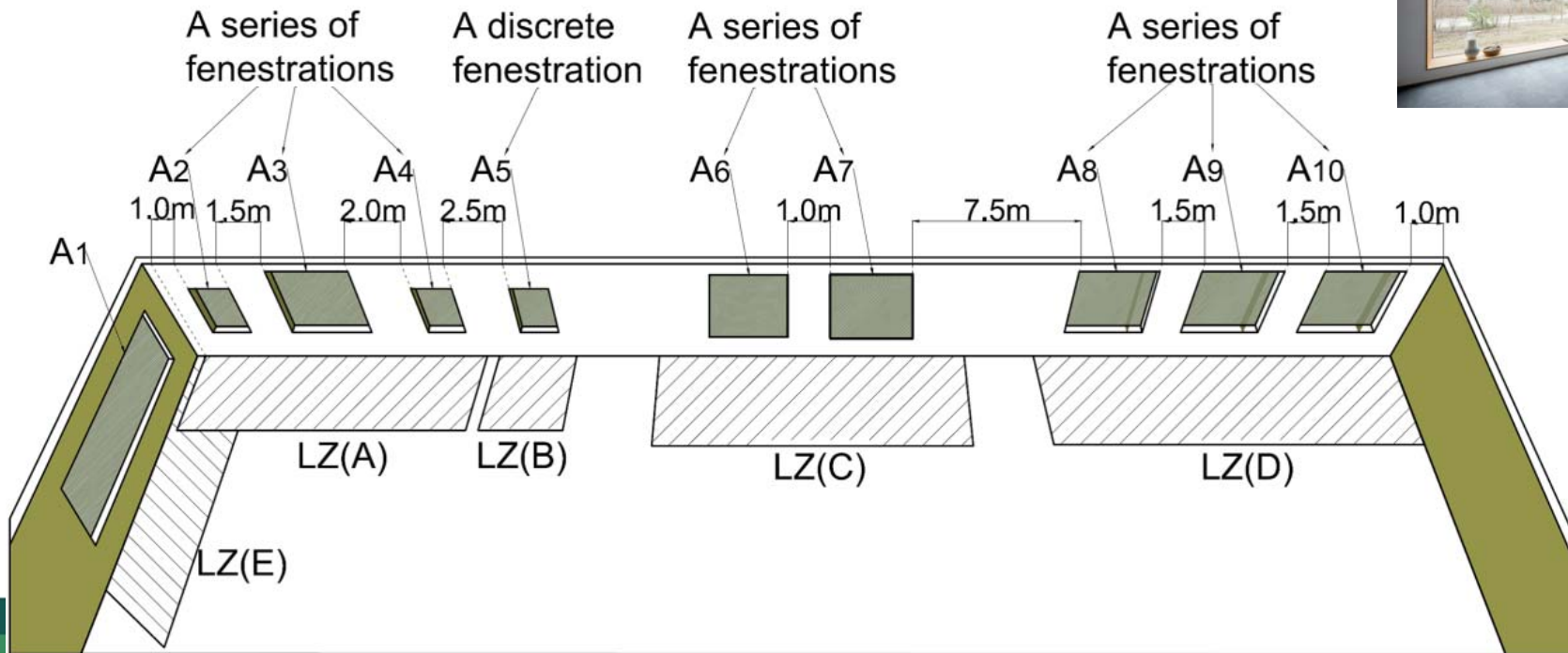
Applicability

- > 150 W lighting power consumption
- By switching off lighting fitting or dimming automatically
- Daylight responsive control if space with side window(s) or skylight
- Applicable to lighting installation for 24-hour a day and 7-day a week operation

TG-BEC2015 Requirements on Lighting

Daylight Responsive Control

TG Figure 5.6.2 (i)





BEC2015 Requirement on Lift and Escalator Installation

- 1) **Electrical Power** and Power Factor of Motor Drive
- 2) **Energy Metering**
- 3) **Lift Decoration Load**
- 4) Lift Parking Mode
- 5) **Lift Regenerative Braking**
- 6) **Automatic Speed Reduction of Escalator**



TG-BEC2015 - Requirements on Lift & Escalator

Lift Decoration Load - Clause 8.5.2



Max. lift decoration load ↓ **10 %**

Lift Rated Load L (kg)	Allowable Decoration Load D (kg)
$L < 1800$	$D = 0.5 \times L$, or 540 whichever is smaller
$L \geq 1800$	$D = 0.3422 \times L - 0.00002344 \times L^2$, or 1125 whichever is smaller

