

The Buildings Energy Efficiency Ordinance and its Codes – Key Driver of Building Energy Efficiency

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ABSTRACT: Buildings are major energy consumers in Hong Kong, and with them powering into the future their climate change impacts would likely top our agenda in the years to come. To address these impacts, energy shortage and associated environmental issues in particular, the Electrical and Mechanical Services Department (EMSD) of Government of the Hong Kong Special Administrative Region (HKSAR) is enforcing the Buildings Energy Efficiency Ordinance, Cap 610 (BEEO) that has come into full operation since Sep 2012. As a key driver of building energy efficiency, the BEEO requires the compliance with its Building Energy Code (BEC) in respect of the design of building services installations in newly constructed buildings and for major retrofitting works (MRW) in existing buildings. For existing commercial buildings, the BEEO also requires the carrying out of energy audit for their central building services installations according to the BEEO's Energy Audit Code (EAC). This paper briefly introduces the BEEO and its BEC & EAC, including the BEC's new lighting power density (LPD) requirements that are effective progressively starting in Aug 2014, which were based on a review in end 2013 that had referenced to LPD standards in developed countries and had accounted for the LPD performances observed in the submissions for MRW under the BEEO. Also highlighted are EMSD's observations on the rooms for improvement to the inputs to the submitted Executive Summary forms regarding the energy audit findings in demonstrating EAC compliance, which if properly addressed would enhance the energy audit achievements.

I. INTRODUCTION

The BEEO establishes both the energy efficiency standards of a building for its design and the means to evaluate its energy efficiency performance in operation. For building design, the BEC governs the design standards in respect of energy efficiency of building services installations, whereas for building operation, the EAC governs the steps in conducting energy audit of its central building services installations (CBSI, which refers to the building services installation not solely serving an individual unit of the building).

EMSD maintains a dedicated web-site at <http://www.beeo.emsd.gov.hk/> for the BEEO, in which its most current information including the codes, technical guidelines, forms, circulars etc. can be found.

Figure 1 : Snapshot of the BEEO Web-site



II. BEEO SCOPE OF COVERAGE

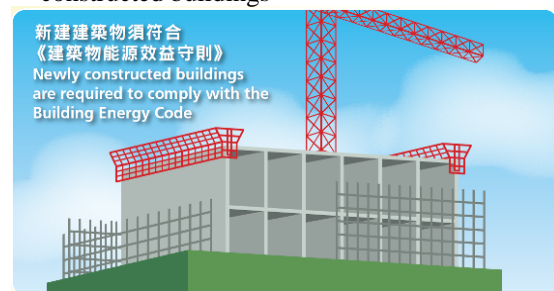
A. Types of buildings

The BEEO governs, in respect of BEC compliance, most types of buildings of both private and government sectors, including buildings for commercial (e.g. office, shopping complex etc.), hotel, municipal, community, education, hospital, railway station, airport passenger terminal usages etc. For industrial buildings, residential buildings and composite buildings, the common area and the portion not for residential or industrial use are governed. On the other hand, residential units and industrial units are not governed.

B. Newly constructed buildings and existing buildings

The building services installations in a newly constructed building i.e. a building in respect of which a consent to the commencement of building works for superstructure construction is given after 21 Sep 2012, should comply with the design requirements of the BEC, and the compliance is applicable to all subsequent retrofitting works irrespective of whether the works are regarded as major retrofitting works or not.

Figure 2 : BEEO applicable to newly constructed buildings



As for an existing building, i.e. a building in respect of which a consent to the commencement of building works for superstructure construction is given on or before 21 Sep 2012, the BEC requirements have to be complied with only for major retrofitting works.

Figure 3 : BEEO applicable to major retrofitting works



C. Major retrofitting works (MRW)

Major retrofitting works (MRW) refer to :

- the addition or replacement of a building services installation in retrofitting works covering an aggregated floor area of 500 m² or above (under the same series of works within 12 months) in a common area or a unit, or
- the addition or replacement of a main component of the CBSI (including a chiller at rating 350 kW or above, or a complete electrical circuit at rating 400A or above, or motor drive & mechanical drive of a lift or an escalator).

