ENERGY SAVING FOR ALL 全民節能

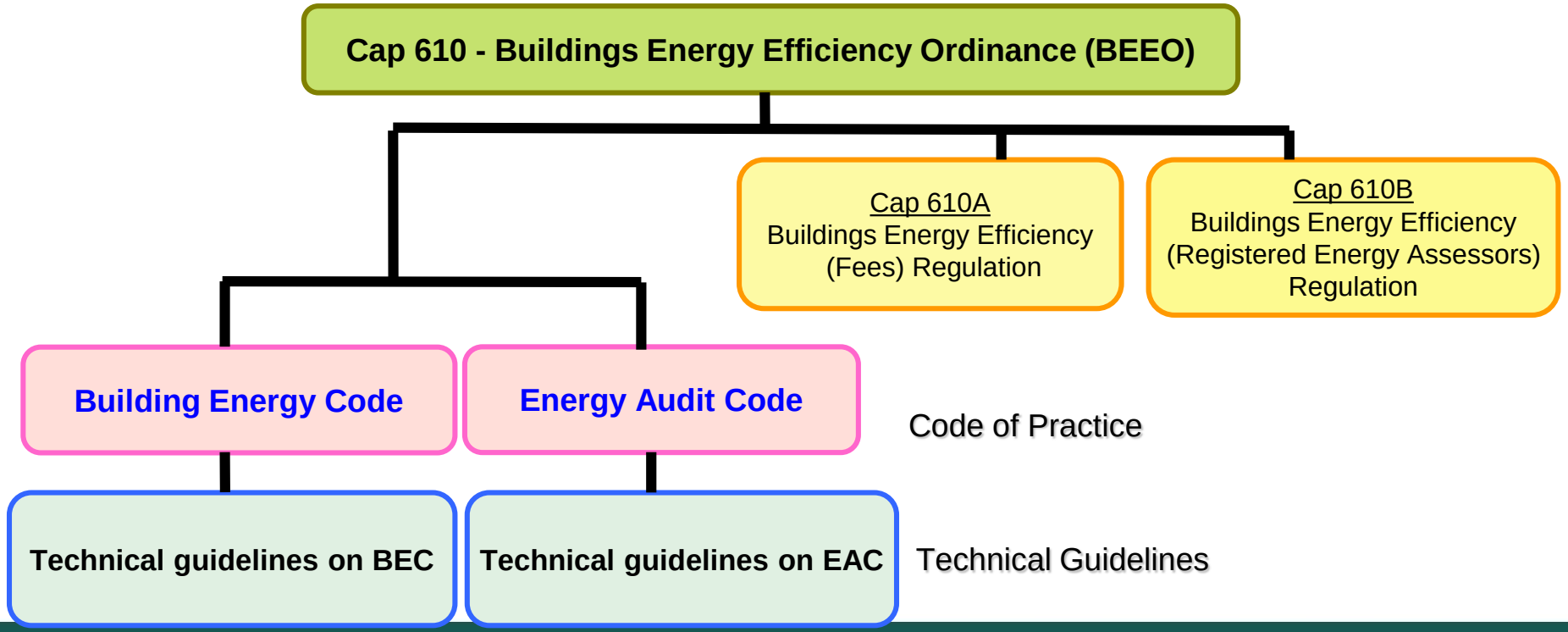
Technical Seminar on Building Energy Code(BEC) 2015 and Technical Guidelines for the BEC 2015

CIBSE HK Branch, HKIE BSD & ASHRAE HK
19 Sep 2016

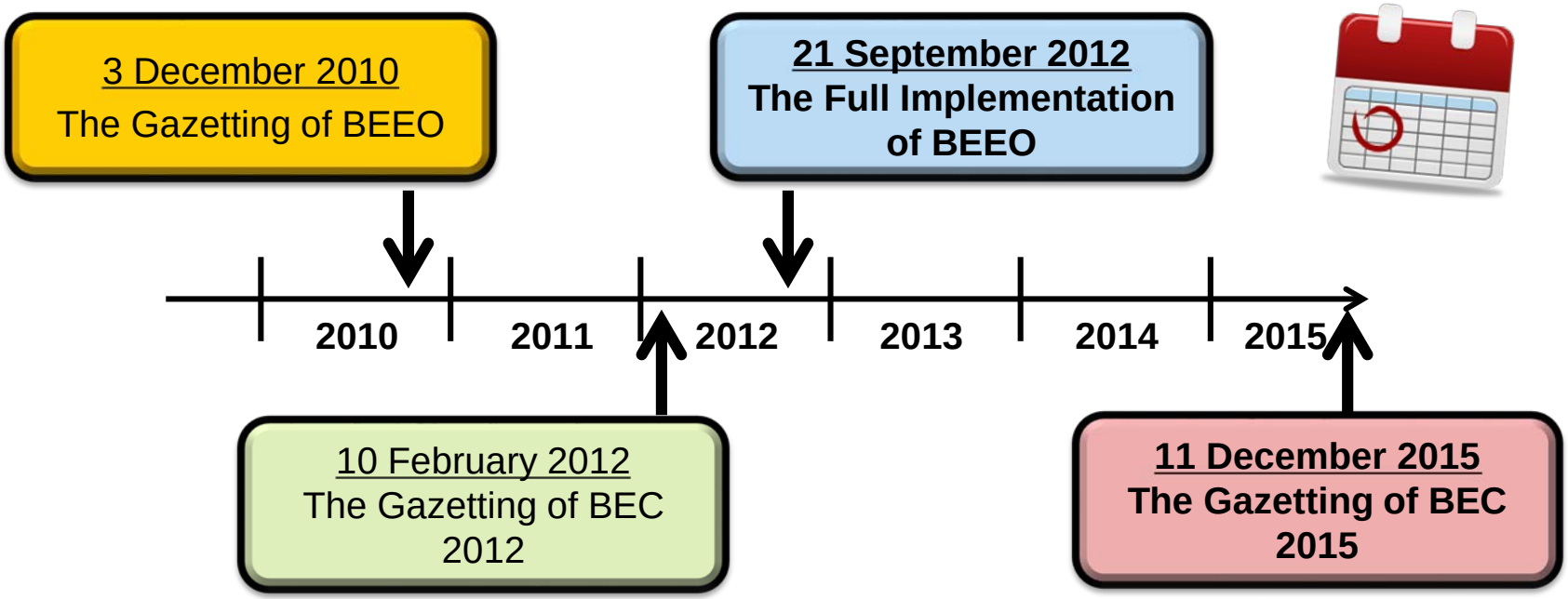
Topics

- Brief on Legislative Framework of BEEO (Cap 610)
- Types of Statutory Submissions under BEEO
- Introduction of BEC 2015 and TG-BEC 2015
- BEC Requirements on Building Services Installation
- Introduction of EAC 2015 and TG-EAC 2015
- Technical Forms – New items & Changes

Legislative Framework



Milestone


3 December 2010
The Gazetting of BEEO
21 September 2012
The Full Implementation of BEEO
2010
2011
2012
2013
2014
2015
10 February 2012
The Gazetting of BEC 2012
11 December 2015
The Gazetting of BEC 2015

Buildings Energy Efficiency Ordinance

- To promote enhancement of HK's building energy efficiency thro' :-
  Compliance with Building Energy Code (BEC)

- Newly constructed buildings
- Major retrofitting works

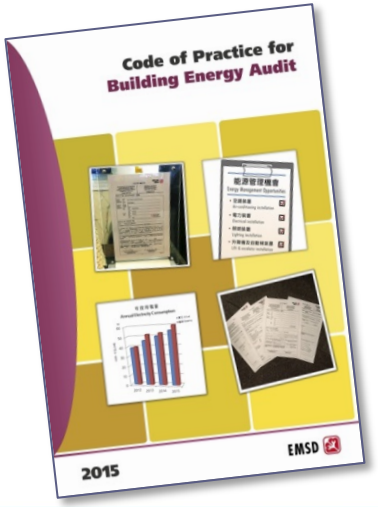
Comply with the min. design standards – 4 BSI

1) lighting
2) Electrical
3) air-conditioning
4) lift and escalator installations

→

Buildings Energy Efficiency Ordinance

- To promote enhancement of HK's building energy efficiency thro' :-
  Compliance with Energy Audit Code (EAC)



- Commercial Buildings
- Commercial Portion of Composite Buildings

In addition to the compliance with the BEC:

➢ Conduct energy audit for central BS installations every 10 years

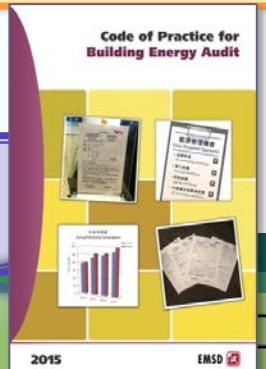
Legislative Framework

BEC

1) Commercial building
2) Industrial building - common area
3) Residential building - common area
4) Composite building - commercial portion
5) Composite building - common area of portion for residential or industrial use
6) Hotel & guesthouse
7) Educational building
8) Community building
9) Municipal services
10) Hospitals & clinics
11) Government building
12) Airport passenger building
13) Railway station

EAC

- Commercial building
- Composite building – commercial portion



New Building - Certificate of Compliance Registration(COCR)

- ✓ Applicable to 13 types prescribed buildings in Schedule 1 in Cap 610
- ✓ **Stage 1 Declaration**
  - Submitted within **2 months** after ***consent date of commencement of superstructure works***
  - Prescribed BSIs will comply with the BEC Code

- ✓ **Stage 2 Declaration**
  - Submitted **4 months** after ***Occupation Permit*** date
  - Prescribed BSIs have been complied with the BEC edition of *not lower than* the declaration in Stage 1

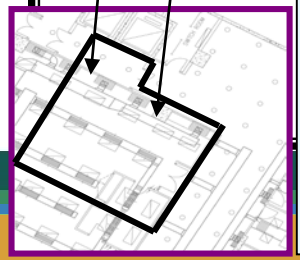
Existing Building - Form of Compliance (FOC)

Major Retrofitting Works (MRW)

Works Area

Addition/replacement of a BS installation specified in the BEC at the following conditions –

- total floor area covered by the works (i.e. works area) ≥ 500 m² in a unit or a common area
- Works conducted as a same series of works in phases or at different places, total floor area covered by these works (i.e. works area) within 12 months aggregating to ≥ 500 m²



All relevant factors **:

1. a single contractor
2. a single arrangement
3. a single works order
4. time and period of the works
5. contractor's payment manner
6. **Single project** in the **plans and works program**

**Notes (3), Schedule 3 of the BEEO

Existing Building - Form of Compliance (FOC)

Major Retrofitting Works (MRW)

1) Air-conditioning Installation

- Replacement of Chillers, replacement of AHU, unitary air-conditioner in works area ≥ 500m²

3) Lighting Installation

- Replacement of light fittings ≥ 3 KW (~ 250m²)

4) Lift & Escalator Installation

- Upgrade of Lift (eg. AC2 to VVVF), replacement of escalator.

