BEAM Society Limited

BEAM Pro Training and Examination

BEAM Plus – **Energy Use for New Buildings**

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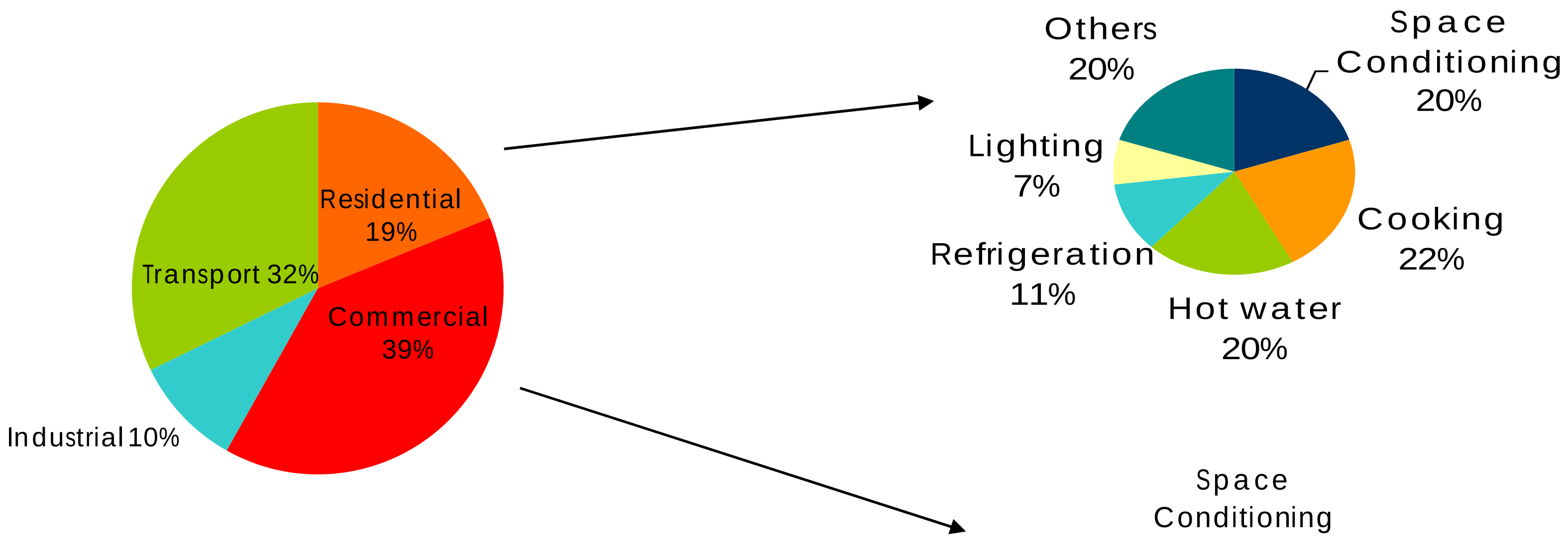
13 September 2012

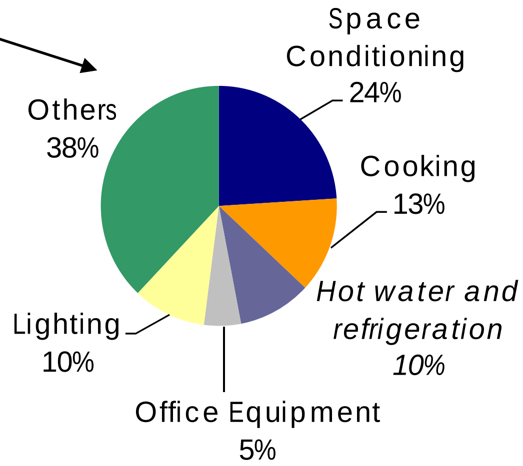
Presentation Overview

- Overall Objectives of Assessing Energy Aspects
- BEAM Plus V1.2 Energy Use Criteria for New Buildings
  - Original Route
  - Alternative Route – Passive Design

The Situation in Hong Kong

- ***Buildings have huge impact on energy and emissions***
- Buildings account for 58% of overall energy consumption in 2008
- Buildings account for 90% of electricity consumption in 2008
- Where are the potential for energy savings?



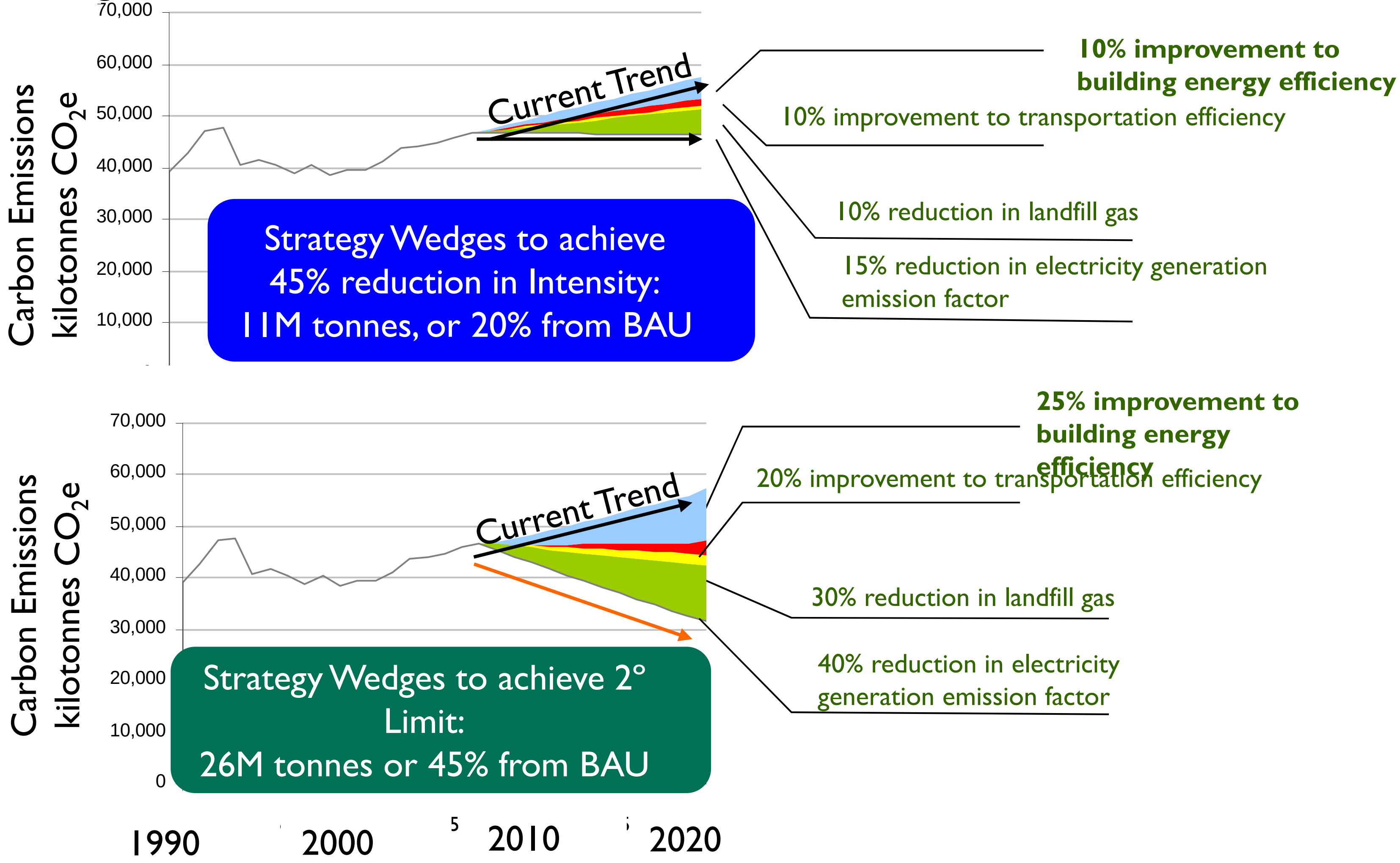


- Our buildings provide huge potential in energy savings.

HKSAR EMSD Energy End-Use Data 2010

Role of Buildings

- Buildings will have to be significantly more energy efficient in the near future in order to halt the production of GHG at 45% intensity reduction or the 2 deg Limit.
- ***A large portion will be achieved through upgrading the energy efficiency of existing buildings***