D. Energy audit

The BEEO requires the carrying out of energy audit for the CBSI in commercial buildings and commercial portions of composite buildings every 10 years in accordance with the steps specified in the EAC. After the audit, the building's energy utilization index (EUI, in MJ/m²/annum & kWh/m²/annum) that reflects the building's energy intensity or energy performance is to be identified and exhibited.

Figure 4 : BEEO applicable to energy audit in commercial buildings

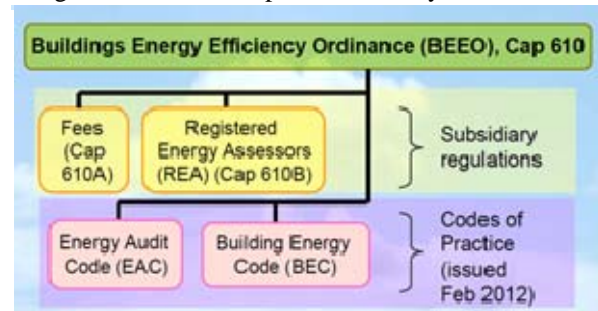


III. BEEO COMPLIANCE HIERARCHY

The BEEO prescribes the responsibilities of the developer, owner or responsible person of a building or a unit of the building, and the Registered Energy Assessor (REA), with requirements of submission and certification to demonstrate the compliance at different stages of the building, from design to occupation

approval and subsequently during normal course of operation. Under the BEEO are two subsidiary regulations, one on REA and the other on the fees for the submissions.

Figure 5 : BEEO compliance hierarchy



A. BEC requirements at design conditions

The BEC requirements are the energy efficiency standards at corresponding design conditions, and not the actual operational settings such as lighting level, air-conditioning room temperature etc., which are left to the discretion of building operators to suit the operational needs of individual buildings and installations.

B. Newly constructed buildings

The developer of a building, at building design stage (within 2 months after obtaining the aforesaid consent to the commencement of building works issued by HKSAR Government's Building Authority), is required to:

- submit to EMSD a "stage one declaration" certified by an REA to declare that the building services installations to be provided by the developer are designed and will be installed and completed in accordance with the BEC.

Subsequently at the occupation approval stage (within 4 months after obtaining an "occupation permit" issued by the Building Authority when the building is ready for occupation), the developer is further required to:

- submit to EMSD a "stage two declaration" certified by an REA to declare that the building services installations provided by the developer in the building at or before the time when the declaration is made have been designed, installed and completed in accordance with the BEC; and
- apply for a Certificate of Compliance Registration (COCR) from EMSD for the building.

The declarations are to be completed in specified forms and be accompanied by supporting documents specified in the forms. Based on the merits of the declarations, EMSD will issue accordingly a COCR to the developer. EMSD maintains a register of COCRs, which is available at all times at the BEEO web-site at <http://www.beeo.emsd.gov.hk/> for the public's inspection.

The aforesaid COCR for newly constructed buildings is subject to renewal every 10 years, and for the renewal the owner of the building is required to:

- engage an REA to certify that :
 - the design (but not the operational performance) in respect of energy efficiency of the CBSI (no need to include the installation only serving an individual unit) is maintained at a level not lower than the standard in the BEC version applicable to the COCR (issued by EMSD 10 years ago) of the building, and
 - if MRW have been undertaken for certain portions of the CBSI, the design of the installation is maintained to a standard not lower than the latest BEC version applied to this part of the installation; and
- submit an application to EMSD for the renewal.

It is estimated that the BEEO, having had addressed to the barriers to energy efficiency, can generate an energy saving in newly constructed buildings in the order of 2.8 billion kWh in the first 10 years.

C. Major retrofitting works

For all prescribed buildings under the BEEO, irrespective of newly constructed or existing buildings, the owner of the CBSI in the building, and the responsible person of a unit or a common area in the building, within 2 months after completion of MRW, are required to :

- engage an REA to certify that the replaced or additional installations of the MRW comply with the latest BEC; and
- obtain a Form of Compliance (FOC) from the REA for the said works.

In the course of operation of a building with a COCR (i.e. a newly constructed building), the owner of the CBSI (usually the owner of the building) and the responsible person (usually the owner or tenant) of a unit or a common area in the building are required to ensure that when a building services installation is replaced or added (irrespective of whether it falls into the scope of MRW or not), its design shall comply with the standard not lower than that applied in the original BEC applied to this installation.