Central BS installation

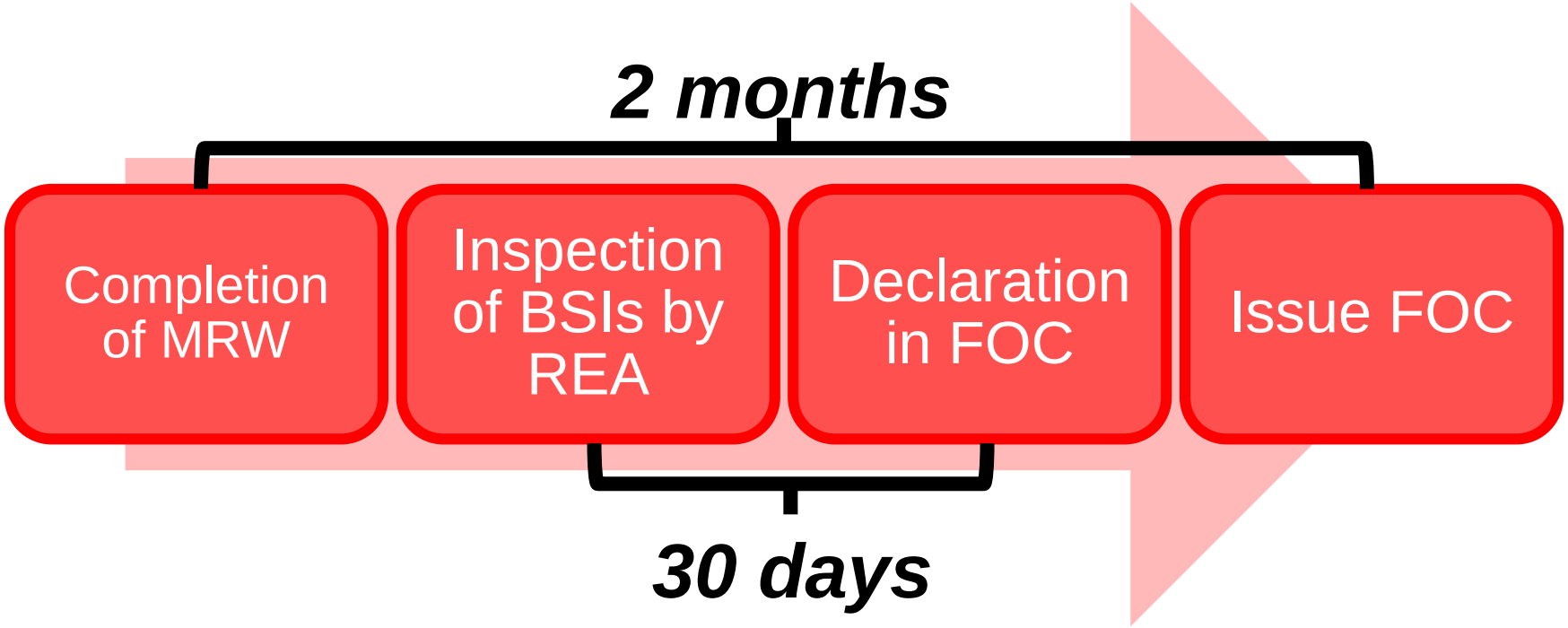
Addition/replacement of a main component of a central BS installation, include: –

a complete electrical circuit at rating ≥ 400A;

a unitary air-conditioner or a chiller at rating ≥ 350kW (cooling or heating);

motor drive + mechanical drive of a lift, escalator or passenger conveyor.

Existing Building - Form of Compliance (FOC)



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**

Step Up Enforcement Action

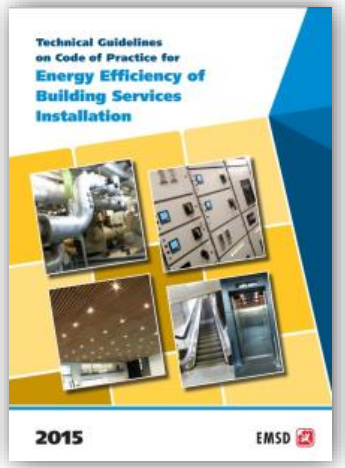
- **Improvement Notice** have been issued for non-compliance cases

- **Prosecution action** will be instigated

No. of issued Improvement Notice	114
No. of prosecution	5
Fine for each prosecution case	$2,000 - $21,000

Buildings Energy Efficiency Ordinance

- BEC 2015 issued on 11 Dec 2015
- 6-month & 9-month grace periods
- TG-BEC2015 issued on 30/6/2016
- Elaborates BEEO & BEC 2015 contents (including tightened and new requirement)
- Technical enquiry consolidated
- Good Practice – to exceed min. requirements in BEC



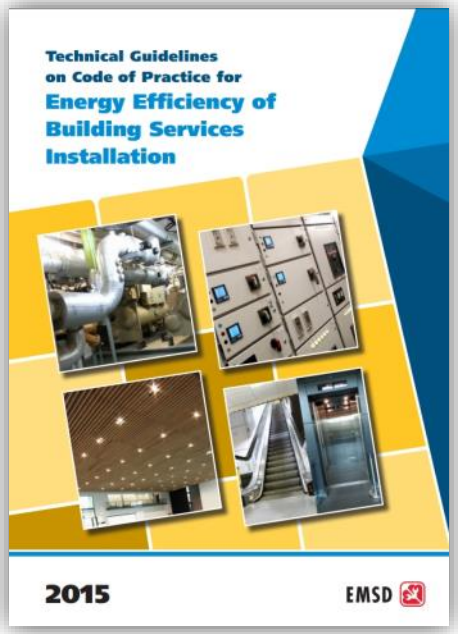
TG-BEC2015 Contents

- 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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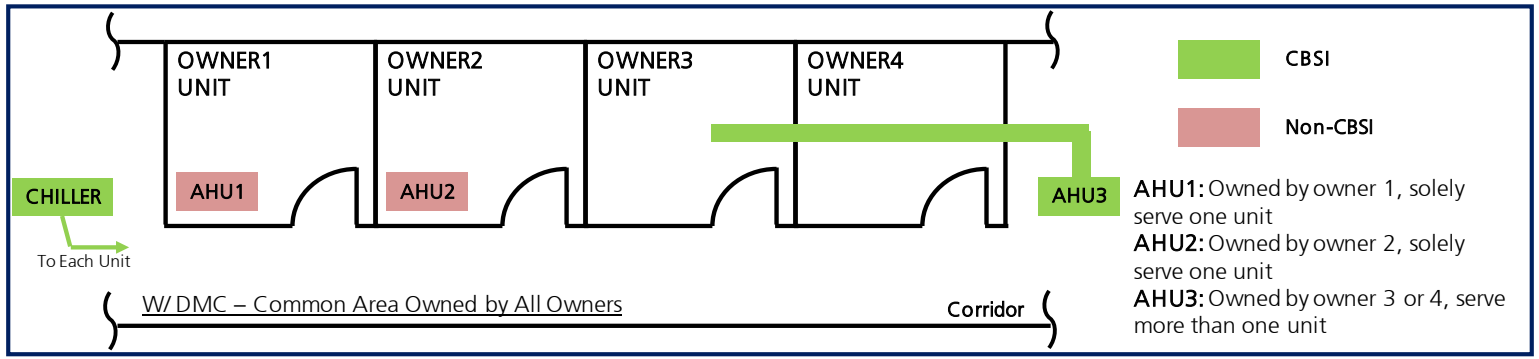
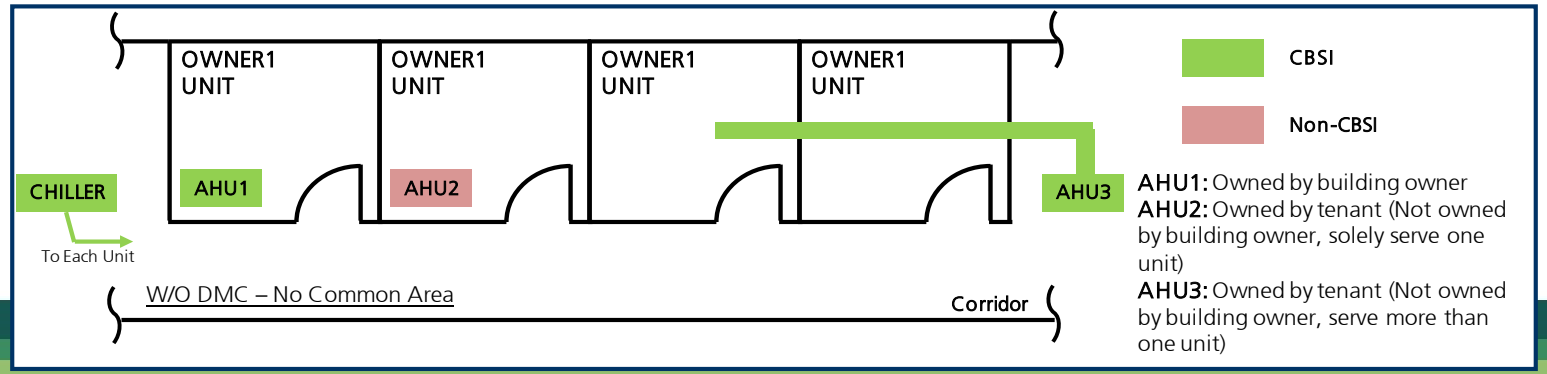
Effective Dates of the BEC 2015

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

TG-BEC2015 Compliance Process

CBSI & Non-CBSI





- Air-conditioning Installation

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)

BEC2015 Requirements on Air-conditioning Installation

System Fan Motor Power

CAV – 1.6 W per L/s
VAV – 2.1 W per L/s
MV – 1.1 W per L/s
Exceptions: system fan motor power < 2.5 kW

Deductible Fan Motor Power

- 250 Pa equivalent deductible fan power
- Applicable to CAV and VAV
- Not applicable to MV

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

Pumping System Variable Flow

- System capable of operating at ≤ 50% of design flow
- Flow reduction by
  - Chiller & pump sequencing (plant cap. to cope w/ bldg. load)
  - Valves on/off/modulation
  - Reduced speed of variable-speed pumps
- Manual operation to achieve flow reduction NOT acceptable
- Motor output power > **3.7kW** → VSD & consumes **30% FL Power @ 50% FL Speed**
- Exemptions
  - Small system or system with chilled water supply temperature reset