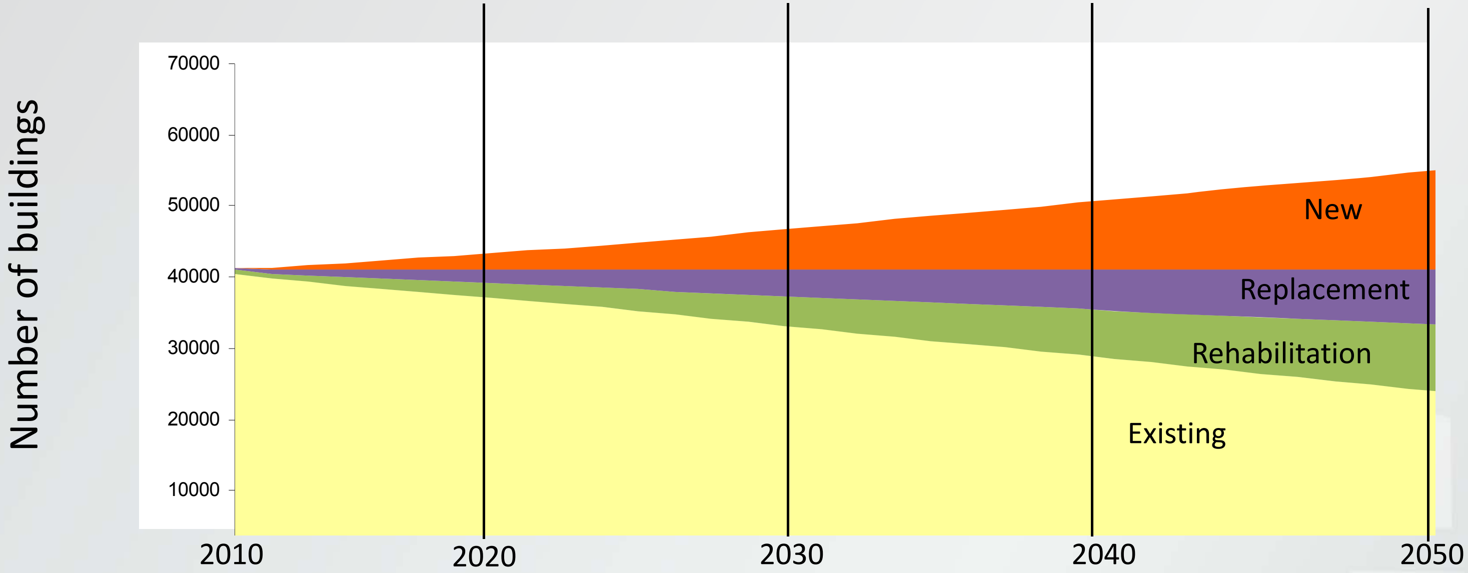
Existing Buildings in Hong Kong

- ***Existing buildings dominate the stock of Hong Kong for years to come***

2020 – 80.6% Existing
7.6% New(**Today**)
6.1% Rehabilitation
5.6% Replacement

2030 – 62.4% Existing
16.4% New
11.5% Rehabilitation
9.8% Replacement

2050 – 36% Existing
28% New
20% Rehabilitation
16% Replacement

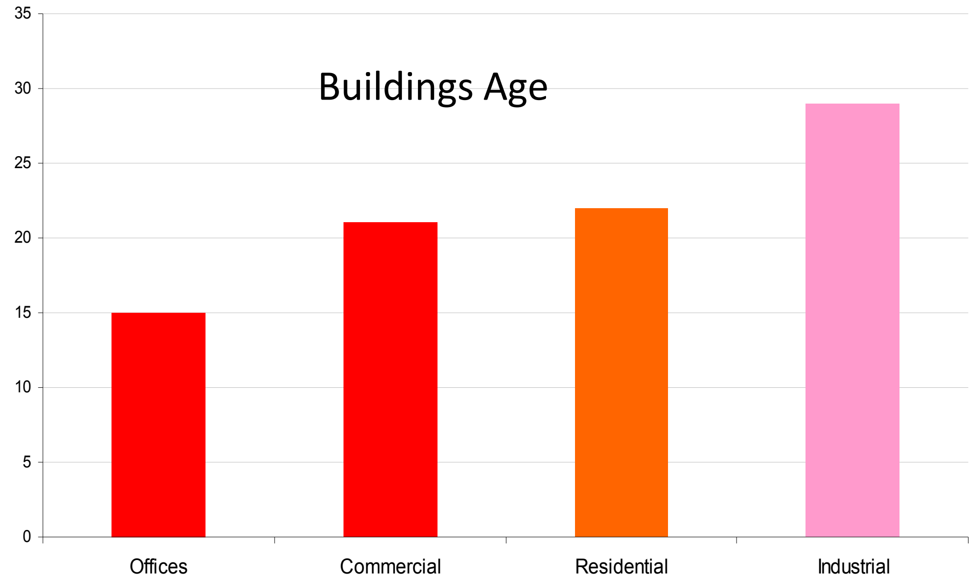


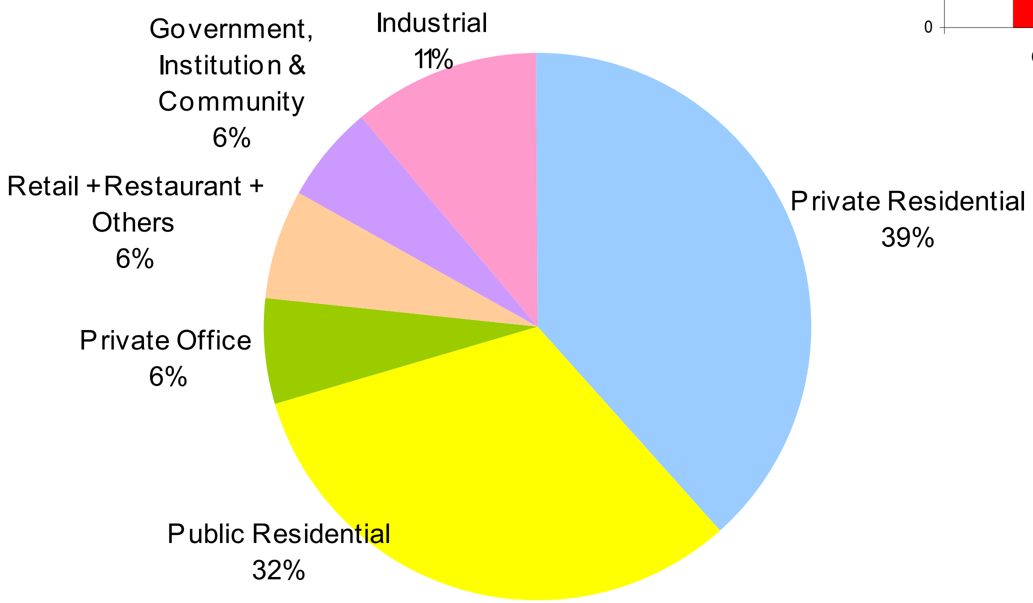
2050
58,000 buildings

Source:
HK Govt, Buildings Dept
HK Govt, Rating and Valuation Dept
HK Govt, Census and Statistics Dept
Hk Govt, Hong Kong 2030, planning and vision strategy

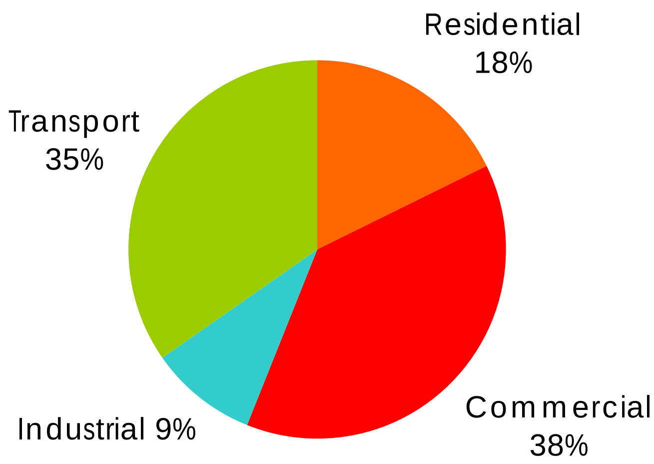
Current Stock of Buildings

- Residential buildings make up the greater part of the floor area composition
- Industrial Buildings are older and may be in more need of retrofitting
- However, commercial buildings use the most energy





Floor Area

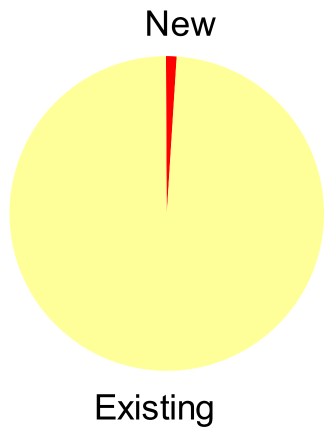


Energy Consumption

Building Energy Codes

- To be mandatory in full operation on 21 September 2012

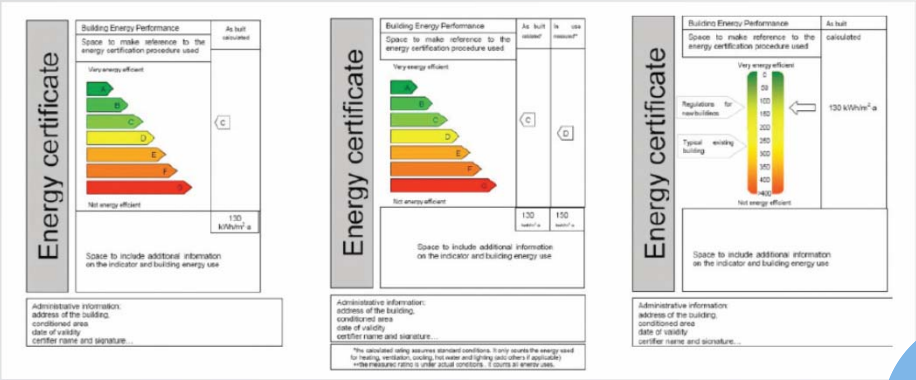
Source:
HK Govt, EMSD, Study on Enhanced Promotion of Building Energy Codes in Hong Kong



Carbon reduction from applying building energy codes

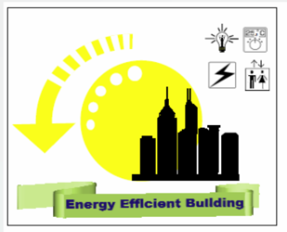
Building Energy Labeling

- ***Provide clear information on performance of buildings***
- ***Identify areas for improvement***
- ***Benchmarking performance***



Context

Building design, construction, and operations are becoming globalized, with major players working on building projects around the globe.



Drivers

A need for harmonization of building energy standards and labels and technical procedures

Benefits

Gives a tangible meaning to building performance and is a useful communication tool to increase public awareness

Energy Use Aspects

BEAM Plus Energy Use Overall Objectives:

- *Minimum energy performance*
- Reduction of CO_2 emissions
- Energy benchmarking
- Energy efficient system / equipment
- Renewable energy
- Energy conservation
- Energy management
- *Energy efficient building layout*
- *Alternative Route – Passive design*

Energy Use Aspects

ANNUAL ENERGY USE / REDUCTION OF CO_2 EMISSIONS

•PASSIVE DESIGN – orientation, massing, façade treatment, building plan, to optimize lighting, cooling and solar gain etc.

- CONSUMPTION & DEMAND – benchmarks for annual consumption (kWh/m2/yr), maximum demand (VA/m2/yr) with reference to base case on Energy Budget approach

- By Energy Simulation

- Buildings including commercial premises, hotels, residential properties, schools & other building types can be benchmarked on a performance based using thermal simulation.

Energy Use Aspects

RENEWABLE ENERGY SYSTEMS

- Solar, wind & biomass

EFFICIENT SYSTEM & EQUIPMENT

- Embodied Energy of Building Structures
- Ventilation / lighting systems in carpark – energy consumption and system control
- Lift, Electrical services – EMSD's COP
- Positioning of units and installation requirement for decentralised A/Cs
- Lighting for public areas – control gear loss, circuit efficacy, control system
- Efficient appliances – Energy efficiency label

Energy Use Aspects

ENERGY MANAGEMENT

- Testing and Commissioning
- Operations and Maintenance – Manual, management plan, training and facilities
- Metering and Monitoring
- Energy Management – Audit, Objectives and Targets, Budget, Energy Charges

BEAM Plus for New Buildings
4 ENERGY USE

BEAM Plus – EU Energy Use in New Buildings

EU	NB
No. of Prerequisites	1
No. of Credits	42
No. of Bonus	2

Credit Summary for NB Version 1.2 Original Route :

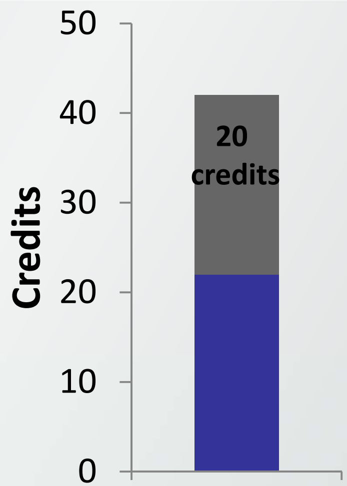
EU P1 Minimum Energy Performance
EU 1 Annual Energy Use – Reduction of CO_2 Emission (15)
EU 2 Peak Electricity Demand Reduction (3)
EU 3 Embodied Energy in Building Structure Elements (1+1B)
EU 4 Ventilation System in Car Parks (2)
EU 5 Lighting System in Car Parks (2)
EU 6 Renewable Energy Systems (5)
EU 7 Air Conditioning Units (1)
EU 8 Clothes Drying Facilities (1)
EU 9 Energy Efficient Appliances (2)
EU 10 Testing and Commissioning (4+1B)
EU 11 Operation and Maintenance (3)
EU 12 Metering and Monitoring (1)
EU 13 Energy Efficient Building Layout (2)

EU 1 Selective Path – Route 1

EU Selective Approach

Or

- **Route 1: Current BEAM Plus Approach**
  - EU 1 Reduction of CO_2 Emission
  - EU 2 Peak Electricity Demand Reduction
  - EU 13 Energy Efficient Building Layout
- Route 2: Combine EU 1, 2 & 13
  - Building Passive Design
    - Spatial Planning
    - Building Fabric
    - Daylight
    - Natural Ventilation
      - Or
        - Prescriptive
          - Operable Window Area
          - Cross Ventilation Design
        - Performance based
  - Building Active System
    - HVAC System
    - Lighting System
    - Vertical Transportation



EU 1 Selective Path – Route 1

EU Selective Approach

Or

Route 1: Current BEAM Plus Approach

- EU 1 Reduction of CO_2 Emission
- EU 2 Peak Electricity Demand Reduction
- EU 13 Energy Efficient Building Layout

Route 2: Combine EU 1, 2 & 13

- Building Passive Design
  - Spatial Planning
  - Building Fabric
  - Daylight
  - Natural Ventilation
    - Or
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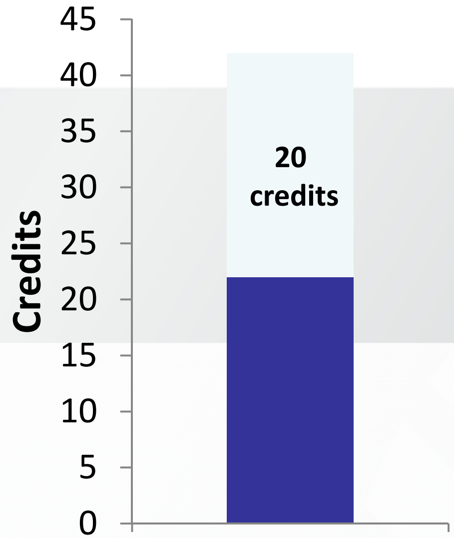
  - Lighting System
  - Vertical Transportation



Energy Use Aspects

Energy Use - New Buildings:

- ***Credit Eu 1 - Reduction of CO2 Emissions***

  - 1 to 15 credits for reduction of CO_2 emissions or annual energy consumption by;

  (a) Commercial and Hotel Buildings,

  3%, 5%, 7%, 9%, 11%, 14%, 17%, 20%, 23%, 26%, 29%, 33%, 37%, 41% & 45%.

  The number of credits to be awarded will be determined wrt % reduction of CO_2 emissions or annual energy consumption of the assessed building relative to the respective benchmark (zero-credit) criteria evaluated from the Baseline Building model.

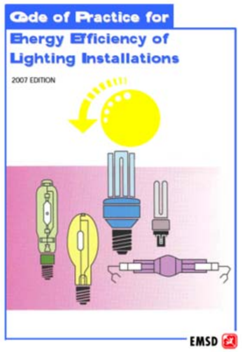
  Methodology of **energy simulation** shall make reference to Performance-based Building Energy Code (PBEC) or Appendix G of ASHRAE 90.1-2007 or equivalent.