D. Energy audit

The owner of a prescribed building (i.e. a commercial building or a portion of a composite building that is for commercial use) must, in respect of the CBSI of the building, cause an energy audit to be carried out in accordance with the EAC at least once every 10 years.

The first energy audit for the CBSI of a building issued with a COCR (i.e. a newly constructed building) is to be carried out within 10 years after the issue of COCR.

For existing buildings, the first energy audit for the CBSI is to be carried out according to a timeframe within 4 years from 21 Sep 2012 as prescribed in schedule 5 of the BEEO, in four batches according to building age, the newer the earlier. As in 2014, the 2nd batch buildings, the buildings with occupation permits

issued between 1978 and 1987, have the deadline of carrying out of energy audit of 20 Sep 2014. For the 1st batch buildings, the deadline was 20 Sep 2013.

The owner of the building is required to :

- engage an REA to conduct the energy audit;
- obtain from the REA an Energy Audit Form and an energy audit report (with recommendations of energy management opportunities (EMO) identified in the audit); and
- exhibit the valid Energy Audit Form bearing the building's EUI in a conspicuous position at the main entrance of the building.

Figure 6 : Energy Audit Form at main entrance



By the disclosure of the EUI, it is expected a benchmarking effect will be exerted on the building operators to improve the building's energy efficiency, as the building's energy performance can be easily compared with that of other similar buildings. As for EMO, their implementation will not be mandatory, in consideration of the wide variety of EMO in terms of scope and cost. Nevertheless, the REA's analysis and recommendations of the EMO in the energy audit report will be conducive to the implementation of some if not all of the EMO, as the energy saving from EMO is itself an incentive.

E. Registered Energy Assessor (REA)

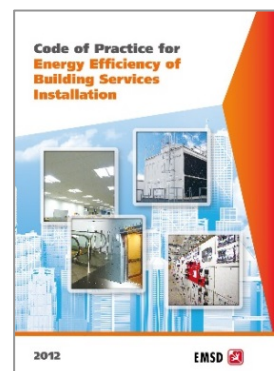
The BEEO opens up a new role of professional engineers, the REAs, who upon appointment by the developer, owner or responsible person have the obligation to perform the certifications and carry out the energy audits. The qualifications required as an REA are prescribed in the Buildings Energy Efficiency (Registered Energy Assessors) Regulation, Cap 610B.

IV. BEC TECHNICAL REQUIREMENTS

To give an overview, the key technical requirements of the BEC (Rev. 1) are extracted as follows.

A. Lighting installation

- Max allowable lighting power density (LPD) (see paragraph VII.)
- Min allowable no. of lighting control points (i.e. switching devices) for office space
- Lighting control points for lighting to which the



BEEO is applicable to be independent from those for lighting to which the BEEO is not applicable

- Not applicable to lighting exterior to building, lighting not of fixed type, signage lighting and lighting solely for decoration

Figure 7 : Lighting installation



B. Air-conditioning installation

- Load calculation per specified outdoor and indoor conditions (e.g. max 35°C outdoor DB)
- Allowable air distribution system fan power per unit volume flow (e.g. max 1.6 W/L/s for CAV)
- Allowable percentage power of full load, of power drawn by motor of variable flow fan at 50% design flow (max 55% of full load)
- Air distribution ductwork leakage limit
- Piping system to cater for variable flow
- Allowable percentage power of full load, of power drawn by motor of variable speed pump at 50% design flow (max 55% of full load)
- Allowable piping system frictional loss (e.g. max 400 Pa/m for above 50 mm diameter)
- Allowable coefficient of performance of chiller and unitary air-conditioner (e.g. min 4.7 for water-cooled screw chiller at 500 to 1000 kW cooling)
- Min allowable thickness of thermal insulation to pipework & ductwork
- Energy metering (e.g. for chiller at 350 kW cooling) to measure power and energy input/output
- Energy efficient system control, including temperature, off-hours, zone