TG-BEC2015 Requirements on Air-conditioning

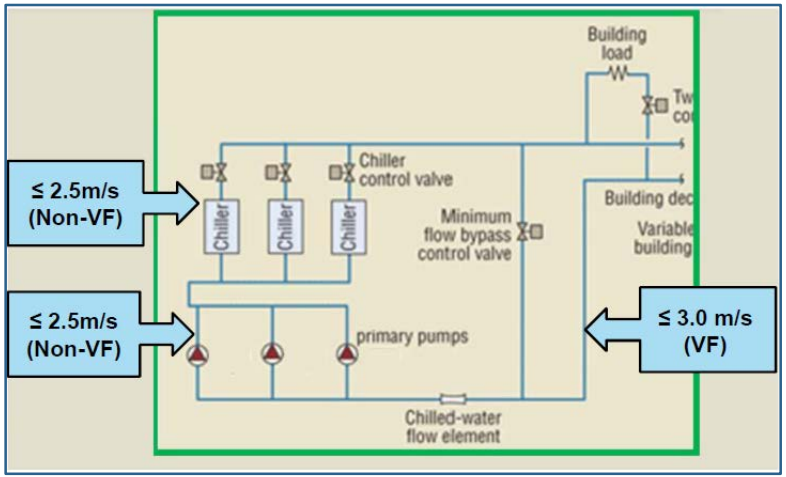
Clause 6.7
Tightening requirement on Air Distribution System Fan Power (Conditioned Space)

TG-BEC2015 Requirements on Air-conditioning

Water Piping Frictional Loss

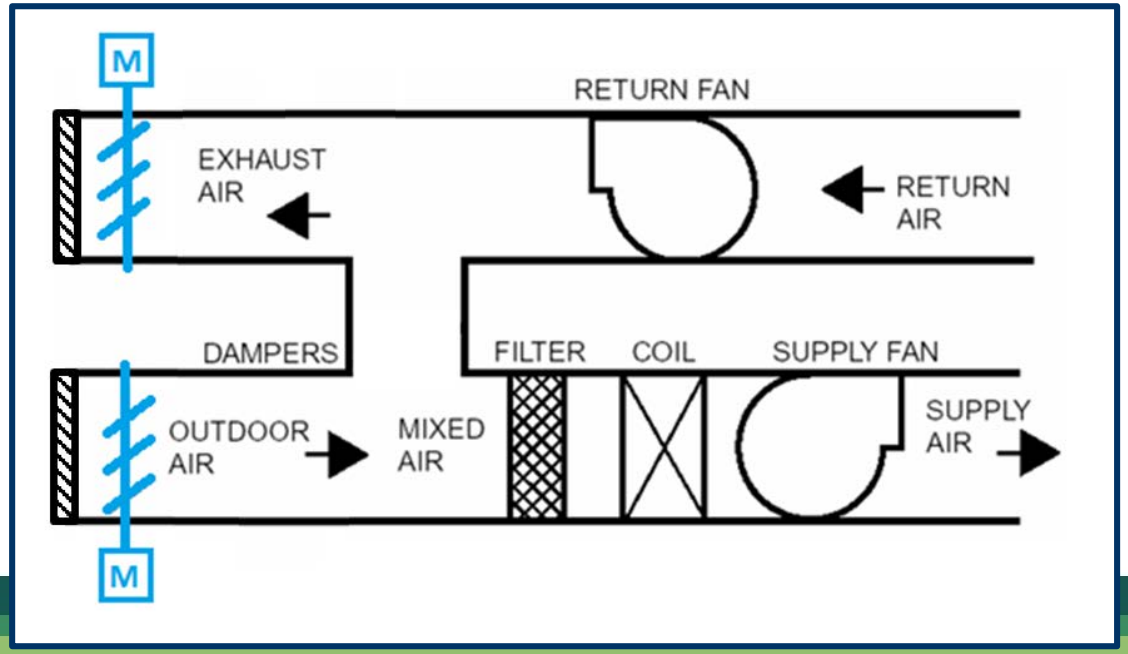
Table 6.9 : Frictional Loss Requirement of Water Piping System		
Piping Diameter (mm)	Greater than 50mm	50mm
Frictional loss (Pa/m)	≤ 400 Pa/m	Not applicable
Water flow velocity (m/s)	≤ 2.5 m/s (non-variable flow condition) ≤ 3.0 m/s (variable flow condition)	≤ 1.2 m/s

- Applicable to chilled water, heated water and condenser water piping



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

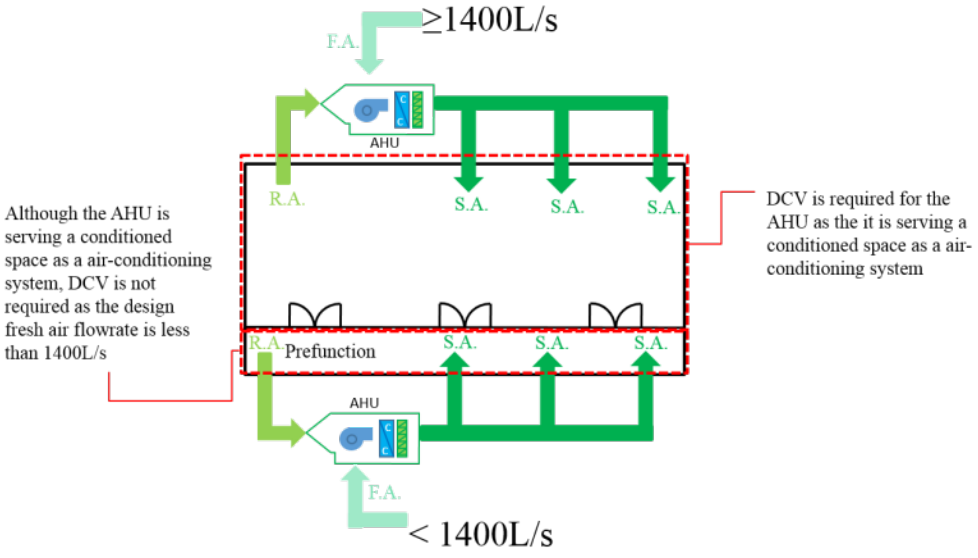
System Control – Carpark DCV

Carpark	***Clause 6.10.7.1***
Staging or modulation of ventilation fans	To ***≤ 50%*** design capacity based on the detected contaminant level
Basement floor : allow with temperature control	

Figure 6.10.7 (a): Example of CO/NO Sensor

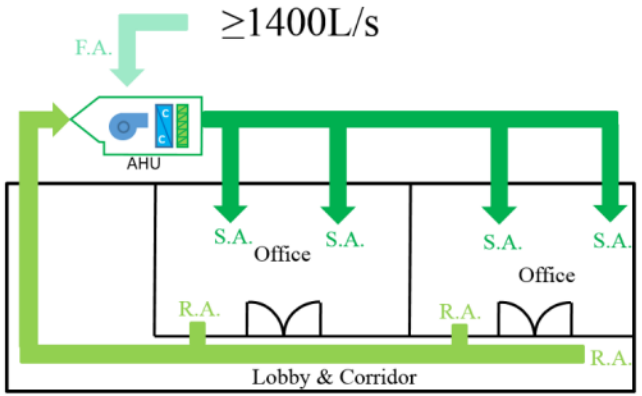
TG-BEC2015 Requirements on Air-conditioning

System Control – Air-conditioned Space DCV



Although the AHU is serving a conditioned space as a air-conditioning system, DCV is not required as the design fresh air flowrate is less than 1400L/s

DCV is required for the AHU as the it is serving a conditioned space as a air-conditioning system



DCV is not required as the AHU is serving more than one 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)	3.1 (@2)	2.6	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

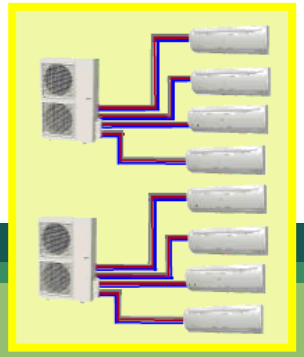
Unitary Air- Conditioner (U-A/C)

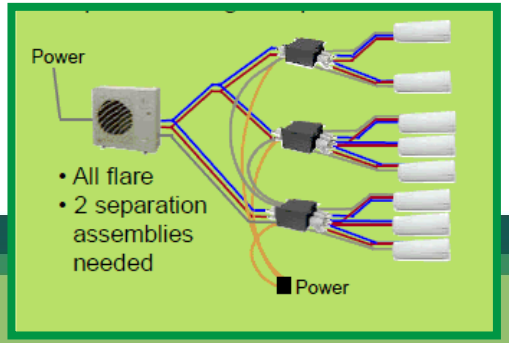
Variable Refrigerant Flow (VRF) System

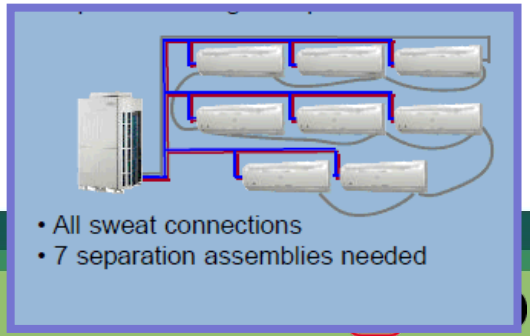
TG-BEC2015 Requirements on A/C

U-A/C Vs VRF System

Typical multi-split	Hybrid multi-split	Typical VRF System
CS or VS	VS typically	VS
4 to around 10 kW	8 to around 20 kW	From 25 kW to over 200 kW
≤ 4 indoor units	Up to 8 or 9 indoor units	Over 60 indoor units
All EVs at outdoor unit	Up to 3 EVs inside a distribution box each connecting 2 to 3 indoor units	EV located inside each indoor unit
May have only simple control	Typically with computerized zone control	Computerized zone control







TG-BEC2015 Requirements on A/C

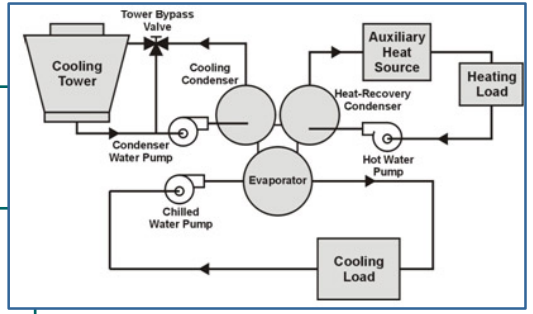
Minimum COP for Chiller

Equipment Type		**BEC 2012 (Rev. 1)**	**BEC 2015**	
Chiller - Water Cooled		***Table 6.12b***	***Table 6.12b***	
Centrifugal				
	1000 to 3000kW	5.6	5.7	
	Above 3000 kW	5.7	5.8	
VSD Centrifugal (New)		Not Specified		
	1000 to 3000kW		5.5	7.1 (75%)
	Above 3000 kW		5.6	7.2 (75%)

(1) VSD at full load
(2) VSD at 75% load

TG-BEC2015 Requirements on Air-conditioning

A/C Equipment Efficiency



Less common chiller	➢ Absorption chiller ➢ Heat recovery chiller
High temp. chiller	➢ Equipment rack cooling ➢ Chilled beam system
Heat pump	➢ Governed under the BEC ➢ COP figures will be formulated
VSD chiller	➢ Part load performance – 75% FL ➢ Oil-free/ magnetic bearing chillers