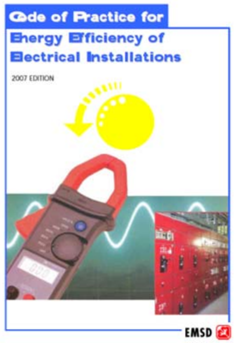
ENERGY USE

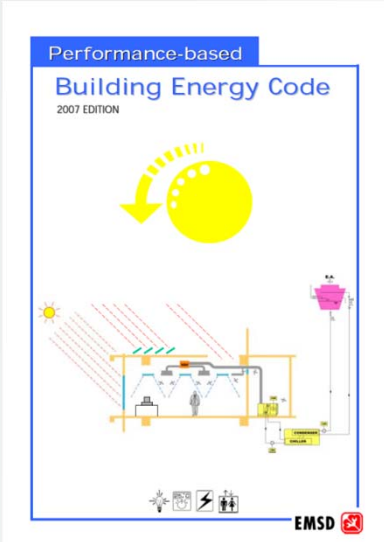
Credit	REQUIREMENT	ASSESSMENT	OTHER
EU P1	-	all the newly registered BEAM Plus projects shall comply with the minimum energy efficiency requirements governing building services installations defined in The Buildings Energy Efficiency Ordinance	-
EU 1	-	Section d is - For Other Building Types. The methodology of the energy simulation shall make reference to the latest Building Energy Code (BEC) or Appendix G of ASHRAE 90.1-2007 or equivalent. (Note: For interim measure before Hong Kong equivalent of Appendix G of ASHRAE 90.1-2007 is available, lighting power density (LPD) in ASHRAE calculation shall use those parameters in Code of Practice for Energy Efficiency of Building Services Installation – 2012 Edition). Appendices 8.1 and 8.2 include the default values or assumptions for design parameters for Performance-based approach for residential and other building types for reference. The energy analysis and supporting documentation shall be prepared by a qualified person. The submission for compliance and the computer software to be used shall make reference to the latest Building Energy Code (BEC) or ASHRAE Standard 90.1-2007. When no simulation program can adequately model a design (Note: For example: passive design with significant contribution on the reduction of CO_2 emissions), material, or device, the rating authority may approve an exceptional calculation method to demonstrate above-standard performance. The exceptional calculation shall make reference to Section A3.4 of Code of Practice for Energy Efficiency of Building Services Installation - 2012 Edition and/or Appendix G2.5 of ASHRAE 90.1–2007[2] and/or Appendix D of the Advanced Energy Modelling for LEED – Technical Manual v1.0 (September 2011 Edition)	Appendix 8 now provides more precise methodology for simulation

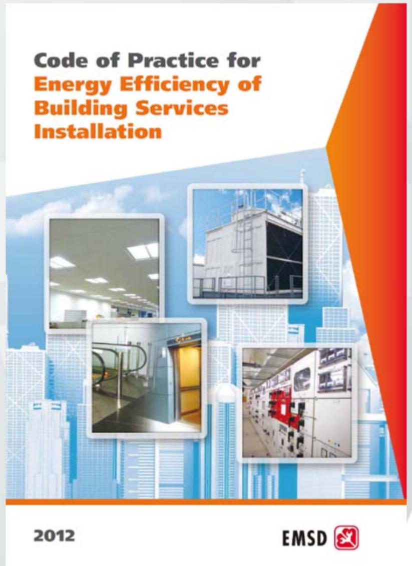
EU 1 – Changes in the Original Path

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
4.1 Credit Requirement - EU 1 Reduction of CO_2 Emissions	(2) Performance based building energy code 2007 is referred.	(2) Code of Practice for Energy Efficiency of Building Services Installation – 2012 Edition). Appendices 8.1 and 8.2 include the default values or assumptions for design parameters for Performance-based approach for residential and other building types for reference.	Latest Building Energy Code (BEC) should be referred









EU 1 – Changes in the Original Path

BEAM

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.1.2 Performance-based Approach	(3) Energy Reduction Measures Considered - Based on the PBEC2007 Performance based Approach	(3) The major modifications concerns clause 9.5.4.1 in BEC ***a)Allowable trade-off requirement in design building based according to energy efficiency requirements in Sections 5 to 8 of the Code*** *b)Adoption of load reduction strategies, such as (but not limited to) natural ventilation, free-cooling, natural daylight etc.* *c)Addition of energy reduction components, such as (but not limited to) variable speed drives, heat recovery, energy efficient lamps and ballasts, smart control over lift banks etc), light pipes and light tubes, sensors (daylight, CO2 occupancy), dimming devices. (see below)* *d)Reduction in equipment/process loads, where sufficient evidence is given to support the savings over common practices* *e)Reduction in energy use through the selection of a more efficient baseline cooling system.*	The purpose of latest Building Energy Code 2012 is applied for the compliance of requirement but not focus on the percentage of energy reduction. These changes allow for the opportunity to taken into account of the energy conservation approaches.

9.5.4 Trade-off in Design Energy

9.5.4.1 In fulfilling clause 9.5.3, the increase in design energy as a result of not satisfying the trade-off allowable requirements in clause 9.4.2, can be off-set with reduction in design energy as a result of -

(a) an improvement over the corresponding minimum allowable levels of performance in any one or more of the items listed with energy efficiency requirements in Sections 5 to 8 of this BEC, and/or

(b) a better OTTV, on condition that the energy reduction (as a result of better OTTV) counted towards the trade-off should be limited to not more than 5% of the energy budget, and/or

(c) having recovered energy or renewable energy captured or generated on site.

Allowable trade-off requirement in design building for BEAM Plus submission except the clause 9.5.4.1b
The change allows for the opportunity to account for better energy conservation on facade design.

BEC 2012 – Clause 9.5.4 allowable trade-off requirement

EU 1 – Changes in the Original Path

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.1.2 Performance-based Approach	(3) Energy Reduction Measures Considered - Based on the PBEC2007 Performance based Approach	(3) The major modifications concerns clause 9.5.4.1 in BEC *a)Allowable trade-off requirement in design building based according to energy efficiency requirements in Sections 5 to 8 of the Code* ***b)Adoption of load reduction strategies, such as (but not limited to) natural ventilation, free-cooling, natural daylight etc.*** *c)Addition of energy reduction components, such as (but not limited to) variable speed drives, heat recovery, energy efficient lamps and ballasts, smart control over lift banks etc), light pipes and light tubes, sensors (daylight, CO2 occupancy), dimming devices. (see below)* *d)Reduction in equipment/process loads, where sufficient evidence is given to support the savings over common practices* *e)Reduction in energy use through the selection of a more efficient baseline cooling system.*	The purpose of latest Building Energy Code 2012 is applied for the compliance of requirement but not focus on the percentage of energy reduction. These changes allow for the opportunity to taken into account of the energy conservation approaches.

A3.1.4 **Occupant-sensitive Features**. Occupant behaviour, unless otherwise specified in this Appendix, should not be relied upon to achieve consistent and permanent reductions in building energy consumption. Design features that depend on the co-operation of the occupants should be excluded from the design energy calculation.

Natural ventilation with automatic control and simulation support is allowed to count for energy saving strategies which is in line with the EU 1 alternative approach in passive design.

<u>BEC 2012 – Clause A3.1.4 Occupant-sensitive features is not allowed</u>

EU 1 – Changes in the Original Path

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.1.2 Performance-based Approach	(3) Energy Reduction Measures Considered - Based on the PBEC2007 Performance based Approach	(3) The major modifications concerns clause 9.5.4.1 in BEC *a)Allowable trade-off requirement in design building based according to energy efficiency requirements in Sections 5 to 8 of the Code* *b)Adoption of load reduction strategies, such as (but not limited to) natural ventilation, free-cooling, natural daylight etc.* ***c)Addition of energy reduction components, such as (but not limited to) variable speed drives, heat recovery, energy efficient lamps and ballasts, smart control over lift banks etc), light pipes and light tubes, sensors (daylight, CO2 occupancy), dimming devices. (see below)*** ***d)Reduction in equipment/process loads, where sufficient evidence is given to support the savings over common practices*** *e)Reduction in energy use through the selection of a more efficient baseline cooling system.*	The purpose of latest Building Energy Code 2012 is applied for the compliance of requirement but not focus on the percentage of energy reduction. These changes allow for the opportunity to taken into account of the energy conservation approaches.

9.5.4 Trade-off in Design Energy

9.5.4.1 In fulfilling clause 9.5.3, the increase in design energy as a result of not satisfying the trade-off allowable requirements in clause 9.4.2, can be off-set with reduction in design energy as a result of -

(a) an improvement over the corresponding minimum allowable levels of performance in any one or more of the items listed with energy efficiency requirements in Sections 5 to 8 of this BEC, and/or

(b) a better OTTV, on condition that the energy reduction (as a result of better OTTV) counted towards the trade-off should be limited to not more than 5% of the energy budget, and/or

(c) having recovered energy or renewable energy captured or generated on site.

Different from BEC 2012, it is allowed to count the potential saving due to high efficiency system in Design Building for BEAM Plus submission. These changes allow for the opportunity to account for better energy conservation on system design.
Under this circumstance, the baseline benchmarking system should be proposed for comparison (which is showed in the next slide)

BEC 2012 – Clause 9.5.4 allowable trade-off requirement

EU 1 – Changes in the Original Path

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.1.2 Performance-based Approach	(3) Energy Reduction Measures Considered - Based on the PBEC2007 Performance based Approach	(3) The major modifications concerns clause 9.5.4.1 in BEC *a)Allowable trade-off requirement in design building based according to energy efficiency requirements in Sections 5 to 8 of the Code* *b)Adoption of load reduction strategies, such as (but not limited to) natural ventilation, free-cooling, natural daylight etc.* *c)Addition of energy reduction components, such as (but not limited to) variable speed drives, heat recovery, energy efficient lamps and ballasts, smart control over lift banks etc), light pipes and light tubes, sensors (daylight, CO2 occupancy), dimming devices. (see below)* *d)Reduction in equipment/process loads, where sufficient evidence is given to support the savings over common practices* ***e)Reduction in energy use through the selection of a more efficient baseline cooling system.***	The purpose of latest Building Energy Code 2012 is applied for the compliance of requirement but not focus on the percentage of energy reduction. These changes allow for the opportunity to taken into account of the energy conservation approaches.

	Public Housing	Private Housing	Industrial, commercial, and other building types <14,000sqm	Industrial, commercial, and other building types >14,000sqm
Cooling Generation	Unitary air-conditioner, non-split-type	Unitary air-conditioner, split-type	Unitary air-conditioner, split-type	Chiller*
Terminal type	N/A	N/A	N/A	VAV
Heat Rejection	Air-cooled	Air-cooled	Air-cooled	Water-cooled

BEAM Plus 1.2 – Baseline system design

High efficiency systems are allowed to compare the saving in Reference and Design Building for BEAM Plus submission.
These changes are based according to the general design practice in HK and make reference to the ASHRAE standard 90.1 (2007)

EU 1 – Original Path (Cont’)

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.1.5 Prerequisites	(6) Defined basic requirement for lighting and air-conditioning installation according to the following table: •Table 8.1 Requirement for Lighting Installations •Table 8.2 Requirement for Air-conditioning installations Where applicable, those requirements labeled as ‘basic’ in Table 8.1 for lighting installations and in Table 8.2 for air-conditioning installations shall be strictly complied with as a pre-requisite for credits under the Performance-based Approach. Substitutes or trade-offs in performance for such requirements are not accepted.	(6) Defined basic requirement for Lighting, Air-conditioning, Electrical, Lift and escalator installation according to the following table: •Table 9.4 of BEC 2012: Basic Requirements for Performance-based Approach Where applicable, those requirements listed in Table 9.4 of Code of Practice for Energy Efficiency of Building Service Installation – 2012 edition shall be strictly complied with as a pre-requisite for credits under the Performance-based Approach. Substitutes or trade-offs in performance for such requirements are not accepted.	Latest BEC 2012 version combine the basic requirement for Lighting, Air-conditioning, Electrical, Lift and escalator installation in one table.

Table 9.4 : Basic Requirements for Performance-based Approach
Energy efficiency requirements on building services installations:
Lighting installations, given in Section 5 of this BEC (clause no.)
Lighting control (5.5)
Air-conditioning installations, given in Section 6 of this BEC (clause no.)
System load calculation (6.4)
Separate air distribution system for process zone (6.5)
Air distribution ductwork leakage limit (6.6)
Pumping system variable flow (6.8)
Frictional loss of water piping system (6.9)
System control (6.10)
Thermal insulation (6.11)
Energy metering (6.13)
Electrical installations, given in Section 7 of this BEC (clause no.)
Power distribution loss (7.4)
Motor installation (7.5)
Power quality (7.6)
Metering and monitoring facilities (7.7)
Lift and escalator installations, given in Section 8 of this BEC (clause no.)
Electrical power (8.4)
Utilization of power (8.5)
Total harmonic distortion (8.6)
Metering and monitoring facilities (8.7)
Energy efficiency requirements on building envelope:
Overall thermal transfer value, requirements same as given in Building (Energy Efficiency) Regulation (Cap.123M)

Under the performance-based approach, both the designed building and the reference building are governed by the basic requirements given in Table 8.1 and Table 8.2 for Lighting and air-conditioning Installation in BEC 2007 version

In BEC 2012, Table 9.4 is referred to as the basic requirement for Lighting, Air-conditioning, Electrical, Lift and escalator installation. Items not included in this table are deemed as trade-off allowable requirement, which other energy efficient system or components could be adopted to reduce energy consumption.

Table 9.4 Basic Requirement of BEC 2012

EU 1 – Original Path (Cont’)

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.1.7 Exceptional calculation methods	No specified	When no simulation program can adequately model a design (Note: For example: passive design with significant contribution on the reduction of CO_2 emissions), material, or device, the rating authority may approve an exceptional calculation method to demonstrate above-standard performance. The exceptional calculation shall make reference to Section **A3.4 of Code of Practice for Energy Efficiency of Building Services Installation - 2012 Edition[3] and/or Appendix G2.5 of ASHRAE 90.1–2007[4] and/or Appendix D of the Advanced Energy Modeling for LEED – Technical Manual v1.0** (September 2011 Edition)[5].	The purpose of this section is to allow the use of advance energy-saving systems or approaches to reduce the total energy consumption.