Figure 8 : Air-conditioning installation



C. Electrical installation

- Allowable power distribution loss (e.g. max allowable circuit copper loss)
- Allowable motor efficiency (e.g. min efficiency of 87% for 2-pole motor with rated output power at 5.5 kW to less than 7.5 kW)
- Allowable motor sizing ratio (max 125%)
- Allowable design total power factor (min 0.85 for circuit at or above 400A)
- Allowable design total harmonic distortion of current (e.g. max 12% for designed circuit current at 400A to

below 800A)

- Balancing of single-phase loads (max allowable unbalance 10%)
- Metering & monitoring facilities requirements (e.g. sub-main circuit at or above 400A to facilitate measuring V, A, kWh, kVA, TPF & THD)

Figure 9 : Electrical installation



D. Lift & escalator installation

- Allowable running active electrical power of motor drive (e.g. max 36.1 kW for traction drive lift at 2.5 m/s to below 3 m/s rated speed and 1350 kg to below 1600 kg rated load)
- Allowable lift decoration load (e.g. max 50% of rated load or 600 kg, whichever lower for lift with rated load less than 1,800kg)
- Shutting off of ventilation/air-conditioning of lift car during idling
- Min allowable total power factor
- Max allowable total harmonic distortion
- Metering & monitoring facilities requirements

Figure 10 : Lift & escalator installation



E. Performance-based approach

The performance-based approach provides an alternative approach to comply with the BEC. This approach focuses on estimating the total energy consumption of a building using an energy simulation software. With this approach, the energy savings from energy efficient features and renewable energy installations can be evaluated and made known to the building owner at the building design stage for his/her cost and environmental benefits consideration. The performance-based approach also provides certain relaxation from some of the above introduced BEC requirements, which are prescriptive in nature. For example, a lighting installation, with a combination of photo sensors and occupancy sensors to adjust the intensity of electric light to account for the availability of daylight and presence of occupants, can be allowed to have a LPD higher than the prescribed requirement, subject to the building's design energy not exceeding its energy budget dictated by compliance with all the

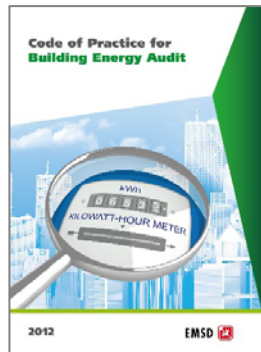
prescriptive requirements.

V. EAC TECHNICAL REQUIREMENTS

To give an overview, the key technical requirements of the EAC (Rev. 1) are extracted as follows.

A. Key steps of audit

- (i) Information Collection
- (ii) Review of energy consuming equipment
- (iii) Identification of EMO
- (iv) Cost benefit analysis
- (v) Recommendations
- (vi) Compiling energy audit report



B. Contents of energy audit report

- Executive summary (Form EE-EAes)
- Energy audit scope
- Descriptions of building characteristics and equipment/systems
- Energy consumption & performance evaluation
- Indication of key characteristics of air-conditioning equipment/systems
- Indication of total lighting power
- Analysis of the building's historical energy consumption
- Indication of the building's EUI (on Energy Audit Form to be displayed)
- Indication of the CBSI energy supply to the building's units

- Findings from review & site inspection of energy consuming equipment, & potential EMO identification
- Evaluation of potential EMO
- Recommendations of EMO and further studies

C. Executive summary Form EE-EAes

The executive summary Form EE-EAes (currently version V.1) plays a vital role in the demonstration of EAC compliance. It serves to record as a summary of the energy audit findings. Snapshots of portions of Form EE-EAes (V.1) are shown in Tables 1 & 2 below. These required inputs target on the REA's appreciation of the audited building's technical characteristics and operation characteristics, and it is in strong belief that with the good appreciation the corresponding energy performances such as LPD, flow performance, chiller plant COP, cooling towers heat dissipation performance, EUI (in terms of W/m^2 , W per L/s , kW heat/ kW power, kWh/m^2) etc. can be assessed with better accuracy. With the proper assessment, the data can be compared across buildings with due regard to each building's corresponding specific usage and operation norm characterized by the range of categorized major usages for office, shopping & leisure, back of house, car park, occupant density, single or multiple ownership etc. In addition the energy savings from the identified EMO can be better evaluated for enhanced cost benefit analysis. For a property management corporation in particular, the data can help to compare and benchmark the corporation's portfolio of buildings, based on which the corporation can devise the strategic measures for collective improvement.