Example

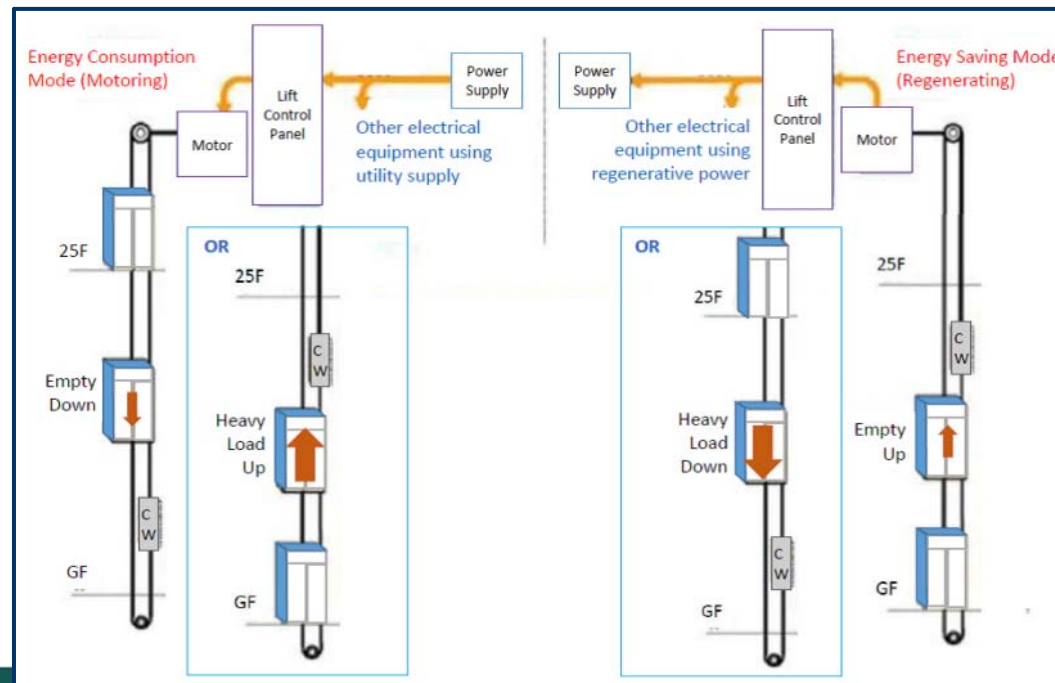
- Capacity: 1200kg.

Maximum Decoration load : From 600kg to 540kg



TG-BEC2015 - Requirements on Lift & Escalator

Lift Regenerative Breakings – Clause 8.5.5



- Applicable to lift at rated speed of $\geq 3\text{m/s}$ and rated load at $\geq 1000\text{kg}$
- Power generated shall be fed towards the **supply source** of the lift
- Wastage of generated power e.g. consumed by **resistor** not acceptable

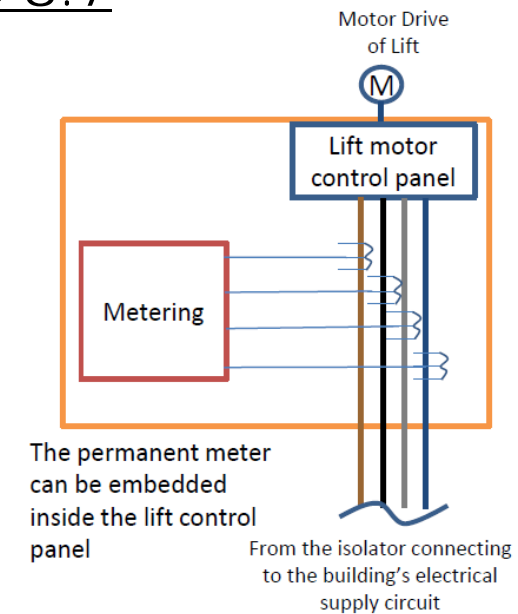
TG-BEC2015 – Requirements on Lift & Escalator

ENERGY SAVING
FOR ALL



Metering & Monitoring Facilities – Clause 8.7

- Data-logging & analytical function (digital power analyzer or multi-function meter, complete with CTs)
- Measuring 31st order harmonics
- Total kVA to base on average line voltage and average line current





TG-BEC2015 – Major Retrofitting Works

Relocation of Luminaires



Conditions:

- In use before;
- Within the same lighting space;
- Same type; and
- LPD not changed

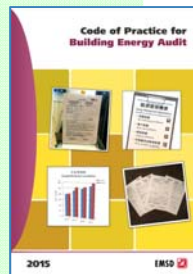
TG-EAC2015 Contents

➤ 9 sections

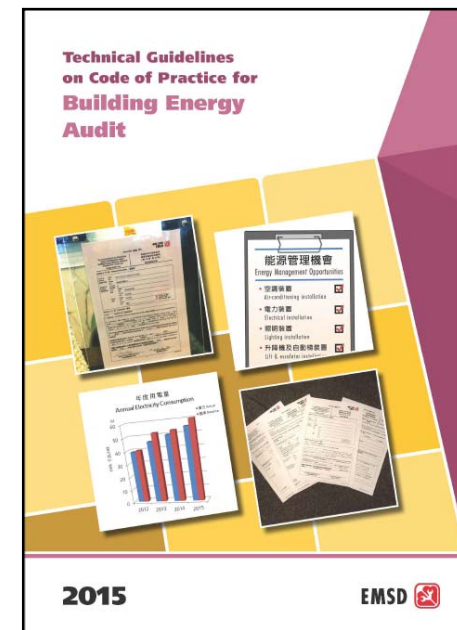
- 1 - Introduction
- 2 - Interpretations & Abbreviations
- 3 - Application
- 4 - Technical Compliance with BEEO