A3.4 Exceptional Calculation Methods

A3.4.1 Where no simulation program is available to model the performance of a design, material, or device, an exceptional calculation method may be used to demonstrate compliance.

A3.4.2 For acceptance by the Director of an exceptional method, its theoretical and empirical information verifying the method’s accuracy should be submitted to the Director, which should include the following documentations :

(a) demonstration that the exceptional calculation method and results make no change in any input parameter values specified in Section 9 of this BEC and this Appendix;

(b) input and output documentation, facilitating the Director’s review, and meeting the formatting and content required by the Director;

(c) clear and concise instructions for using the technique and method to demonstrate that the requirements in Section 9 of this BEC and this Appendix are met; and

(d) demonstration of reliability and accuracy relative to the simulation program.

In BEC 2012, the exceptional calculation methods are defined to give opportunities to the use of other energy efficient design.

Other standard such as ASHRAE 90.1 and Advance Energy Modeling for LEED could also be referred to.

Clause A3.4 of BEC 2012

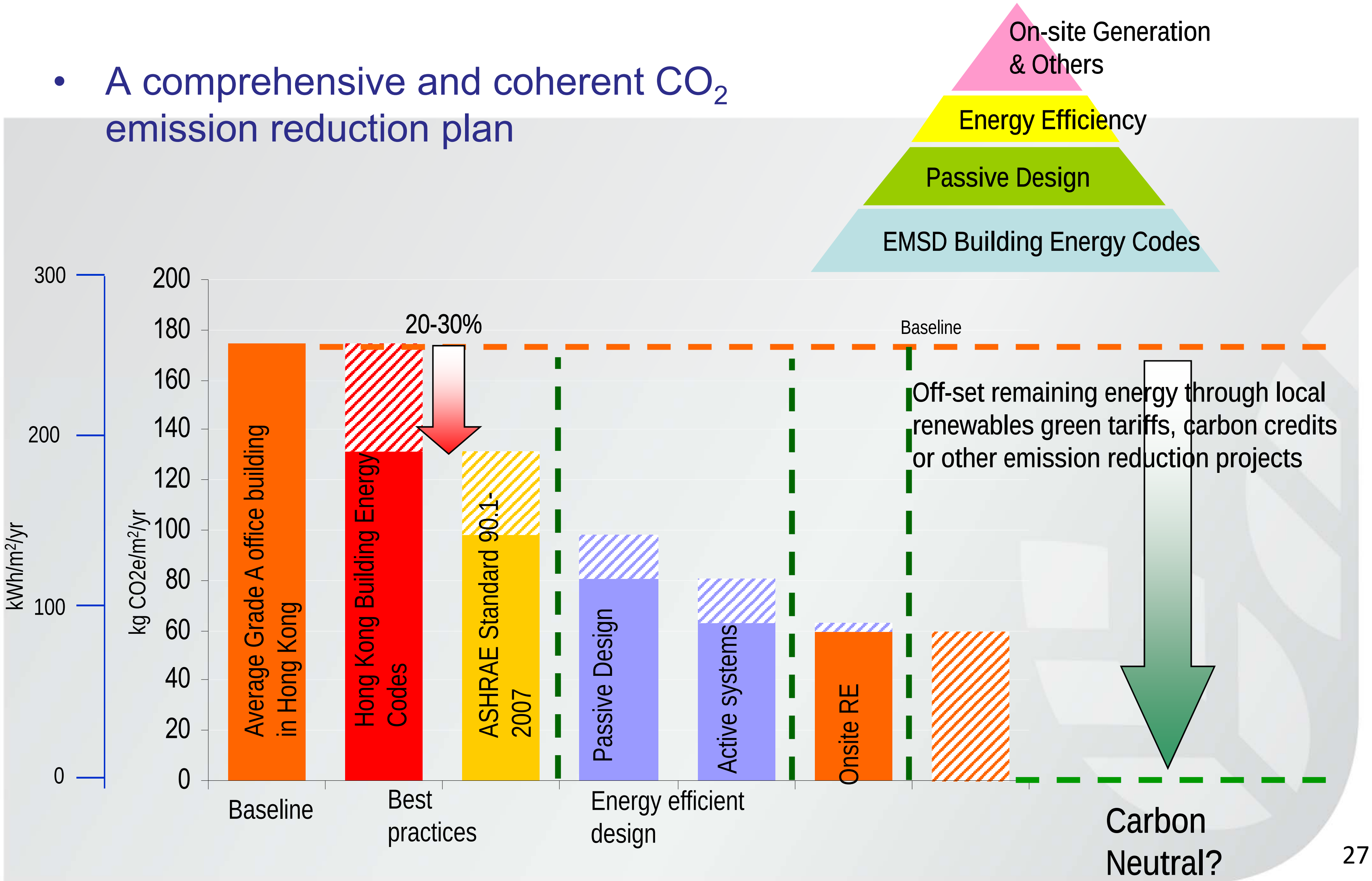
EU 1 – Original Path (Cont')

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.2.3 Other building types	The default parameters for Tinted Glass : K=1.05W/mK P =2500 kg/m3 Cp=840 J/KgK α = 0.65	The default parameters for Tinted Glass : K=1.05W/mK P =2500 kg/m3 Cp=840 J/KgK α= 0.65 SC=0.65	The purpose of adding this parameter is to give a well defined glass property. This parameter is important to the performance of the building envelope.

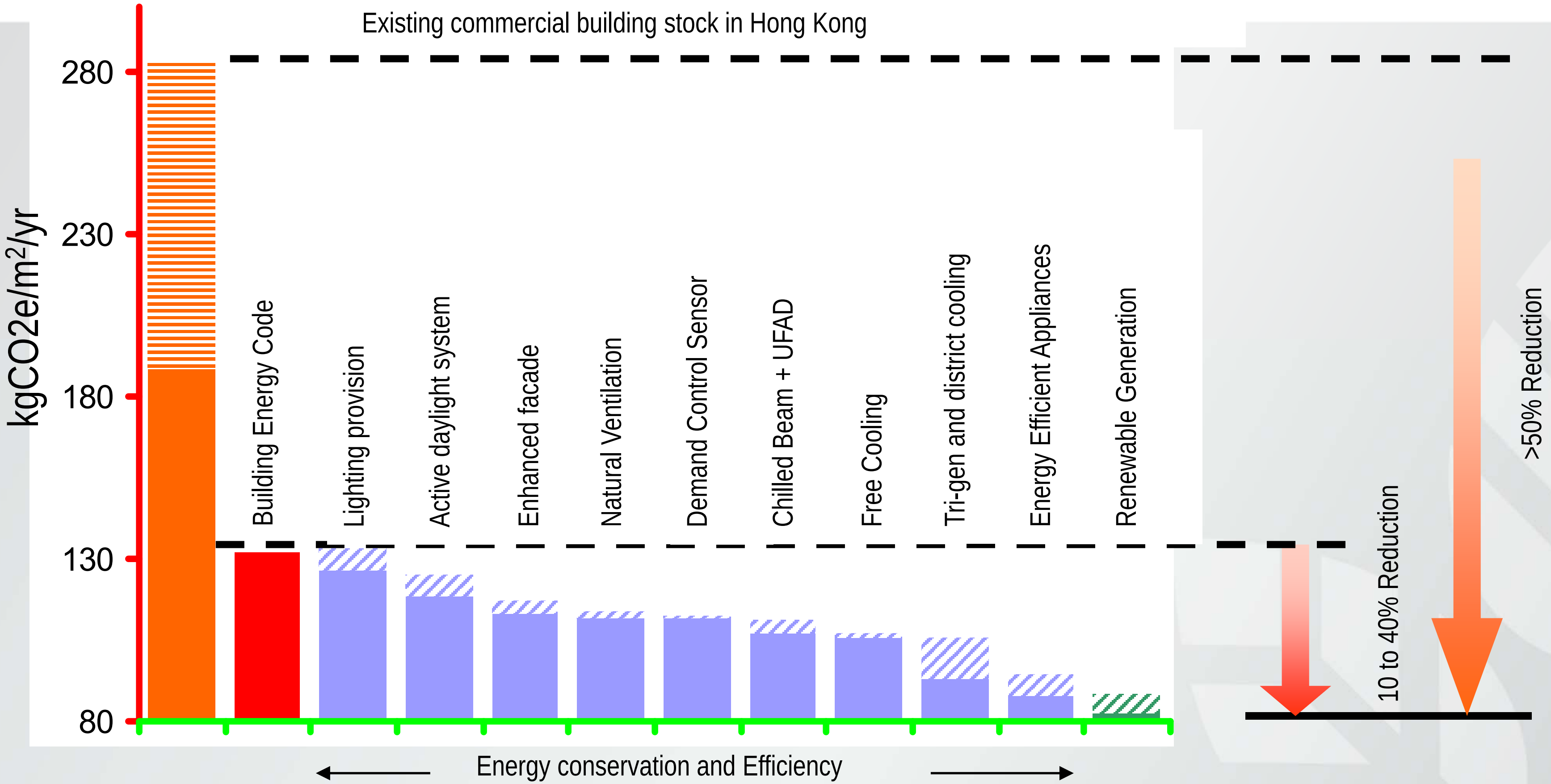
As the shading coefficient (SC value) determines solar gain of a glass unit and referred to as an indicator to how the glass is thermally insulating (shading) the interior when there is direct sunlight on the panel or window.
Therefore defining the default SC value for building envelope can standardize the setting for Baseline Building

Reduction of CO_2 Emission Framework

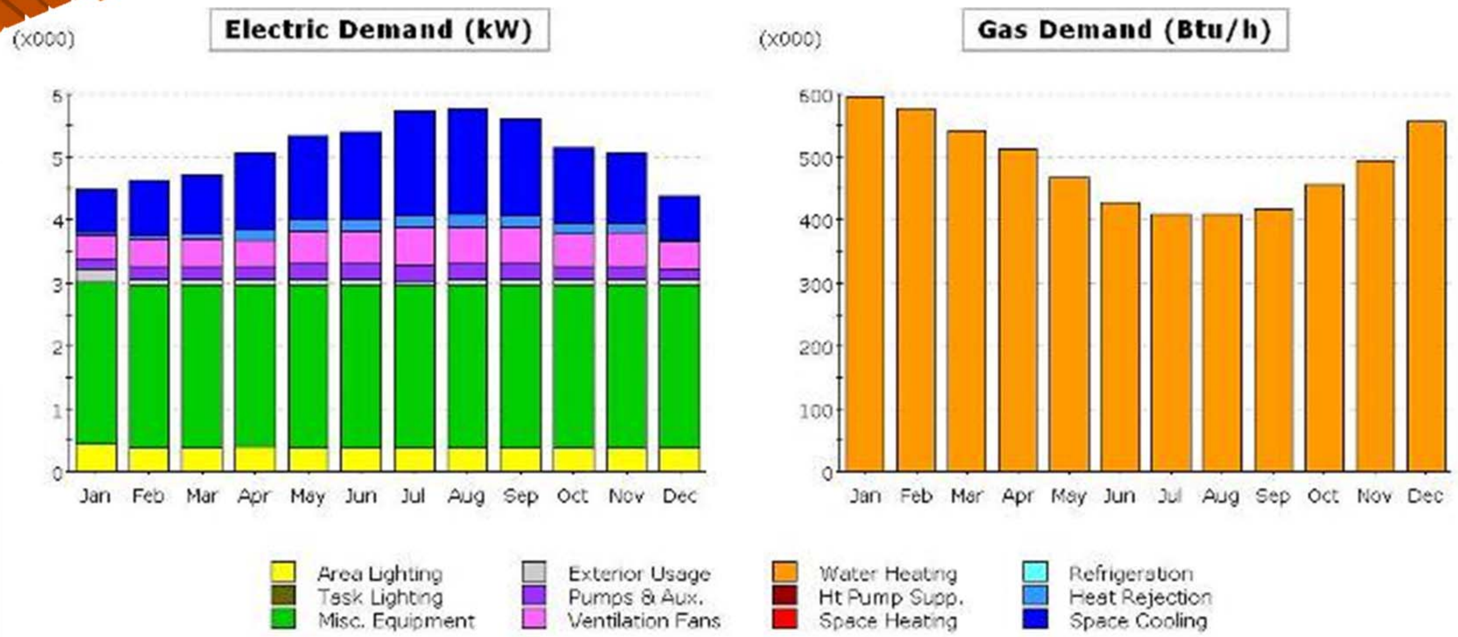
- A comprehensive and coherent CO_2 emission reduction plan