- Electrical Installation

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

	BEC 2012	BEC 2015	% 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

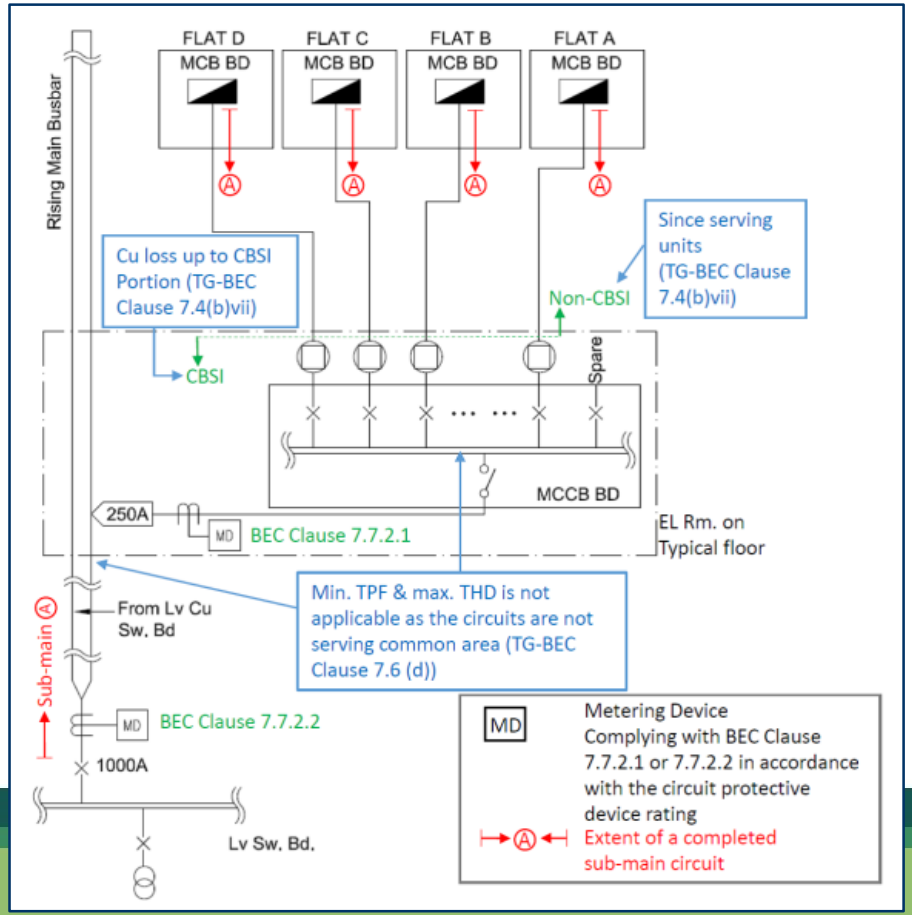
Metering Provision is required for:-

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

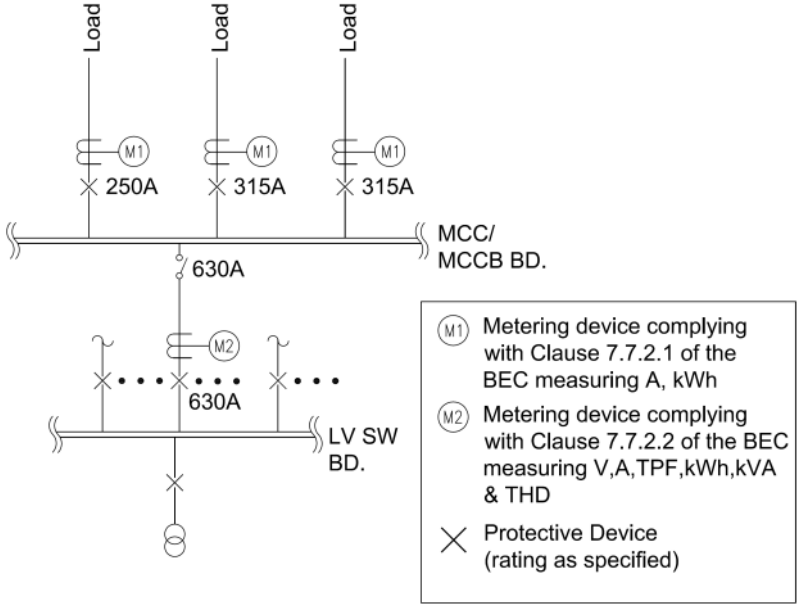


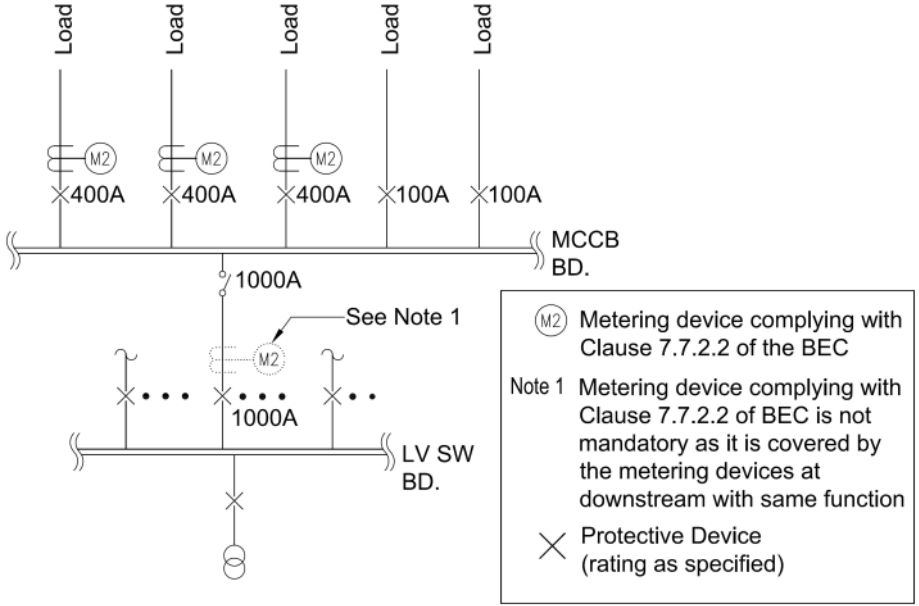
Sub-Circuit Serving Units

- 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

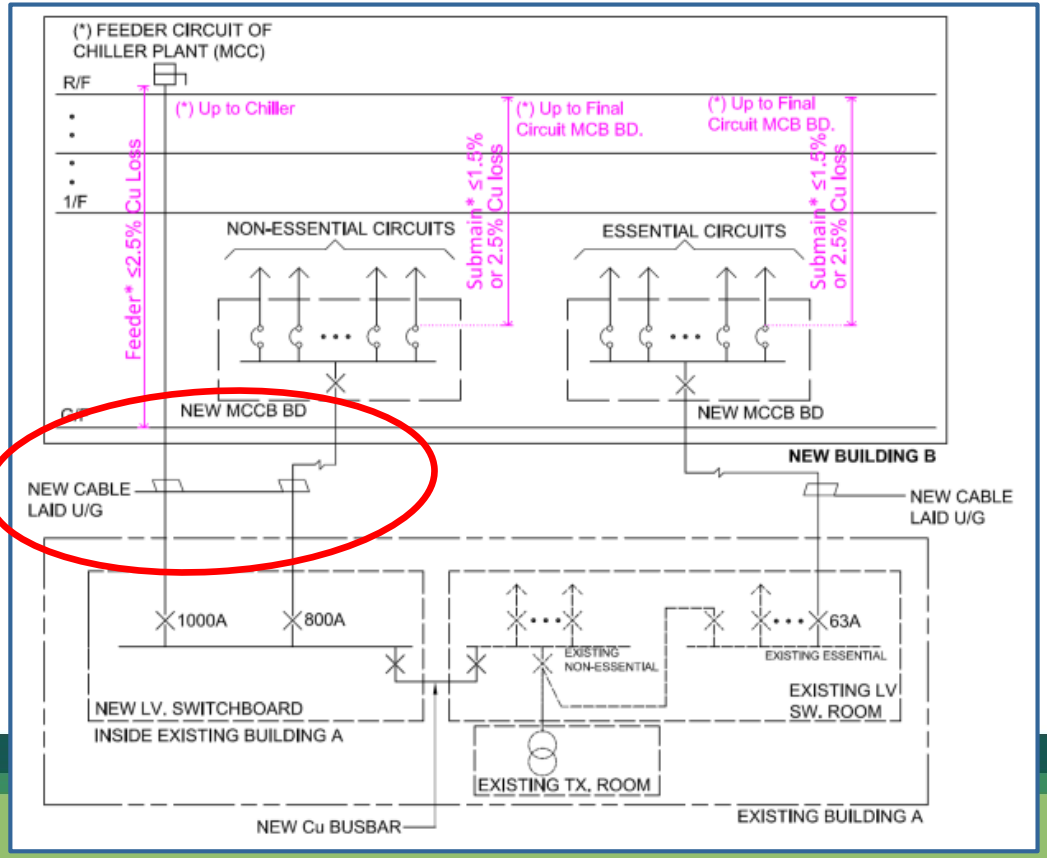
Sub-Circuit Metering Device





TG-BEC2015 - Requirements on Electrical

Works Involving Two Buildings (New)

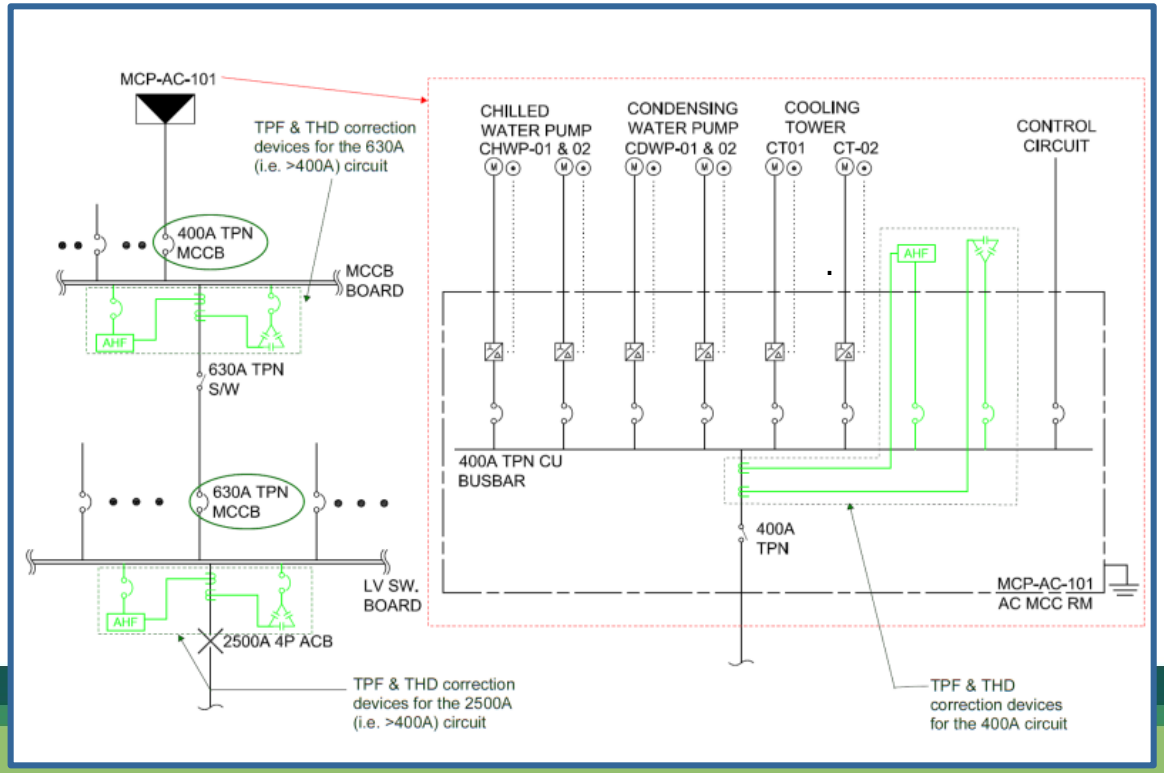


TG Clause 7.4 (b) ix)