Table 1 : Snapshot of Form EE-EAes(V.1) showing information requiring input in respect of building type, usage and operation (certain contents in the form are simplified for this snapshot)

(I) Building Type, Usage & Operation (Please tick where applicable and insert N/A for non-applicable items.)					
1) Type of building					
(a) Please choose the type (tick one item only) of building of the building entity ^{^2} audited :					
<input type="checkbox"/> Commercial building	<input type="checkbox"/> Commercial portion of composite (commercial & residential) building	<input type="checkbox"/> Commercial portion of composite (commercial & industrial) ^{^3} building			
(b) Please indicate the portion of the building entity being common area ^{^4} :					%
(c) Please indicate the no. of blocks ^{^2} of the building entity :					no. of blocks
2) Total internal floor area^{^5} of the building entity (m^2) :					
3) No. of floors^{^6} of the building entity :					
4) Major type of building façade (tick one item) :					<input type="checkbox"/> Curtain wall <input type="checkbox"/> Non-curtain wall
5) Date(s) of issue of occupation approval (dd/mm/yyyy)^{^7} :					
6) Type of central air-conditioning^{^8} : <input type="checkbox"/> Cool air <input type="checkbox"/> Chilled water <input type="checkbox"/> Condenser water only <input type="checkbox"/> N/A					
7) Summary of operation characteristics of categorized major usages of CBSI-served areas :					
Major usage	Operation characteristics	%tage area of total of building entity ^{^9^27E}	%tage AC area of total of building entity ^{^10^27E}	Average weekly operating hours (hrs/week) ^{^11^12}	Daily average no. of occupants ^{^12}
(a) Office					
(b) Shopping & leisure					
(c) Back of house area					
(d) Restaurant					
(e) Car park					N/A
(f) Others ^{^13}					
Total ^{^14^27E}				N/A	
Daily average occupant density (m^2 per person) ^{^15^27E}					

Table 2 : Snapshot of Form EE-EAes (V.1) showing information requiring input in respect of chillers, chilled water pumps, air-conditioning fans, lighting LPD etc. (certain contents in the form are simplified for this snapshot)

(II) Central Building Services Installation ^{^19}							
1) Air-conditioning Installation							
(a) (i) Chillers, Heat Pumps, Boilers, Other Heating ^{^20^34}							
Type of equipment (Chiller, Heat Pump, Boiler, Other heating) ^{^21}	Cooling (for heat rejection) (A/FW/SW/FE) ^{^22}	Compressor (Ce/Se/So/Re) ^{^23}	Refrigerant (R134a/ R123/R407c/R410a etc.) ^{^24}	Rated Capacity (kW)	Rated input power (kW)	Quantity	COP (kW / kW) ^{^25}
Total for cooling ^{^26} , of all chillers / heat pumps							
(a) (ii) Unitary air-conditioners ^{^20^34}							
Type of equipment ^{^21} (Room type, Split type, Packaged type)	Cooling (for heat rejection) (A/FW/SW/FE) ^{^22}	Compressor (Se/So/Re) ^{^23}	Refrigerant (R134a/ R123/R407c/R410a / R22 etc.) ^{^24}	Rated Capacity (kW)	Rated input power (kW)	Quantity	COP (kW / kW) ^{^25}
Total for cooling ^{^26} , of all unitary air-conditioners							
(b) Air-conditioning pumps				Pump rated motor power (kW)	Pump rated flow (L/s)	Quantity	Performance (W per 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}						
(c) Heat rejection				Fan rated motor power (kW) ^{^27C}	Rated heat rejection capacity (kW) ^{^27C}	Quantity	Performance (kW/kW) ^{^27C}
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 rated motor power (kW)	Fan rated flow (L/s)	Quantity	Performance (W per 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}							
(e) Chilled / Heated water plant sequencing control provided ?				<input type="checkbox"/> Yes <input type="checkbox"/> No			
(f) Overall representative indoor room temperature set point in summer (°C) :							
(g) Major type of air-side system (CBSI) : (may tick more than one item, if it serves 20% or more of AC area of building entity)							
<input type="checkbox"/> Chilled water AHU (VAV/CAV) <input type="checkbox"/> Chilled water FCU <input type="checkbox"/> Unitary air-conditioner <input type="checkbox"/> Not applicable							
(h) Is power supply to air-side system AHU/FCU fans mainly on account of the building owner or tenants ? (please tick only one item) :							
<input type="checkbox"/> On account of the building owner <input type="checkbox"/> On account of tenants <input type="checkbox"/> Not applicable							
2) Central Mechanical Ventilation				Fan rated motor power (kW)	Fan rated flow (L/s)	Quantity	Performance (W per L/s)
Sub-total, of all exhaust and intake fans for car park ^{^27}							
Sub-total, of all exhaust and intake fans for toilets, pantries, un- conditioned areas etc. ^{^27}							
Total, of all central mechanical ventilation fans ^{^27B}							
Total internal floor area of areas served by central mechanical ventilation (m ²) :							
3) Lighting Installation (Lighting power below to be based on rated luminaire wattage, and to include decoration lighting of the building owner but not external lighting)							
Sub-total lighting power, of all luminaires with T5 fluorescent lamps (kW)							
Sub-total lighting power, of all luminaires with fluorescent lamps other than T5 (kW)							
Sub-total lighting power, of all luminaires with compact fluorescent lamps (kW)							
Sub-total lighting power, of all luminaires with incandescent lamps (tungsten filament, tungsten halogen etc.) (kW)							
Sub-total lighting power, of all luminaires with LED (light emitting diode) lamps (kW)							
Sub-total lighting power, of all luminaires with other types of lamps, if any (kW)							
Total lighting power , of all luminaires (kW) [obtained by summing up all figures above ^{^27E} :							
Total internal floor area of areas having CBSI lighting installation (m ²) :							
Total lighting power density (kW/m ²) [obtained by dividing total lighting power by total internal floor area (having CBSI lighting) above ^{^27E}] :							