An Example of CO_2 Reduction Strategy



Example



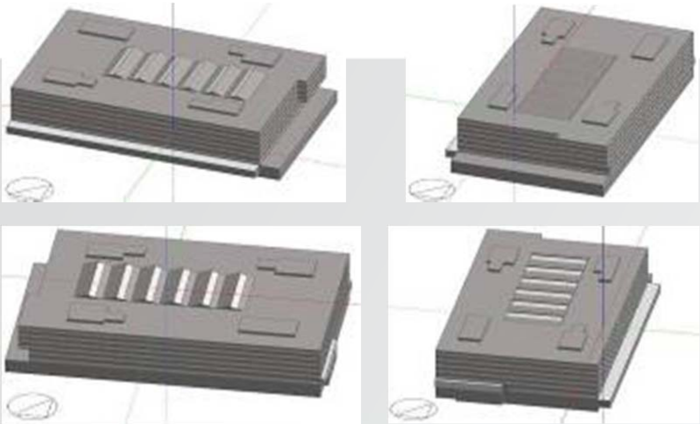
Electric Demand (kW x000)

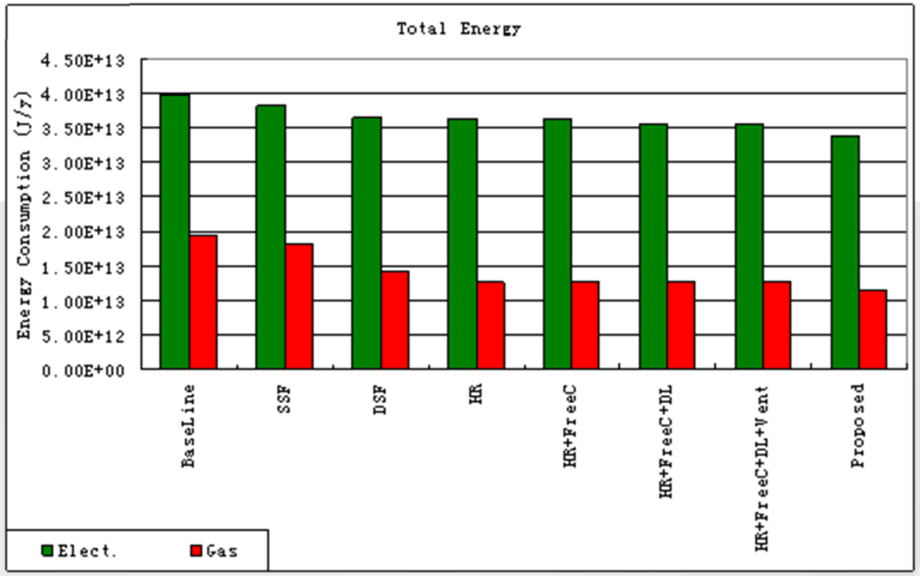
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.68	0.88	0.93	1.22	1.33	1.38	1.66	1.68	1.52	1.21	1.12	0.71	14.33
Heat Reject.	0.03	0.07	0.08	0.15	0.19	0.19	0.19	0.19	0.19	0.16	0.14	0.02	1.58
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.38	0.43	0.44	0.43	0.50	0.51	0.60	0.58	0.57	0.52	0.53	0.43	5.94
Pumps & Aux.	0.16	0.21	0.21	0.21	0.26	0.26	0.26	0.26	0.26	0.22	0.22	0.16	2.68
Ext. Usage	0.21	0.09	0.09	0.07	0.09	0.09	0.05	0.09	0.09	0.09	0.09	0.09	1.12
Misc. Equip.	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	31.00
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.43	0.38	0.38	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	4.62
Total	4.48	4.64	4.71	5.06	5.34	5.39	5.73	5.76	5.60	5.15	5.06	4.37	61.27

Energy Study

Example

Building Energy Simulation





Case	Name	Description
2	Proposed Single-skin	Same system with baseline
3	DSF	Double-skin Façade with Baseline HVAC System
4	Heat Recovery	Double-skin Façade with Baseline HVAC System + Heat Recovery System
5	Free Cooling	Double-skin Façade with Baseline HVAC System + Heat Recovery System + Cooling Tower Cooling
6	Daylighting	Double-skin Façade with Baseline HVAC System + Heat Recovery System + Cooling Tower Cooling + Daylighting
7	Ventilation Cooling	Double-skin Façade with Baseline HVAC System + Heat Recovery System + Cooling Tower Cooling + Transition Season Ventilation

Overall Annual Energy Cost Saving: 21% [Comparing with Performance-based BEC]

8 credits

EU 1 – Original Path (Cont’)

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.2.4 Residential Buildings	In devising the Baseline Building model for a new residential building, the major façade of each flat in the building will be identified, which will be the group of external walls that are exposed to the same direction in which the aggregate window area is the largest amongst all groups of external walls (grouping determined with reference to the orientation of walls). Only external walls that enclose air-conditioned rooms in the flats shall be considered. In predicting the annual energy use and maximum electricity demand for the Baseline Building model, each flat in the building model will be rotated such that its major façade will be facing west, the worst orientation in respect of solar heat gain in the flats. However, the layout design of flats in the building, including their respective orientations, will be modeled ‘as designed’ in the prediction of the annual energy use of the Assessed Building.	**The default WWR area ratio of the Baseline Building model shall be 0.4.** The annual energy use and maximum electricity demand for the Baseline Building model shall be generated by simulating the building with its actual orientation and again after **rotating the entire building 90, 180 and 270 degrees, then averaging the results.** In predicting the annual energy use and maximum electricity demand for the Assessed Building, all components of the building envelope, including the respective orientations, shall be modeled as designed.	The definition of the WWR for residential distinguishes the residential building from other building types. The envelope performance for baseline should be an average value which takes into consideration of all the major directions.

In BEAM Plus version 1.1, WWR is not specified for Residential Building. Therefore in the BEAM Plus version 1.2, WWR is defined as 0.4. Comparing to the 0.65 for the Other Building Types, 0.4 is more reasonable for Residential Building.

The methodology for predicting the annual energy use and maximum electricity demand in BEAM Plus 1.1 representing the worst/extreme case and may benefit some trick design. More appropriate baseline case should be an average value of building performance in all major directions. The method stated in BEAM Plus Version 1.2 make reference to the method in ASHRAE 90.1 2007

Baseline Building Performance

Equivalent dimensions shall be assumed for each exterior envelope component type as in the *proposed design*; i.e., the total gross area of exterior walls shall be the same in the *proposed* and *baseline building designs*. The same shall be true for the areas of roofs, floors, and doors, and the exposed perimeters of concrete slabs on grade shall also be the same in the *proposed* and *baseline building designs*. The following additional requirements shall apply to the modeling of the *baseline building design*:

a. **Orientation.** The *baseline building performance* shall be generated by simulating the building with its actual orientation and again after rotating the entire building 90, 180, and 270 degrees, then averaging the results. The building shall be modeled so that it does not shade itself.

Reference: ASHRAE 90.1

EU 1 – Original Path (Cont')

Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.2.5 Indoor design conditions, Occupancy Densities and Ventilation and infiltration rates	The default indoor design conditions to be used for various types of premises in the Baseline Building model shall be as given in Table 8.4 The default occupancy density pattern, and ventilation and infiltration rates for various types of premises shall be made reference to BEC 2007. The relevant default values are as summarised in Table 8.4 and 8.5 for both the Baseline Building Model and the Assessed Building.	For building operation parameters, including Occupant Density, Minimum Outdoor Air, Operating Schedule, Service Water Heating Power and Equipment Power Density, **the designer should prepare a table summarizing the design value of these operation parameters for all the different spaces in the building.** For simplification purpose, spaces with similar functions and operational characteristics, as represented by the operation parameters, may be grouped together as a space type. For details including table format, Section A3.5.2 (a) of BEC 2012 [3] may be considered as a reference. An operating schedule for each type of space should be prepared summarizing for different times of a day the operation densities of occupants, equipment, lighting, AHU/fan, cooling, heating hot water etc. **The operating schedule should reflect the time profiles which establish the extent of operation, such as the percentage of the equipment load during operation.** For details regarding time profile and occupant density, **Section A3.5.2 (b) & (c) of BEC 2012 can be referred to.** For residential building type, it needs to note that the air-conditioner operation pattern applies to all days in April to October inclusive. The assumption is made that Air-conditioners will not be used in other months in the year.	It is more reasonable to define the appropriate patterns of operation parameter and density on building usage, as long as the profile is consistent for baseline and design building. This gives the opportunity of using addition energy efficient design.

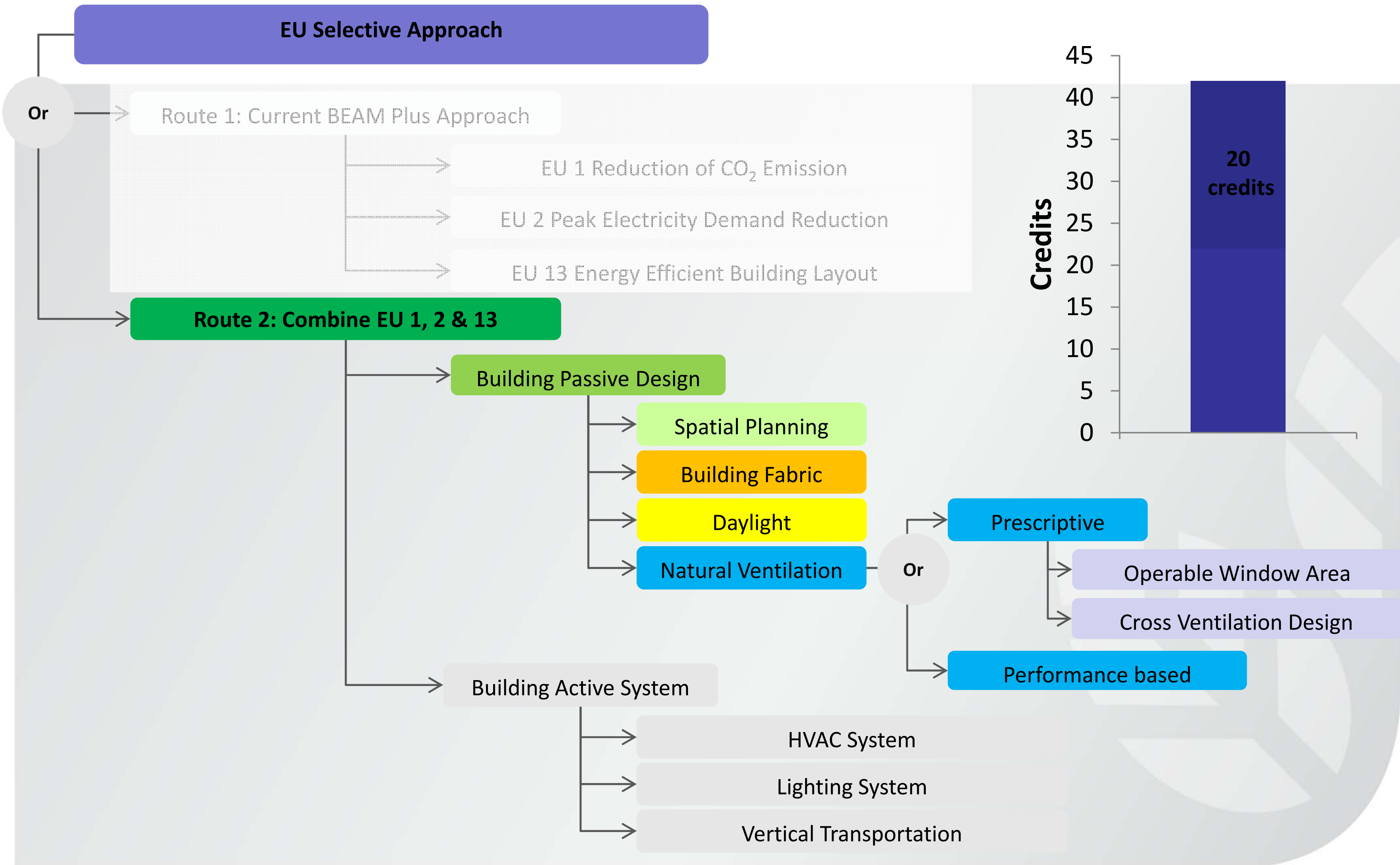
To carry out a side-by-side comparison between the baseline and design buildings, the indoor conditions, patterns of occupancy , fresh air supply and loads , except lighting power density, should be modeled as designed. Therefore, no default parameters is given in BEAM Plus 1.2 except lighting power density.