- Newly constructed prescribed building with power supply fed from an existing building
- Cu loss confines within the portion of cable within the new building.
- Works in the the existing building might not be regarded as MRW (not involving completed sub-main/feeder circuits
- N/A to towers on development podium (especially newly constructed buildings)

TG-BEC2015 - Requirements on Electrical

Power Quality



Clause 7.6.1 – Total Power Factor

Clause 7.6.2 – Total Harmonic Distortion

- Lighting Installation

BEC2015 Requirement on Lighting Installation

1) Lighting Power Density (W/m^2)
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/m^2)' 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:

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

,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.

BEC2015 Requirement on Lighting Installation

Table 5.4
LPD Requirement Covers New Spaces

Type of Space	BEC 2015 LPD (W/m^2)
Computer Room / Data Centre	15
Court Room	15
Passenger Terminal Building	13 -18
Refuge Floor	11
School Hall	14

Table 5.4
LPD Requirement of Certain Spaces Tightened

Type of Space	BEC 2012 (Rev. 1) (W/m^2) (effective in 2014)		BEC 2015 (W/m^2)
Office	13	→	12
Classroom	13	→	12
Loading & Unloading Area	10	→	8
Plant Room	11	→	10

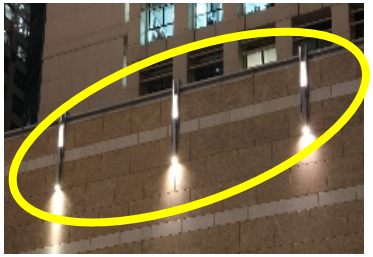
BEC2015 Requirement on Lighting Installation

Clause 5.4.1
Exception on LPD requirement

BEC 2012 (Rev. 1)	BEC 2015
Does not exceed 100W	Does not exceed 70W

TG-BEC2015 Requirements on Lighting

BEC Non-applicable Installations (examples) Table 5.1.2

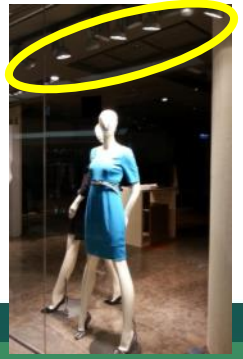


External building facade

Signage

Non-maintained

Signage (advertisement)



Display

Decoration

Stage

TG-BEC2015 Requirements on Lighting

BEC Non-applicable Installations (examples)

Festival

Non fixed type

Research
(illuminating testing in fume cupboard)

Surgical

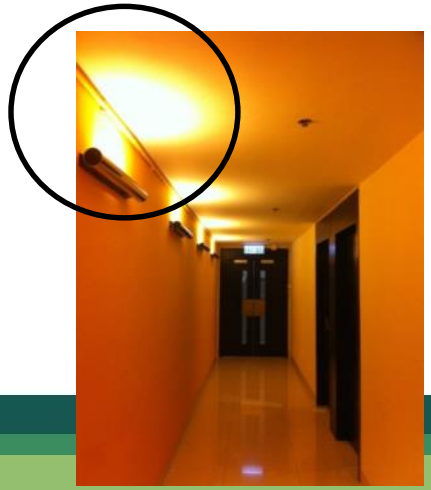
Plant growth

Luminaires for sale in a shop

TG-BEC2015 Requirements on Lighting

Lighting Power Density (LPD)

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



Pendent light

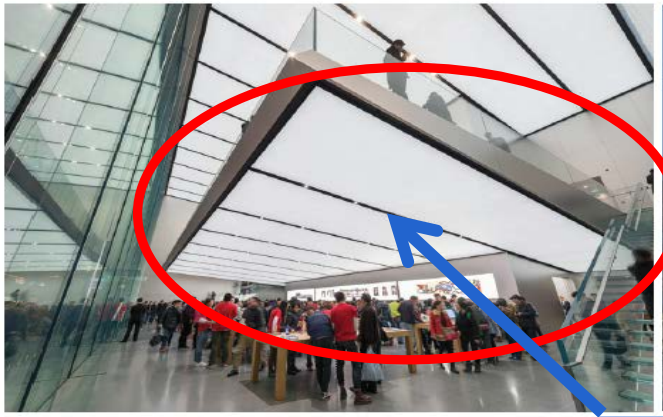
Indirect light

Lighting besides mirror

Cove Lighting

TG-BEC2015 Requirements on Lighting

Lighting Power Density (LPD)



Providing substantially uniform level of illumination throughout an area

→ General lighting;
→ Not solely used for decoration.

TG-BEC2015 Requirements on Lighting

Lighting Control Points (LCP) – Clause 5.5

For Office

- No. of lighting control point : **No Change**
- Reduction of lighting control point : **No Change**

For Other Spaces

One control point covers **≤500m²**

Lighting Control Point (LCP)

- Manual on/off switch;
- 2-way switch;
- Relay or contactor

Not regarded as LCP

- Occupant sensor;
- Photo sensor

LCP - Exemption for lighting installation of 7-day & 24-hour operation

TG-BEC2015 Requirements on Lighting

Automatic Lighting Control (ALC) – Clause 5.6

- 21 Spaces (BEC Table 5.4, 3rd Column)
- Bare shell tenancy space, may not have ALC at Stage 2 Submission.
- Document proof about picking up of ALC's scope

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

Type of Space	Maximum Allowable LPD (W/m^2)	Automatic Lighting Control Required (Yes / No)
Atrium / Foyer with headroom over 5m	17	Yes
Bar / Lounge	14	No
Banquet Room / Function Room / Ball Room	20	No
Canteen	11	No
Car Park	5	Yes, at parking spaces only
Classroom / Training Room	12	Yes
Clinic	15	No
Computer Room / Data Centre	15	Yes
Conference / Seminar Room	14	Yes

Basic Provision (Clause 5.6.1)

ENERGY SAVING FOR ALL 全民節能

Automatic Lighting Control:

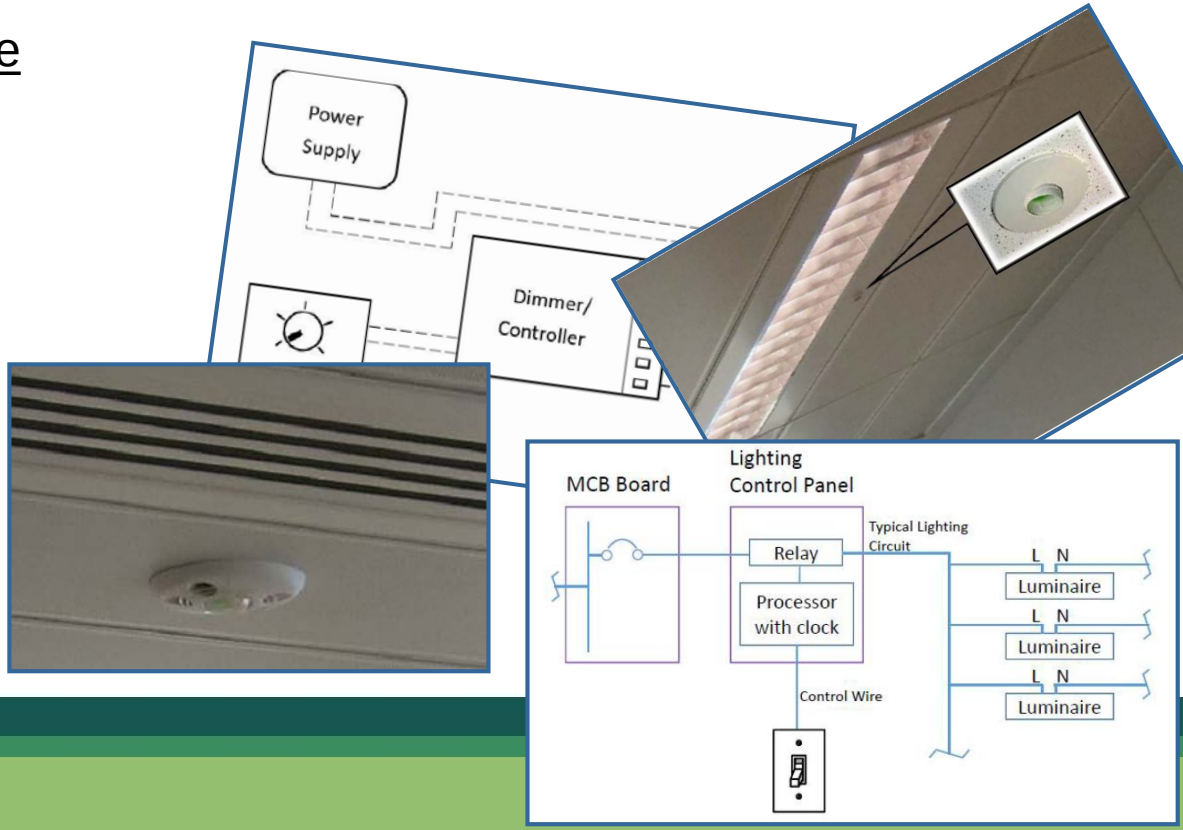
- To shut off or reduce the general lighting power by at least ***50% automatically***
- Control devices/systems : < **2000 m²**;
- Weekend & holiday operation pattern -
  Except **7-day 24-hour** operation lighting; and
- Serve no more than one floor, unless the multiple floors are -
  - of similar configuration;
  - With similar lighting layout; and
  - of lighting installations under same owner (e.g. staircase).