Overview & explanation of BEEO compliance process

- 5 – Objectives of EA
- 6 – Overview of EA
- 7 – EA Requirements
- 8 – EA Report
- 9 – EA Form



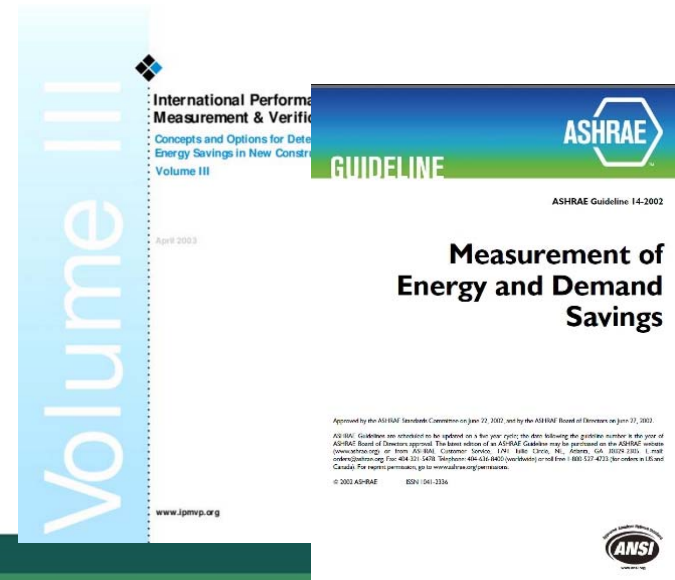
Explanations of EAC's technical requirements with examples



TG-EAC2015

On-Site Measurement

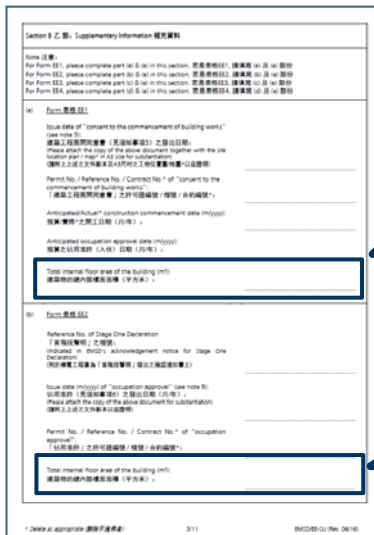
- Required for inadequate **operation records and/or equipment rated power consumptions**
- Proper **methodology** of measurement
- Might make reference to :
 - ❖ **International performance measurement & verification protocol volume III**
 - ❖ **ASHRAE 14 Measurement of Energy and Demand Saving**



Form EE-SU (Rev. 06/16)

Supplementary Information for other Forms

Section B (a) Form EE1 (Stage One)



Section B (a) Form EE1 (Stage One) details: Includes fields for 'Issue date of consent to the commencement of building works', 'Anticipated/Actual construction commencement date', and 'Anticipated occupation approval date'. The 'Total internal floor area of the building (m²)' field is highlighted with a blue box.

Total internal floor area of the building (m²):
建築物的總內部樓面面積 (平方米) : _____

Section B (b) Form EE2 (Stage Two)

Total internal floor area of the building (m²):
建築物的總內部樓面面積 (平方米) : _____

Technical Forms [2015(V.0)]

Declaration by the REA – Last Part of each Form [New]

- Each BSI involved in the MRW
- Stage 2 Submission – all technical forms.
- Accuracy, completeness, consistency on the submitted materials.

<p>《建築物能源效益守則》2015 照明裝置技術資料 <small>(請參照《屋宇裝備裝置能源效益實務守則》2015 版第 5 節)</small></p>		<p>表格 EE-LG</p>	
<p>第 6 部分 - 聲明</p>			
<p>本人作為註冊能源效益評估師，現聲明就本表格所填報的一切內容，及附件中作核實用途的資料，進行了妥善及徹底的審視，並證明其準確、一致及完整。</p> <p>本人明白，有關資料如：</p>			
<p>註冊能源效益評估師姓名： <input type="text"/></p>	<p>Technical Data of Air-Conditioning Installation for Building Energy Code (BEC) 2015 <small>(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2015 Edition)</small></p>		
<p>註冊能源效益評估師簽署： <input type="text"/></p>	<p>Form EE-AC</p>		
<p>Part 10 – Declaration</p>			
<p>I, Registered Energy Assessor, hereby declare that all the information contained in this form and in the substantiation materials attached have been thoroughly examined and well prepared to demonstrate the compliance with the Building Energy Code.</p> <p>I understand that any missing information, inconsistency and incorrectness on the submitted materials / information may result in jeopardizing the approval process and having the entire submission been rejected.</p>			
<p>Name of the REA: <input type="text"/></p>	<p>Registration No.:</p> <input type="text"/>	<p><input type="text"/></p>	
<p>Signature of the REA <input type="text"/></p>	<p>Date:</p> <input type="text"/>	<p><input type="text"/></p>	
		<p>DD / MM / YYYY</p>	