EU 1 – Original Path (Cont')

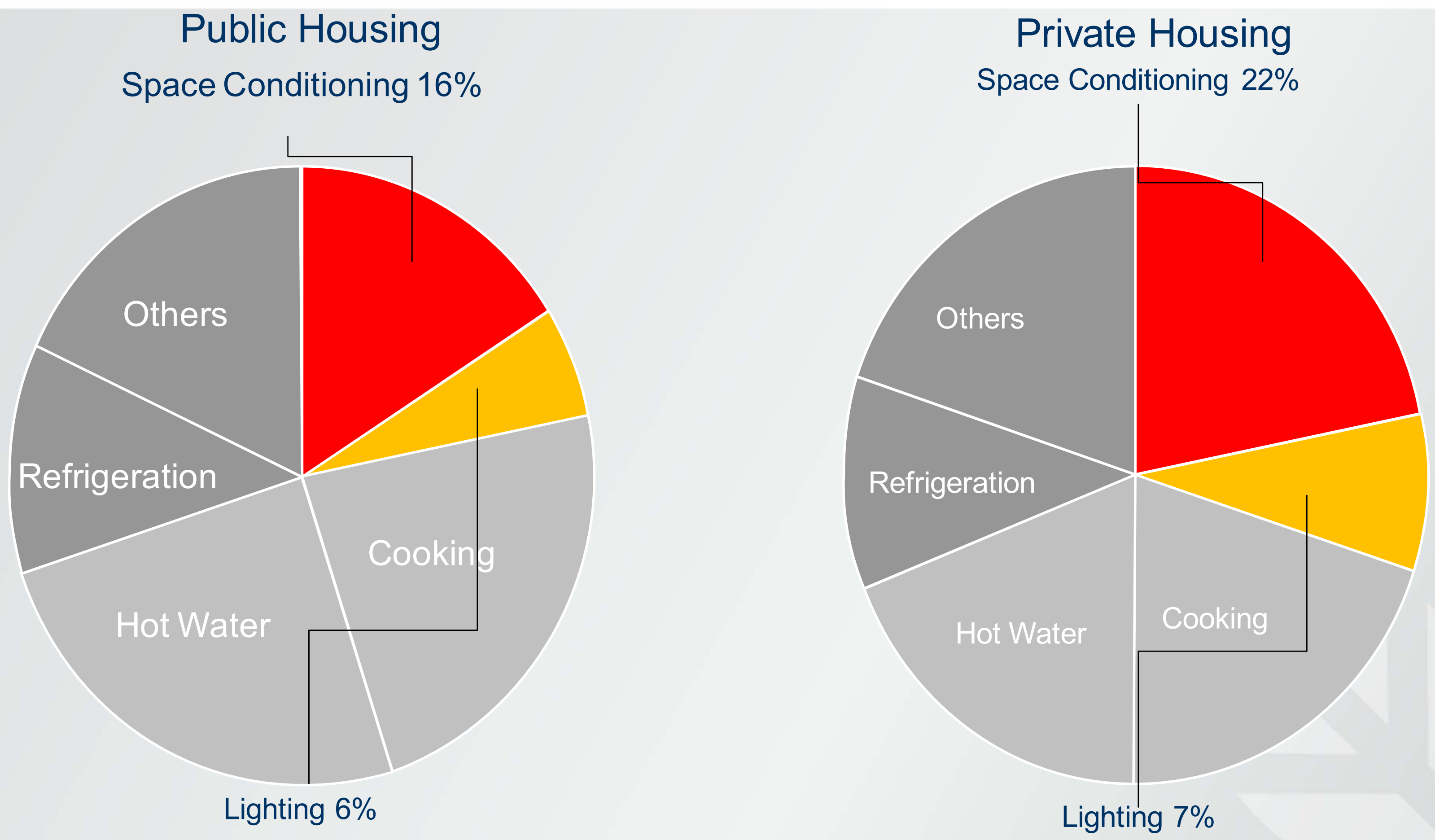
Items	Previous description in BEAM Plus 1.1	Current Changes in BEAM Plus 1.2	Remarks (Reason of changes)
8.2.6 Internal Loads	The default indoor design conditions to be used for various types of premises in the PBEC) [3]. The relevant default values for Baseline Building model shall be as given in Table 8.4. These design indoor conditions correspond to the threshold design conditions as stipulated in the Code of Practice for Energy Efficiency of Air Conditioning Installations or, for those types of premises for which such threshold values are unavailable in the Code, to typical conditions found from surveys in existing buildings. The default occupancy density and pattern, and ventilation and infiltration rates for various types of premises shall be made reference to Performance-based Building Energy Code (are as summarised in Tables 8.4 and 8.5 for both the Baseline Building model and the Assessed Building. Prediction of the energy use in the Assessed Building shall be based on the corresponding equipment densities, occupation densities and ventilation rates adopted for the air-conditioning system design,	The lighting power intensities to be used for various types of premises in the Baseline Building model shall be the threshold compliance values as stipulated in the Building Energy Code (BEC 2012) applicable to the types of premises. **For those types of premises that the Building Energy Code (BEC 2012) does not cover, the values in Table 8.3 are used. The equipment power density shall be modeled as designed.** The equipment power reduction in Assessed Building model must be documented by an Exceptional Calculation Methods. The applicants must provide justification for assumptions used in both the Baseline Building model and the Assessed Building model, supported by following: **• Side-by-side comparison of local industry standard equipment and new proposed equipment, with energy efficiency metric for each piece of equipment (e.g., kWh/ pound of material processed);** **• List of modifications that make new equipment more efficient;** **• Operation schedules for facility and equipment.**	It is more reasonable to define the appropriate patterns of occupancy and load based on building usage, as long as the profile is consistent for baseline and design building. This gives the opportunity of using addition energy efficient design.

To carry out a side-by-side comparison between the baseline and design buildings, the indoor conditions, patterns of occupancy , fresh air supply and loads , except lighting power density, should be modeled as designed. Therefore, no default parameters is given in BEAM Plus 1.2 except lighting power density.

EU 1 Selective Path – Route 2



Energy consumption in HK's Housing



Annual Energy Use in HK in 2009
(EMSD: HK Energy End-use Data 2011)

EU 1 Alternative route – Site Planning

Credit	ASSESSMENT
EU1 Option 2 Alternative Route	**Site Planning** 1 credit attained if the permeability of the site is in accordance with APP 152. 2 credits attained if the permeability of the site is 33% or more in both projection planes in accordance with APP 152. Alternatively the second credit can be achieved by: Carrying out a performance assessment to show an improvement in ventilation performance for the proposed case compared to a site with a permeability of 33%.

Site Planning – Reasoning

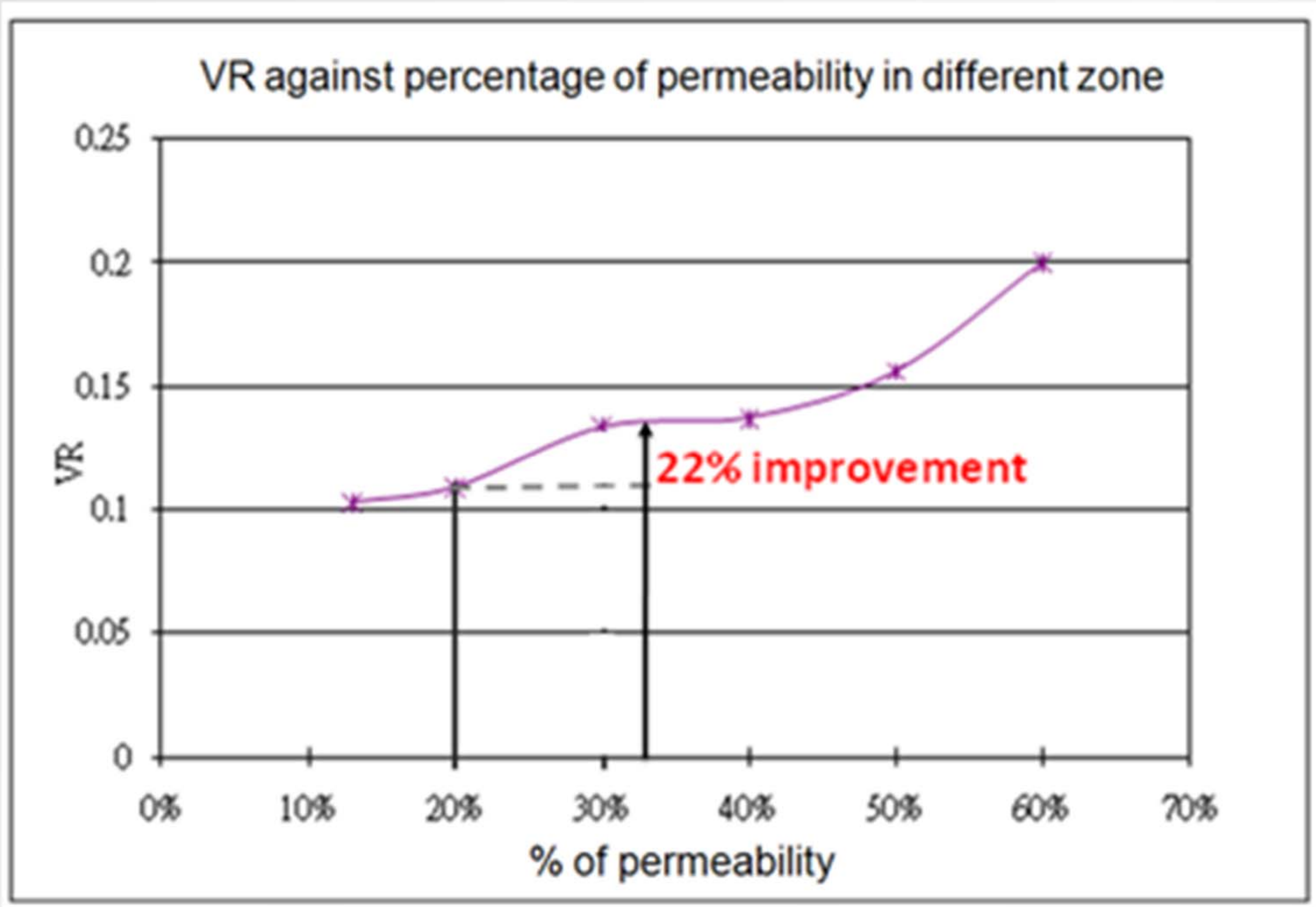
•Aims to improve access to ventilation for the neighbourhood, which in turn improves the natural ventilation potential, improves air quality and enhances the pedestrian environment – improving the architectural collateral of The City.
•APP 152, The Sustainable Building Design Guidelines, sets out as prescriptive method to assess this.
•However, to assess improved performance, this method allows for a performance based approach based on computational simulation or wind tunnel testing. This in line the AVA methodology. This compares a notional base case having a building permeability of 33% and the proposed design case. This is assessed as follows:

- **The model and domain should be set up as per AVA methodology.**
- **Different to the AVA assessment, the measurement plane should be taken at the half the average building height**

•It is anticipated that this improvement will be achieved by:

- **Increasing building separation**
- **Increasing building set back**
- **Implementing building staggering through the site**
- **Including large ‘holes’ in buildings**

Site Planning – increased air movement



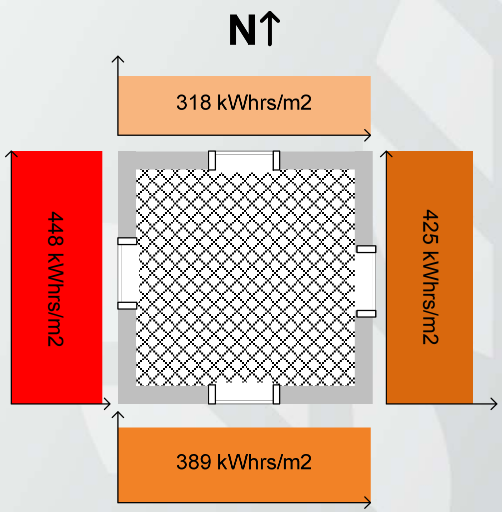
EU 1 Alternative route – Building Orientation

Credit	ASSESSMENT
EU1 Option 2 Alternative Route	**Building Orientation** 1 credit attained if the average solar irradiation of all façades is ≤ 80% of baseline solar irradiation value of 395 kWhr/m²/ apr-oct.

Building Orientation – Reasoning

•Reducing the solar irradiation will reduce summer cooling loads and as such energy consumption.
•Different facade orientations will be exposed to different levels of solar irradiation through the cooling period
•The peak solar irradiation occurs towards the west.
•Residential developments are conditioned from April to October inclusive and have an average solar irradiation of 395 kWh/m2/(Apr-Oct).
•The method compares the solar irradiance received at a facade and sets a target improvement.

•It is anticipated that this improvement will be achieved by:
- **•Favoring non west orientated facades;**
- **•Design self shading into the building;**
- **•Orientating the building to account for neighborhood shading and topography.**



EU 1 Alternative route – Building Envelope

Credit	ASSESSMENT
EU1 Option 2 Alternative Route	**Building Envelope** Prescriptive Approach 1 credit if 28.0 W/m² ≤ OTTV < 30.0 W/m² 2 credits if 26.0 W/m² ≤ OTTV < 28.0 W/m² 3 credits if 24.0 W/m² ≤ OTTV < 26.0 W/m² 4 credits if 22.0 W/m² ≤ OTTV < 24.0 W/m² 5 credits if 20.0 W/m² ≤ OTTV < 22.0 W/m²

Building Envelope– Reasoning

•Building envelopes in Hong Kong should be designed to minimize solar heat gain. This reduces summer cooling loads and associated energy consumption.