TG-BEC2015 Requirements on Lighting

Automatic Lighting Control (ALC)

Common Technology Available

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



Daylight Responsive Control (Clause 5.6.2 & 5.6.3)

ENERGY SAVING FOR ALL

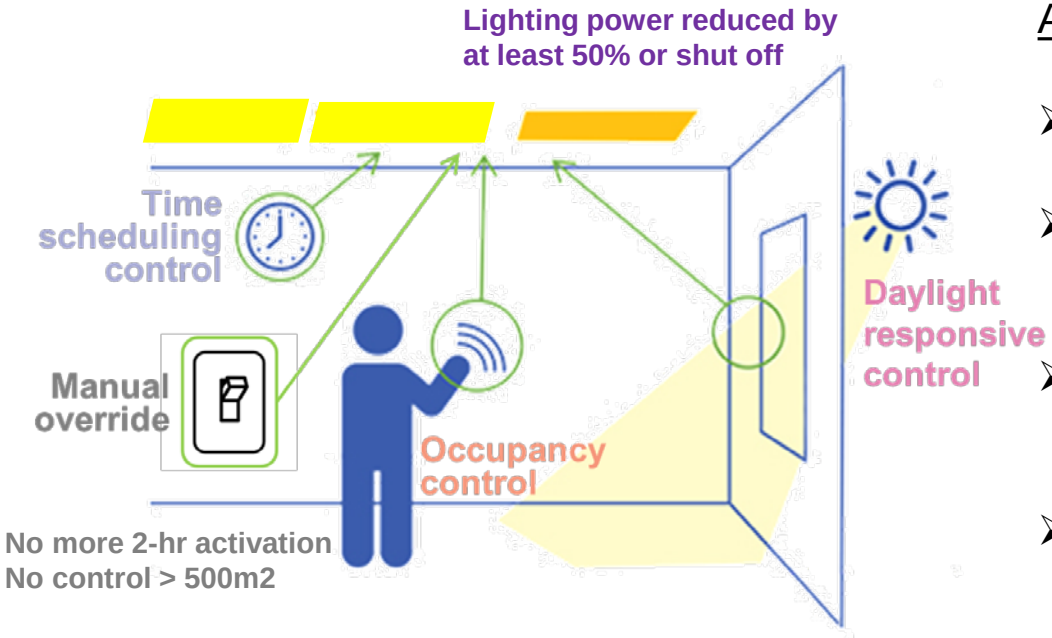
Thro' Fenestrations on Exterior Wall	Thro' Overhead Skylight
➢ Area of Fenestration(s) ≥ $5m^2$	
➢ A discrete fenestration or a series of fenestrations serves one lighting zone	
➢ Separated control device for each lighting zone	
➢ Shut off or reduce lighting power to 50% or less	
Lighting zone's area • ≥ 2 x fenestration area (discrete); • ≥ 2 x sum of fenestration areas	Lighting zone's area • ≥ 5 x fenestration area (discrete); • ≥ 5 x sum of fenestration areas

Exception:

- **Non-see-through** fenestration;
- Fixed lightings ≤ ***150W*** (wholly or partially within ***a lighting zone***);
- Overlapped area of any lighting zone assigned under other daylight responsive control

TG-BEC2015 Requirements on Lighting

Automatic Lighting Control (ALC)



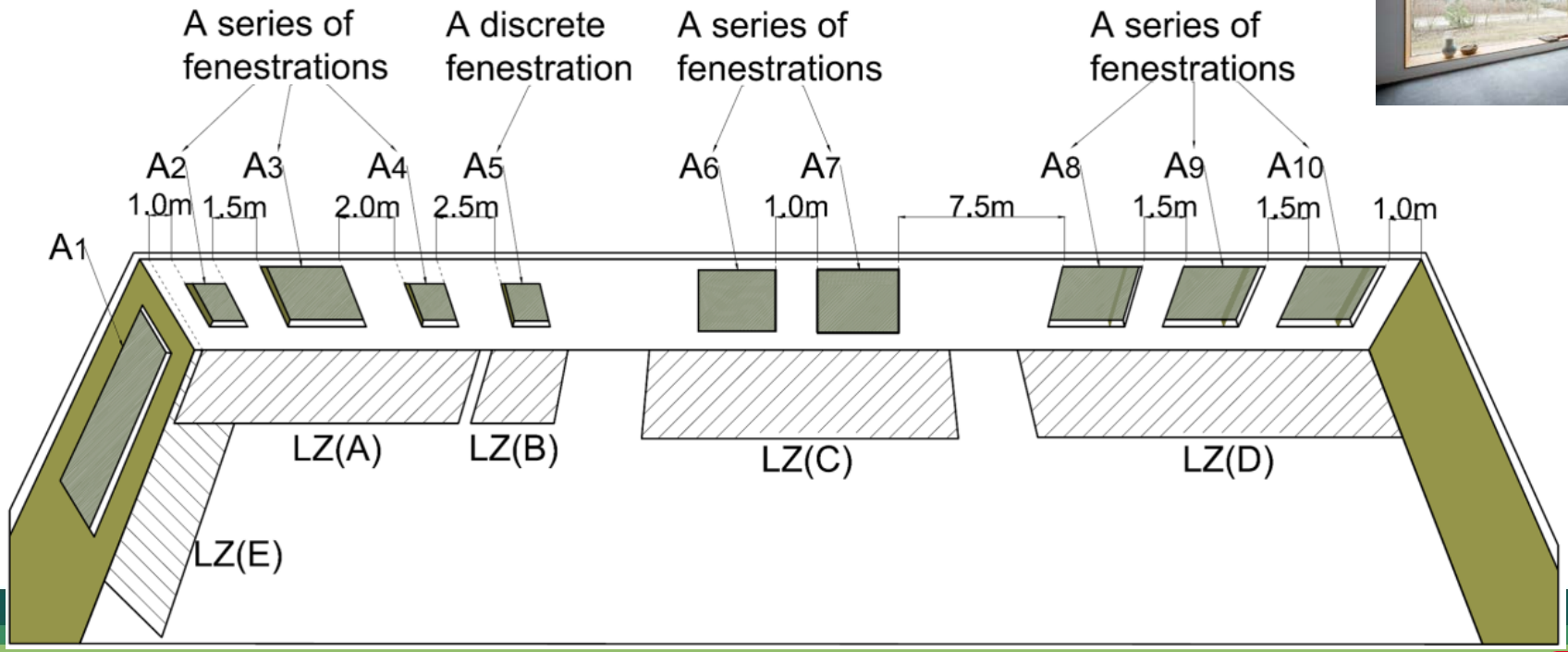
Applicability

- > 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)



TG-BEC2015 Requirements on Lighting

Daylight Responsive Control

Applicable Examples

Non-applicable Examples

- Lift and Escalator Installation

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**

BEC2015 Requirement on Lift and Escalator Installation

Max. Allowable Electrical Power – Clause 8.4

- Max. allowable escalator electrical power ⇩ **2 %**
- Max. allowable hydraulic lift electrical power ⇩ **5 %**
- Max. allowable passenger conveyer electrical power ⇩ **2 %**

TG-BEC2015 - Requirements on Lift & Escalator

Max. Allowable Electrical Power – Clause 8.4

Table 8.4.1a : Maximum Electrical Power (kW) of Traction Drive Lift at Rated Load for Various Ranges of Rated Speed
(applicable to new building)

Rated Load L (kg)	Rated Speed Vc (m/s)				
	Vc < 1	1 ≤ Vc < 1.5	1.5 ≤ Vc < 2	2 ≤ Vc < 2.5	2.5 ≤ Vc < 3
L < 750	6.5	9.2	11.1	14.7	16.6
750 ≤ L < 1000	9.2	11.1	15.7	19.4	22.1
1000 ≤ L < 1350	11.1	15.7	20.3	24.9	29.5

Table 8.4.1 of BEC 2012
→ Table 8.4.1a and Table 8.4.1b of BEC 2015

Requirements the same as BEC 2012

Table 8.4.1b : Maximum Electrical Power (kW) of Traction Drive Lift at Rated Load for Various Ranges of Rated Speed
(applicable to major retrofitting works in an existing building)

Rated Load L (kg)	Rated Speed Vc (m/s)				
	Vc < 1	1 ≤ Vc < 1.5	1.5 ≤ Vc < 2	2 ≤ Vc < 2.5	2.5 ≤ Vc < 3
L < 750	6.7	9.5	11.4	15.2	17.1
750 ≤ L < 1000	9.5	11.4	16.2	20	22.8
1000 ≤ L < 1350	11.4	16.2	20.9	25.7	30.4
1350 ≤ L < 1600	14.3	19	25.7	30.4	36.1

Table 8.4.1 of BEC 2012
→ Table 8.4.1a and Table 8.4.1b of BEC 2015

TG-BEC2015 - Requirements on Lift & Escalator

Lift Decoration Load – Clause 8.5.2

Max. lift decoration load ⇩ **10 %**

Table 8.5.2 : Maximum Lift Decoration Load

Lift Rated Load L (kg)	Allowable Decoration Load D (kg)
L < 1800	D = 0.5 x L, or 540 whichever is smaller
L ⩾ 1800	D = 0.3422 x L – 0.00002344 x L^2, or 1125 whichever is smaller

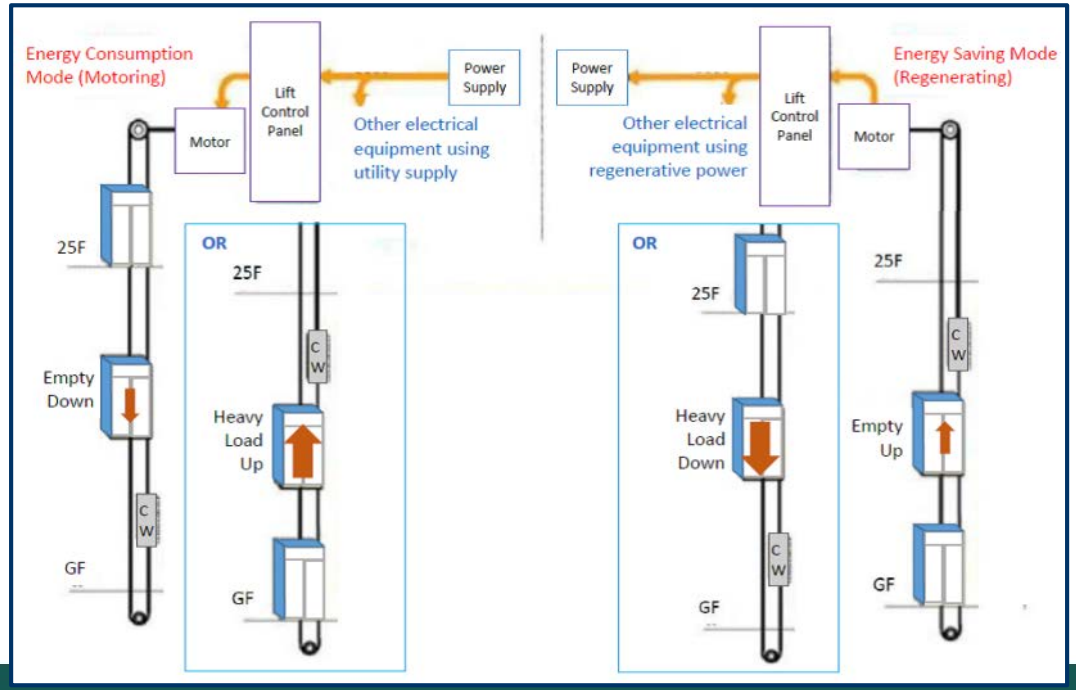
Example

- 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 ≥3m/s and rated load at ≥ 1000kg**
- **Power generated shall be fed towards the supply source of the lift**
- **Wastage of generated power e.g. consumed by resistor not acceptable**