D. Rooms for improvement of inputs

The inputs to Form EE-EAes lay the backbone for but do not give the details of the EMO, which are left to the discretion of individual REAs and building owners based on their available resources of funding, staff, time etc. Most importantly, the quantified inputs can easily demonstrate the compliance with the EAC requirements, as opposed to EMO that usually require certain detail study from preliminary identification to finalization.

Given the inputs being a demonstration of compliance, deviations from requirements have been however noted in some of the submitted EE-EAes forms, and as such there are rooms for improvement, examples as follows :

- paying attention to corresponding remarks for the form (34 nos. in total, numbering ^1 to ^34);
- for a building without common area (as interpreted in the BEEO), such as a single owner building having no deed of mutual covenant, a “0” should be inserted in sub-item (I) 1) (b) [Table 1];
- proper apportioning of the percentage areas in sub-item (I) 7) [Table 1], with due regard that the “Total” under the column with heading “%tage area of total of building entity” may not necessary be 100%, as it refers to spaces served by the CBSI (which may not serve the whole building) and as such the spaces not served by the CBSI should be excluded in the %tage figure;
- each row in sub-item (II) 1) (a) (i) [Table 2] for chillers should cater for and be the summary of equipment of the same configuration (e.g. all scroll-compressor R410a air-cooled chillers to be summarized in a single row), and likewise for each row in sub-item (II) 1) (a) (ii) for unitary air-conditioners;
- the capacity and power demand of standby equipment should not contribute to the inputs in sub-items (II) 1) to 5) [Table 2] for chillers, air-conditioners, pumps, fans etc.; and
- differentiation between “AHUs & FCUs (excluding primary air AHU)” and “primary air AHUs, fresh air and return air fans (for conditioned areas)”, and have the corresponding data inserted in the appropriate rows for sub-item (II) 1) (d) [Table 2].

VI. TECHNICAL GUIDELINES

Supplementing the BEC and the EAC, corresponding technical guidelines (TG), namely TG-BEC and TG-EAC in short, were also issued to assist in the understanding of the BEC and EAC requirements against the legislative background of the BEEO.