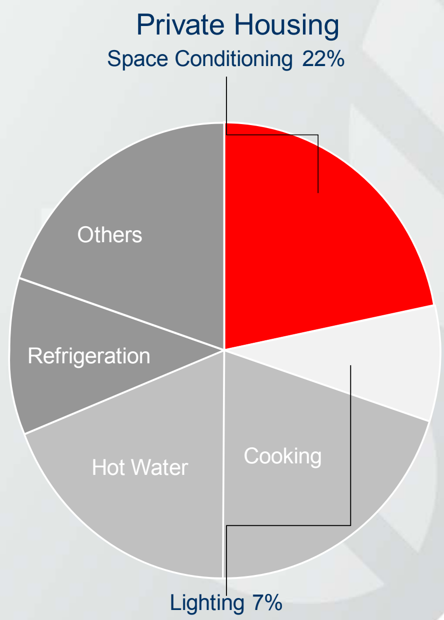
•Good envelope design can reduce the cooling load by almost 20%, which accounts 22% of private housing energy consumption.

•There is no current measure for residential envelope heat transfer in Hong Kong, as such reference is made to the Overall Thermal Transfer Value (OTTV). Buildings Department - Code of Practice for Overall Thermal Transfer Value in Buildings, 1995.

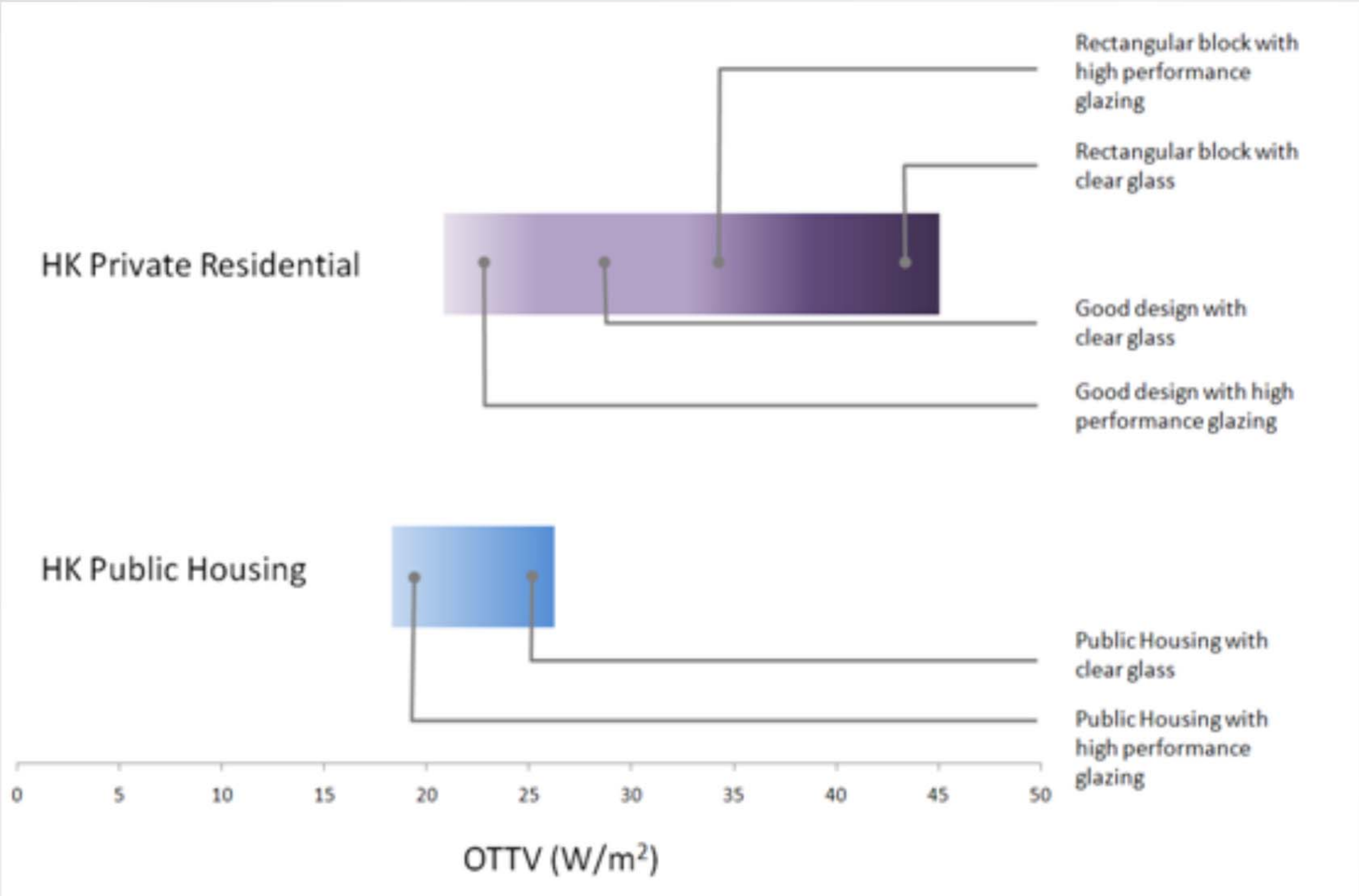
•This considers:

1. **Orientation.**
2. **Window to wall ratio.**
3. **Glazing specification (shading coefficient).**
4. **Solar shading.**
5. **Wall build up (overall u-value, thermal mass and outer absorptivity).**
6. **Roof build up (overall u-value, thermal mass and outer absorptivity).**

- **The 30 W/m2 is calibrated against People's Republic of China – JGJ 75-2003 - "Design Standard for Energy Efficiency of Residential Buildings in Hot Summer and Warm Winter Zone". Where this value is comparable to the basic requirement.**
- **The requirement will be achieved through a balance of the above factors, with interventions to the glazing or window to wall ratio having relatively larger affects.**



Range of OTTVs for HK's Building Stock



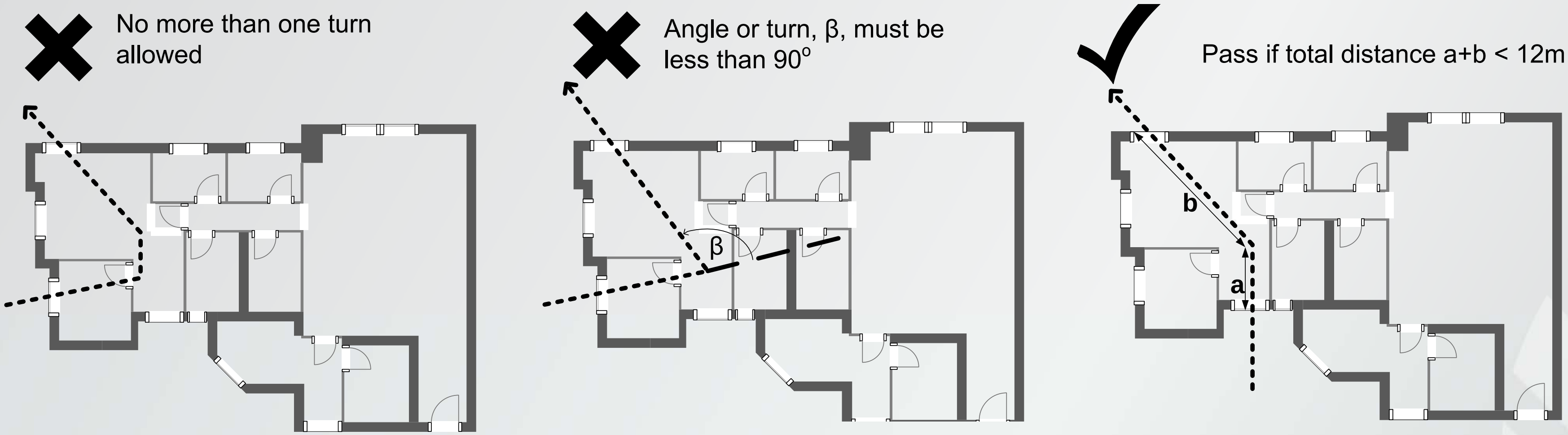
EU 1 Alternative route – Natural Ventilation

Credit	ASSESSMENT
EU1 Option 2 Alternative Route:	**Natural Ventilation** Prescriptive Approach 1 credit if 20% of habitable areas meet the ventilation requirements. 2 credits if 40% of habitable areas meet the ventilation requirements. 3 credits if 60% of habitable areas meet the ventilation requirements. 4 credits if 80% of habitable areas meet the ventilation requirements. 5 credits if 100% of habitable areas meet the ventilation requirements. Performance Approach 1 credit if 20% of habitable areas satisfy the Area-Weighted Average Wind Velocity (AAWV) requirement. 2 credits if 40% of habitable areas satisfy the AAWV requirement. 3 credits if 60% of habitable areas satisfy the AAWV requirement. 4 credits if 80% of habitable areas satisfy the AAWV requirement. 5 credits if 100% of habitable areas satisfy the AAWV requirement.

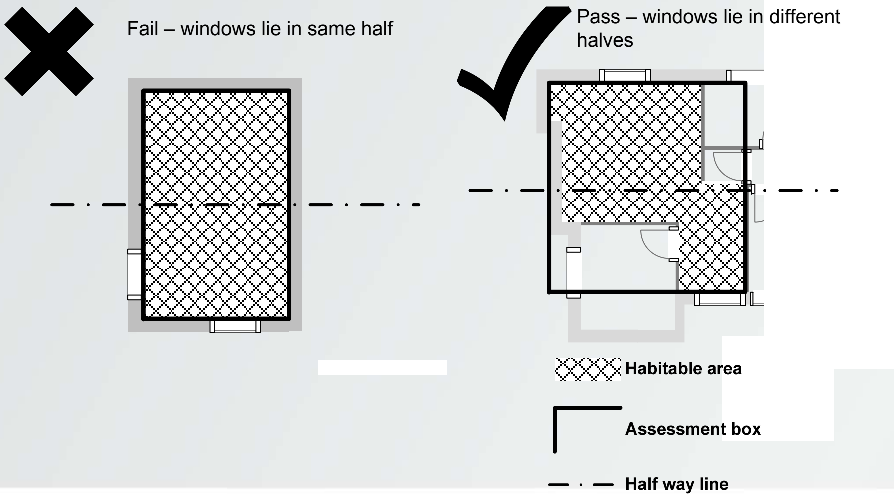
Natural ventilation – Reasoning

- **Natural ventilation reduces the dependency of mechanical cooling systems and reduces energy consumption.**
- **Good natural ventilation can reduce the cooling load by almost 30%.**
- **Good quality natural ventilation is not simply a case of opening a window. The following features should be considered:**
  - **Size of openings must be sufficient to allow air to enter *& exit.***
  - **Cross ventilation is far more effective than single sided ventilation and should, where possible be included.**
  - **Ensure that ventilation paths are not overly long.**
  - **Ensure the ventilation path is clear of obstructions and the moving air is not required to turn many times.**
  - **If re-entrants are included, ensure that they a not too small to allow ventilation air to enter.**
  - **Ensure that pollutants from other residences do not affect the air quality.**
- **It is the intention of this credit to ensure good provision for natural ventilation is included in buildings, as such this credit does not focus on wind directions or availability. These are covered in the site planning section. This credit simply optimizes the potential for natural ventilation.**
- **Ventilation performance is a complex problem, as such, it is encourage that practitioners follow the performance based approach should they feel that the prescriptive approach is overall simple.**

EU 1 Alternative Route – Natural Ventilation



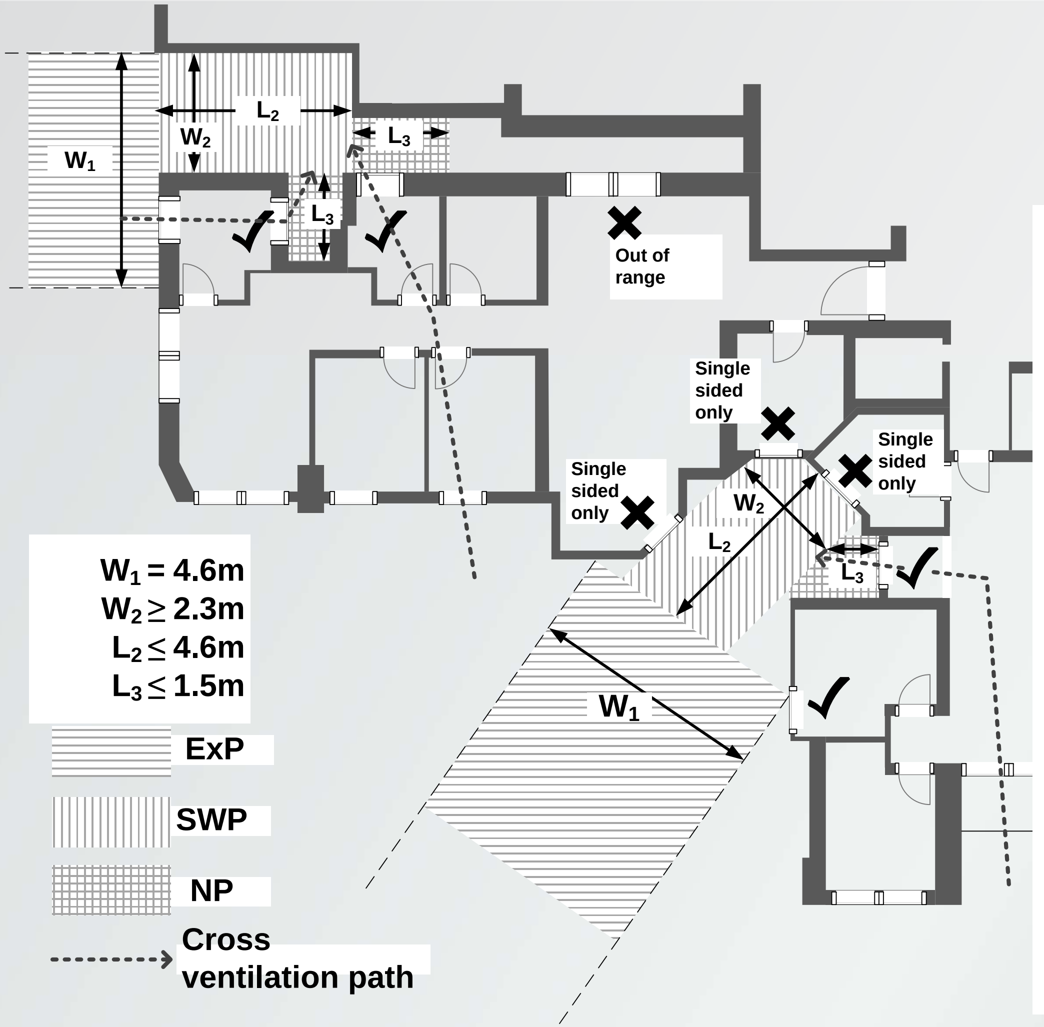
Cross ventilation window separation



- **The total operable window size (i.e. physical opening not aerodynamic free area) in each habitable area should be double of that of the statutory requirement (i.e.1/8 of operable window area to floor area);**