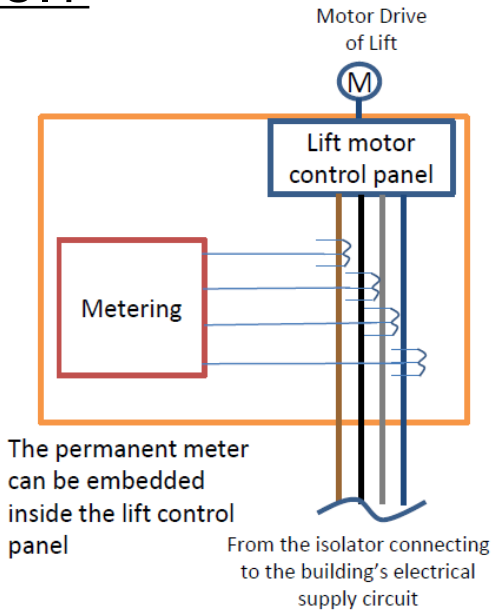
TG-BEC2015 - Requirements on Lift & Escalator

Provision of Automatic Speed Reduction - 8.5.7

TG-BEC2015 – Requirements on Lift & Escalator

Metering & Monitoring Facilities – Clause 8.7

- Permanent fixed metering devices
- 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
- Good Practice
  - Metering - transmit measured data to BMS



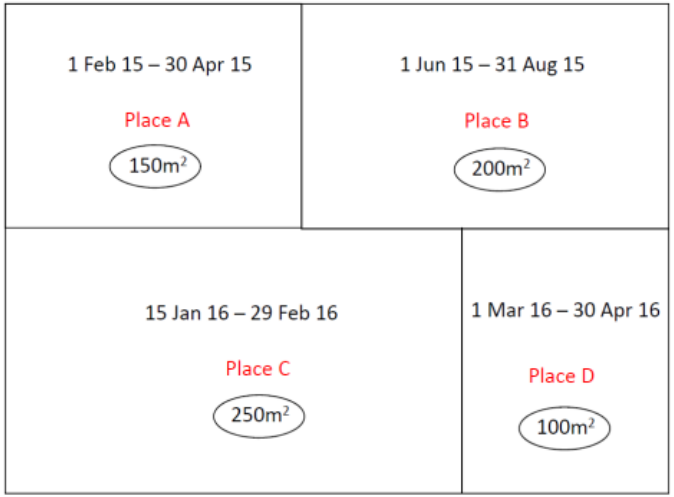
TG-BEC2015 – Performance-based Approach

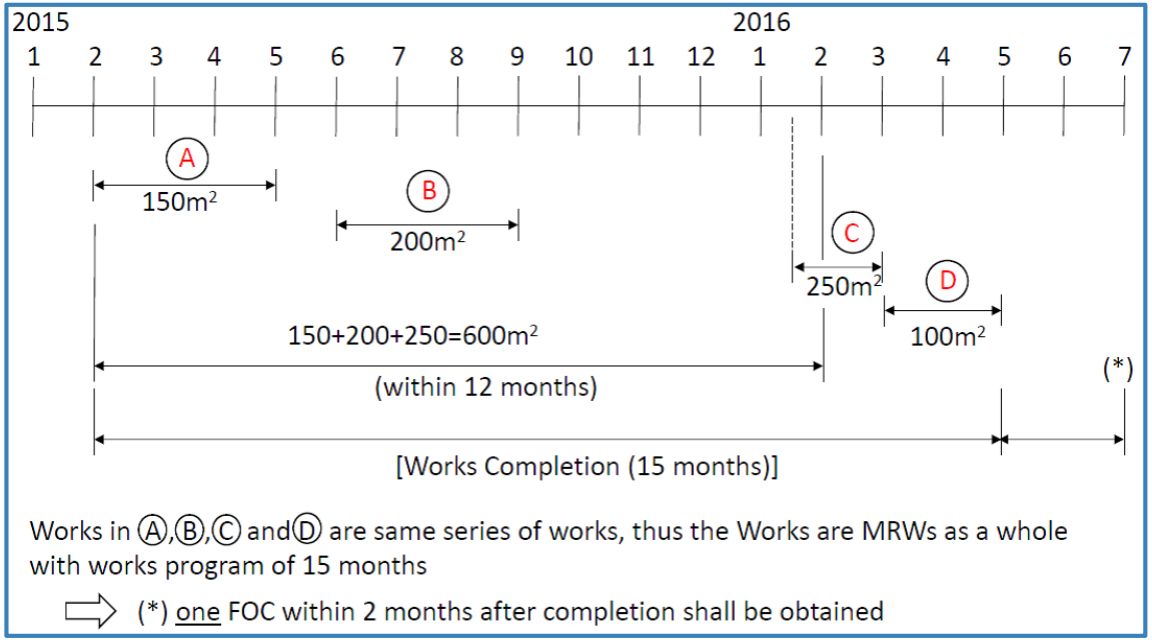
Trade-off items cover all the 4 BSIs **(15% Threshold)**

Lighting installation (3 items)
LPD; Lighting Control Point and Automatic Lighting Control
Air-conditioning installation (9 items)
e.g. Insulation Thickness & Pipe Friction Loss etc.
Electrical installation (3 items)
Motor Efficiency; Cu Loss & Power Quality
Lift and escalator installation (3 items)
Electrical power; Utilization of Power & Total Harmonic Distortion

TG-BEC2015 – Major Retrofitting Works

Same Series of Works in 12-month





Works in Ⓐ,Ⓑ,Ⓒ and Ⓓ are same series of works, thus the Works are MRWs as a whole with works program of 15 months

⇨ (*) one FOC within 2 months after completion shall be obtained

TG-BEC2015 – Major Retrofitting Works

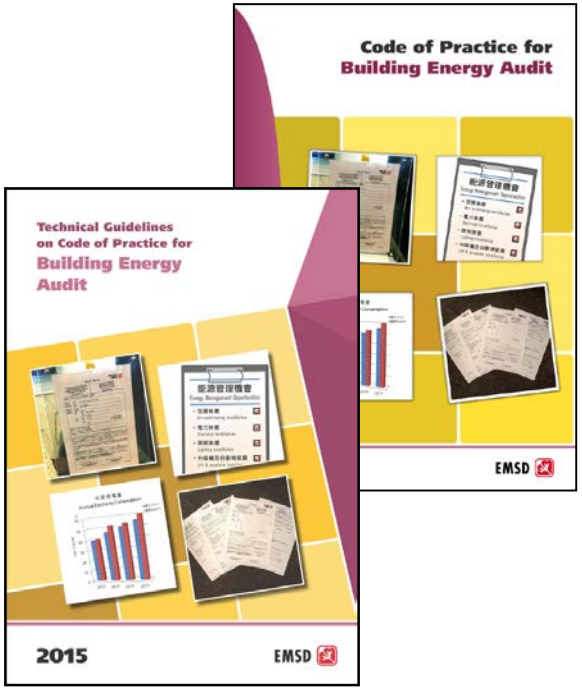
Relocation of Luminaires

Conditions:

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

TG-EAC2015

- EAC 2015 issued on 11 Dec 2015
- 6-month grace period
- TG-EAC 2015 issued on 12 Aug 2016
- Explains BEEO & EAC 2015 contents
- Good Practice – to exceed EAC min requirements
- Not to replace the TG-EAC 2012



TG-EAC2015 Contents

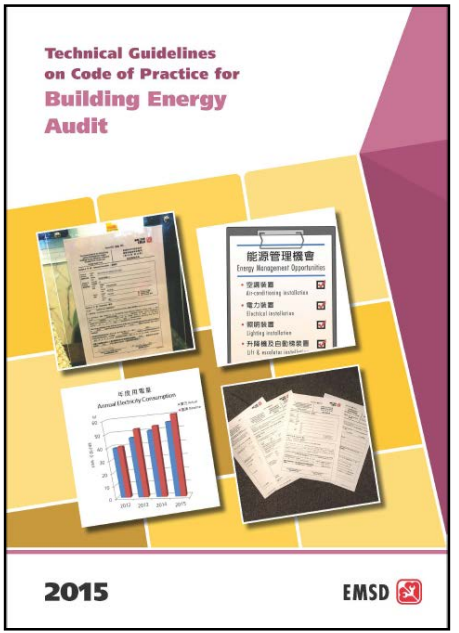
- 9 sections

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



Technical Form EE-EAes 2015 (V.0)

Part 1 – Administrative Information & Building Characteristics

(b) Air-conditioning pumps		Pump motor input power ^35		Pump capacity ^35		Quantity	Performance (W per L/s)
		Measured / Calculated (kW)	Rated (kW)	Measured / Calculated (L/s)	Rated (L/s)		
(i) Chilled water pumps	Primary circuit, sub-total of all pumps ^27						
	Secondary circuit, sub-total of all pumps ^27						
	Total, of all chilled water pumps ^27A						
(ii) Condenser water pumps	Fresh water, sub-total of all pumps ^27						
	Sea water, sub-total of all pumps ^27						
	Total, of all condenser water pumps ^27B						
(iii) **Heater water pumps - total of all** heated water pumps ^27							

(c) Heat rejection	Fan motor input power ^35		Rated heat rejection capacity (kW) ^27C	Quantity	Performance (kW / kW) ^27C
	Measured / Calculated (kW)	Rated (kW)			
Sub-total, of all cooling towers ^27C					
Sub-total, of all radiators ^27C					
Total, of all heat rejection equipment ^27C					

(d) Air-conditioning fans	Fan motor input power ^35		Fan capacity ^35		Quantity	Performance (W per L/s)
	Measured/ Calculated (kW)	Rated (kW)	Measured/ Calculated (L/s)	Rated (L/s)		
Sub-total, of all AHUs & FCUs (excluding primary air AHU) ^27						
Sub-total, of all primary air AHUs, fresh air and return air fans (for conditioned areas) ^27						
Total, of all air-conditioning fans ^27D						

Percentage (based on total fan rated motor power) of all air-conditioning fans (add up to 100%) :	for office floors	for shopping & leisure floors	for other floors

(e) Chilled / Heated water plant sequencing control		
Please indicate if automatic sequencing control is provided:	☐ Yes	☐ No
(f) Overall COP of chiller plant ^27E (kW/kW)		
(g) Overall representative indoor room temperature set point in summer (°C):		