VII. BEC REVIEW

Around end 2013, after having fully implemented the BEEO for over a year, the stringency of the BEC’s requirements on maximum allowable LPD was reviewed. Having referenced to LPD standards in developed countries, and LPD data collected from the

submissions under the BEEO for MRW, and having consulted local professional institutions and trade associations, the LPD requirement is slightly tightened for enhanced energy efficiency, and a new version, the Rev. 1 version BEC incorporating the new LPD standards has been issued in Feb 2014. The Rev. 1 LPD for certain common space types are listed below alongside the LPD in the initial version BEC.

Table 3 : Comparison of Rev. 1 LPD and initial version LPD of the BEC

Type of Space	Maximum Allowable LPD (W/m ²)	
	Initial version	<i>Rev. 1</i>
Car Park	6	<i>5</i>
Corridor	10	<i>8</i>
Entrance Lobby	15	<i>14</i>
Lift Lobby	12	<i>11</i>
Office	15	<i>13</i>
Plant Room / Switch Room	12	<i>11</i>
Public Circulation Area	15	<i>13</i>
Restaurant	20	<i>17</i>
Retail	20	<i>17</i>
Staircase	8	<i>7</i>

The Rev. 1 LPD is promulgated in EMSD Technical Circular No. 1/2014 issued in Feb 2014, with grace periods of 6 months and 9 months allowed respectively for newly constructed buildings and for MRW, so as to allow ample time for the REAs and the trade to develop their acquaintance. Accounting for the grace periods, the Rev. 1 LPD applies to lighting installations covered in a stage one declaration (for newly constructed building) signed by the developer on or after 28 Aug 2014, and to lighting installations covered in a FOC (for MRW) signed by the REA on or after 28 Nov 2014.

VIII. CONCLUSION

With the implementation of the BEEO that serves as the key driver of building energy efficiency, Hong Kong has taken the very major step forward in addressing to the impacts of climate change brought about by energy consumption in buildings. This mandatory approach reinforces the roothold of the minimum energy efficiency standards in the BEC and the minimum energy audit requirements in the EAC, and paves the way for further enhancement of the standards. EMSD will review and tighten the standards at suitable time intervals, and the tightening will further trigger a new round of improvement in the pursuit of building energy efficiency in the combat of climate change.

IX. ACKNOWLEDGEMENTS

Sincere thanks are extended to members of the

Technical Taskforce on Mandatory Implementation of the BEC and its working groups (member organizations including the HKIE Electrical Division) in offering their expertise advice and support in the development of the BEC & EAC.

X. REFERENCES

- HKSAR Government (2010) *Buildings Energy Efficiency Ordinance (Cap. 610)*
EMSD (2014) *Code of Practice for Energy Efficiency of Building Services Installation 2012 (Rev. 1)*
EMSD (2013) *Code of Practice for Building Energy Audit 2012 (Rev. 1)*
EMSD (2014) *Technical Guidelines on Code of Practice for Energy Efficiency of Building Services Installation 2012 (Rev. 1)*
EMSD (2013) *Technical Guidelines on Code of Practice for Building Energy Audit 2012 (Rev. 1)*

XI. BIOGRAPHIES



Ir Cheung Yuen-fong, Patrick is a chief engineer with EMSD, HKSAR Government. He has over 20 years experience in building services design and project management of a wide variety of government premises. Ir CHEUNG is now leading different teams to promote energy efficiency in buildings by various initiatives including mandatory implementation of the BEEO, district cooling system in Kai Tak District and Fresh Water Cooling Towers Scheme.



Ir Lau Siu-kei, Dominic is a senior engineer with EMSD, HKSAR Government. He has over 20 years experience in building services design and project management of a wide variety of government premises. Ir Lau is now leading a team of engineers and inspectors tasked to promote and enforce the BEEO & its codes, and to process the registration of Registered Energy Assessors under the BEEO.



Ir David Li is an engineer with EMSD. He has over 20 years experience in building services design and project management of a wide variety of government premises. Ir Li has actively involved in recent years in technically supporting the development of the BEEO, including the serving of the Technical Taskforce (with trade participation) & the guiding of its Working Groups in the drafting & finalization of the codes and their guidelines under the BEEO, the devising of the technical information inputs for demonstration of code compliance, the assessment of REA applications, and the promotion of the BEEO and its codes & guidelines to stakeholders & the public.