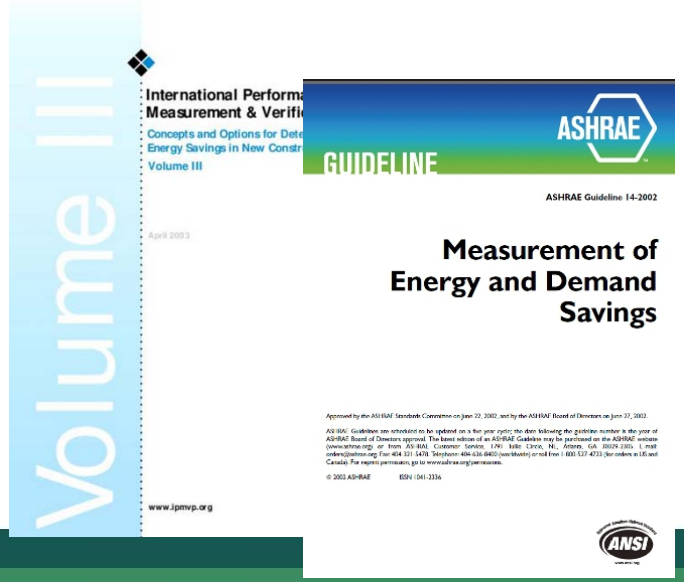
New columns for on-site measured data input

New input data required – Plant's overall COP

TG-EAC2015

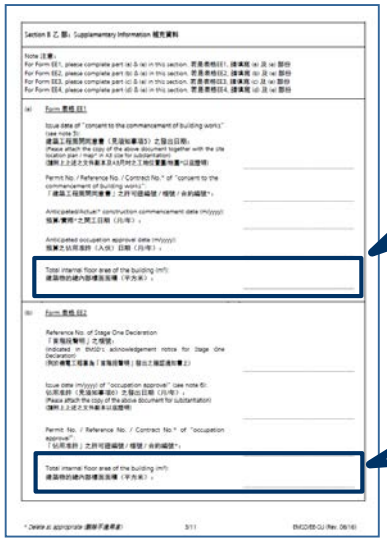
On-Site Measurement

- **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



Form EE-SU
(Rev. 06/16)
Page 3/11

Section B (a) Form EE1 (Stage One)

Total internal floor area of the building (m^2):
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 (m^2):
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.

《建築物能源效益守則》2015 照明裝置技術資料 表格 EE-LG

(請參照《屋宇裝備裝置能源效益實務守則》2015 版第 5 節)

第 6 部分 - 聲明

本人作為註冊能源效益評核人，現聲明已就本表格所填報的一切內容，及附作申核證明途的資料，進行了
善及徹底的審視，並證

本人明白，有關資料如

註冊能源效益評核人姓名:

註冊能源效益評核人簽署:

Technical Data of Air-Conditioning Installation for Building Energy Code (BEC) 2015 Form EE-AC

(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2015 Edition)

Part 10 – Declaration

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.

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.

Name of the REA:

Registration No.:

Signature of the REA

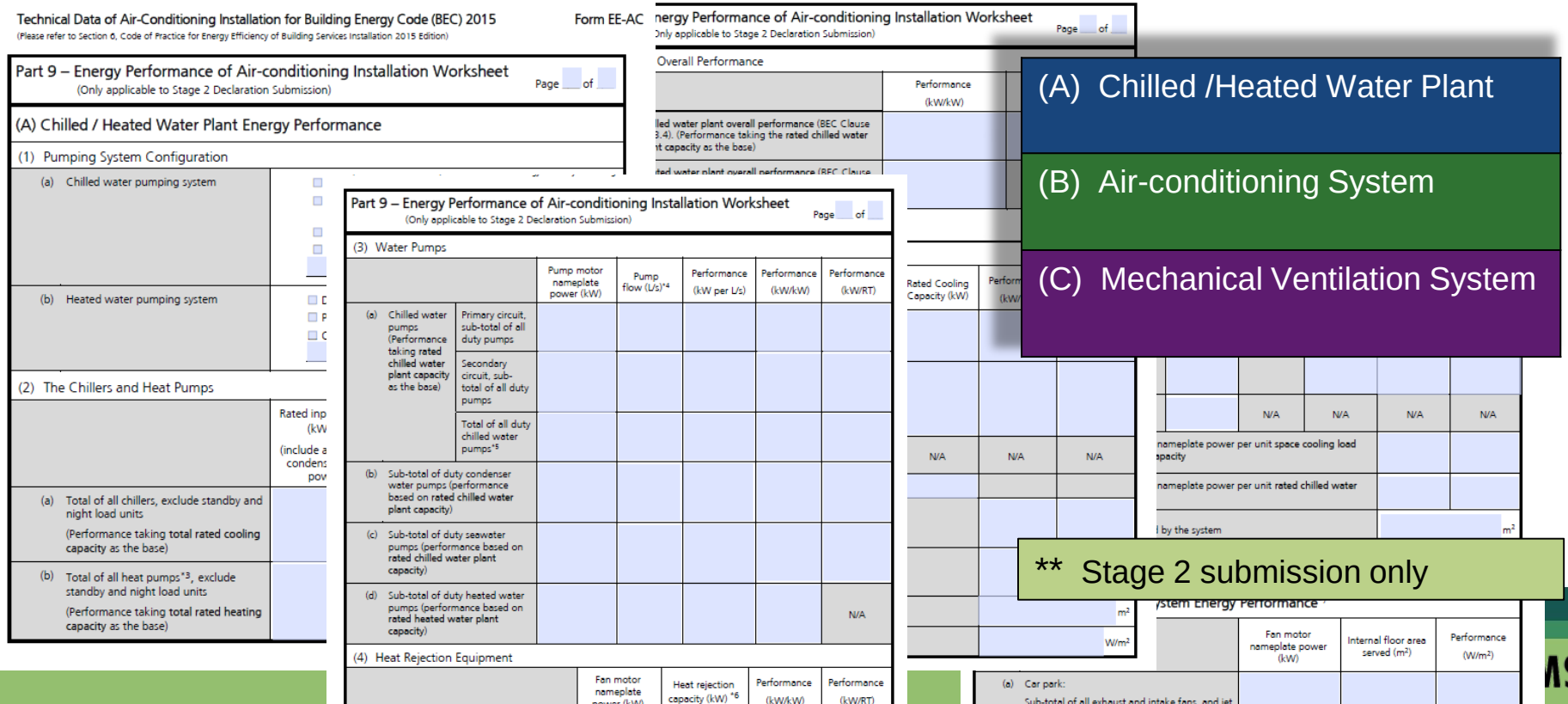
Date:

DD / MM / YYYY

Form EE-AC 2015(V.0)

ENERGY SAVING FOR ALL 全民節能

Part 9 – Energy Performance of A/C Installation [New]



Technical Data of Air-Conditioning Installation for Building Energy Code (BEC) 2015 — Form EE-AC

(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2015 Edition)

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission) Page ___ of ___

(A) Chilled / Heated Water Plant Energy Performance

(1) Pumping System Configuration

(a) Chilled water pumping system

(b) Heated water pumping system

(2) The Chillers and Heat Pumps

(a) Total of all chillers, exclude standby and night load units (Performance taking total rated cooling capacity as the base)

(b) Total of all heat pumps*3, exclude standby and night load units (Performance taking total rated heating capacity as the base)

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission) Page ___ of ___

(3) Water Pumps

		Pump motor nameplate power (kW)	Pump flow (L/s)*4	Performance (kW per L/s)	Performance (kW/kW)	Performance (kW/RT)
(a) Chilled water pumps (Performance taking rated chilled water plant capacity as the base)	Primary circuit, sub-total of all duty pumps					
	Secondary circuit, sub-total of all duty pumps					
	Total of all duty chilled water pumps*5					
(b) Sub-total of duty condenser water pumps (performance based on rated chilled water plant capacity)						
(c) Sub-total of duty seawater pumps (performance based on rated chilled water plant capacity)						
(d) Sub-total of duty heated water pumps (performance based on rated heated water plant capacity)						N/A

(4) Heat Rejection Equipment

	Fan motor nameplate power (kW)	Heat rejection capacity (kW) *6	Performance (kW/kW)	Performance (kW/RT)
(a) Cooling towers (Performance taking rated chilled water plant capacity as the base)				
(b) Air-cooled condensing units (Performance taking rated chilled water plant capacity as the base)				

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission) Page ___ of ___

Overall Performance

	Performance (kW/kW)
...led water plant overall performance (BEC Clause ...3.4). (Performance taking the rated chilled water ...t capacity as the base)	
...ted water plant overall performance (BEC Clause	

Rated Cooling Capacity (kW)	Perform (kW/				
N/A	N/A	N/A			

		N/A	N/A	N/A	N/A
...nameplate power per unit space cooling load ...apacity				
...nameplate power per unit rated chilled water				
...l by the system				m²

...ystem Energy Performance

	Fan motor nameplate power (kW)	Internal floor area served (m²)	Performance (W/m²)
(a) Car park: Sub-total of all exhaust and intake fans, and jet			

(A) Chilled /Heated Water Plant

(B) Air-conditioning System

(C) Mechanical Ventilation System

** Stage 2 submission only

Anticipated Effects

- ✓ Further improvement in energy efficiency: 10%
- ✓ The saving of 5 billion kWh for newly constructed buildings up to 2025

- The total reduction of CO_2 emission: 3.5 million tonnes
- Equivalent to total annual electricity consumption by about 1 million households

Way Forward

a) The Technical Taskforce will continue to review the BEC on a regular basis.

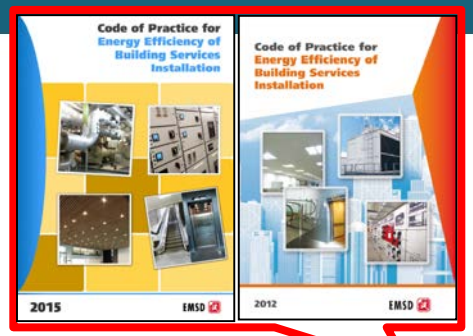
b) Update the pertinent requirements where necessary through addendum before the next round of comprehensive review.

c) Comprehensive review to be conducted in 2018, 2021 and 2024.

Information Source

ENERGY SAVING FOR ALL 全民節能

http://www.beeo.emsd.gov.hk/



ABOUT BEEO | CODES AND FORMS | CIRCULAR | REGISTER & LIST | REGISTERED ENERGY ASSESSOR (REA) | PUBLICITY | FAQS | USEFUL LINKS

Publicity

Publication

TV Announcements

Events

Events

Briefing Sess for Registered Energy Assessors 11 and 18 December 2015

EMSD share update on the implementation of dings Energy Efficiency Ordinance (BEEO), common irreg es in the submissions Declarations orm of Compliance, and briefing lding Energy Code (BEC) 2015 and Energy Audit Code (E 015 with Registered En Please click owing links to download the Pow sentations:

- Up plementation of BEEO [PDF B)]
- C bmission Irregularities [PDF f]
- E e BEC 2015 & EAC 2015 [P MB)]

- Specified Forms
- Technical guidelines

- Register of REA and COCR
- List of Stage One Declaration, FOC, EA Form and IN

Frequently Asked Questions

Thank You

Energy Efficiency Office
能源效益事務處

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