- **When considering a single room the operable window size located at each wall should be at least 1/16 of the floor area;**

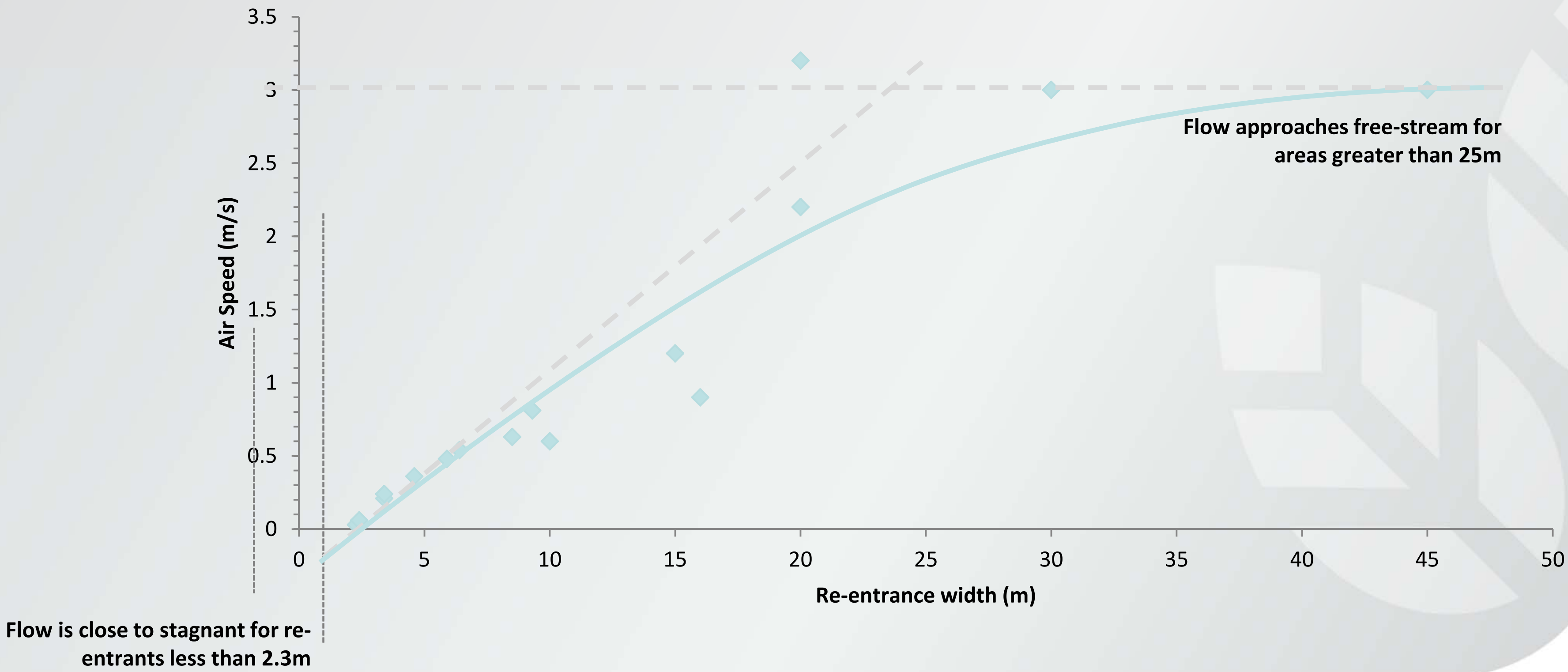
EU 1 Alternative Route – Natural Ventilation



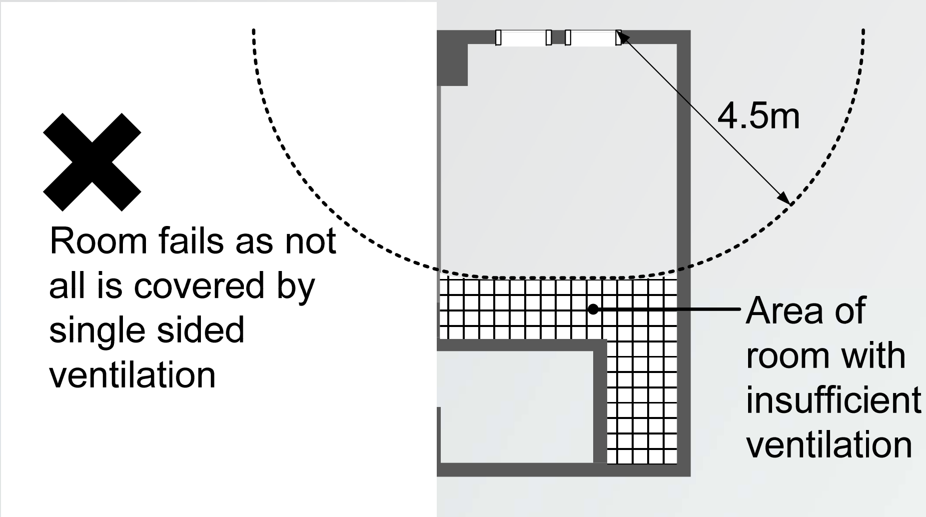
- First re-entrant dimension – ExP defines the start of the re-entrant and equals 4.6m
- Second re-entrant dimension (SWP) must not be less than 2.3m, below this size, air will stagnate and pollutants will not be removed from the re-entrant (R. Yau et al 2004) – next slide
- The third re-entrant dimension (NP) links the SWP to the window, this is limited to 1.5m.
- The cross ventilation path is extended into the NP with the same constraints as listed in the previous slide.
- The NP also limits the location of AC condensers – they cannot be within 1.5m of this.

Re-entrance width

- Re-entrants begin when dimensions is less than 5m (4.6m for convenience)
- Re-entrants less than 2.3m width are effectively stagnant
- Conclusions in agreement with “Effect of Building Re-entrant on ventilation Effectiveness in High Rise Residential Buildings, International Housing Conference 2004, R. Yau et al



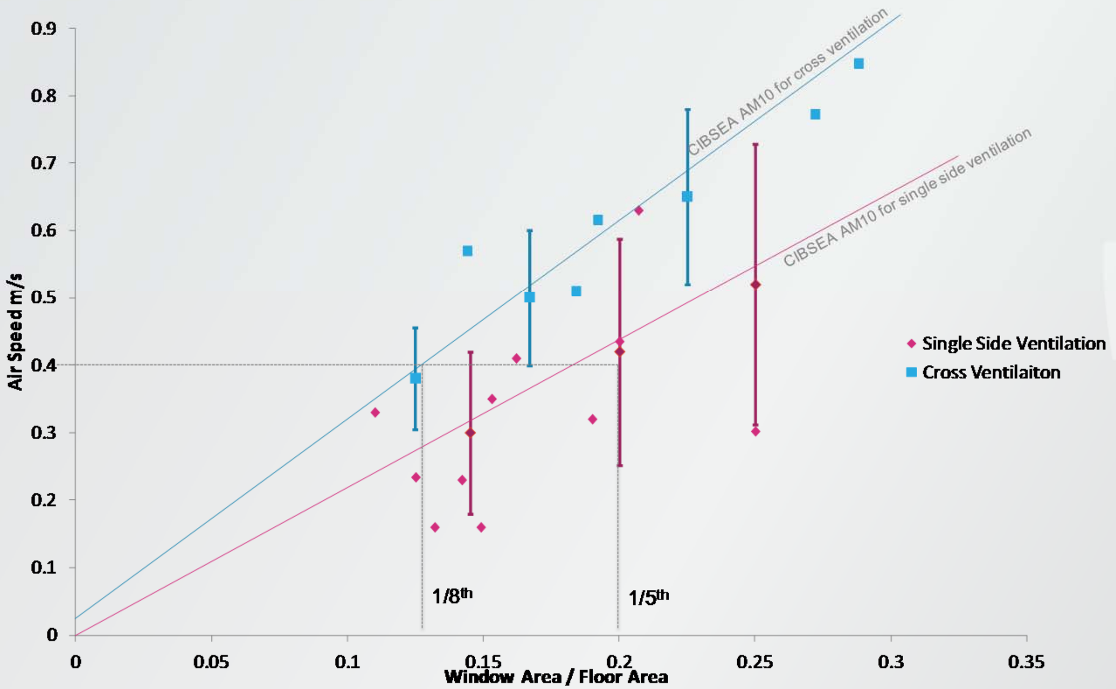
EU 1 Alternative Route – Natural Ventilation



- The window will ventilate up to 4.5m from opening area, the area under question must be contained within this zone
- Preferably two separated operable window panes must be located at same wall or different walls; and
- The total operable window size (i.e. physical opening not aerodynamic free area) in each habitable area must be double of the statutory requirement (1/5 operable window of the floor area).

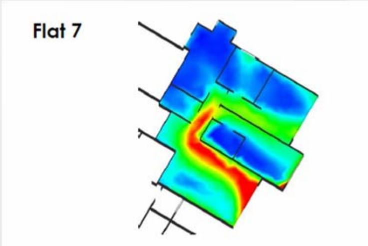
Minimum Window Area

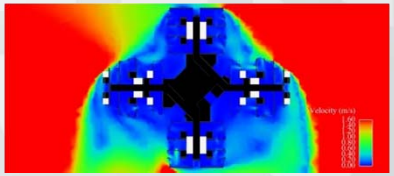
- Rooms with larger window area (as a function of the floor area) have better ventilation performance
- Minimum window area for Cross Ventilation to achieve AAWV=0.4m/s is 1/8th of floor area
- Minimum window area for Single-Sided Ventilation to achieve AAWV=0.4m/s is 1/5th of floor area



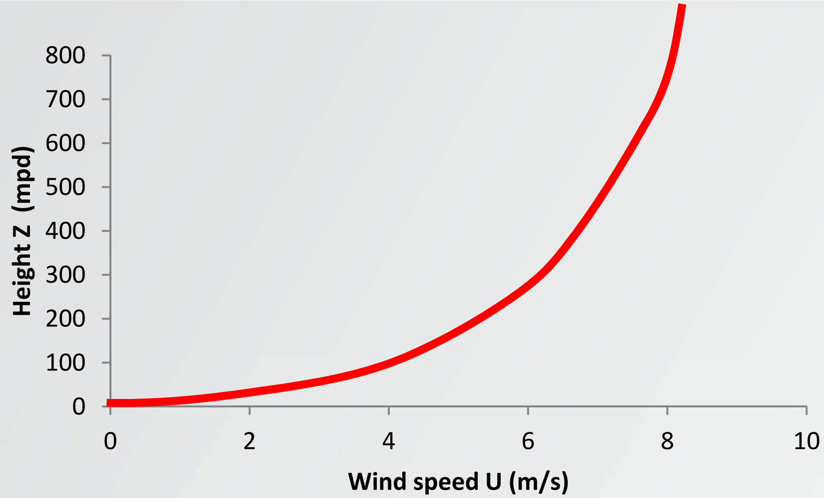
EU 1 Alternative Route – Natural Ventilation

Wind speed 3.0m/s	Typical value at 50mPD for urban HK, this also gives a standard comparison
Choose 4 wind directions	Allows for variety of designs
Calculate habitual rooms separately	Different rooms can be benefit for a different wind direction
Model realistic openings	Aerodynamic openings determine ventilation, not physical opening
Use CFD to predict air flow in the room	Robust tool for detailed air flow predictions
0.4m/s internal air speed is consider adequate for thermal comfort	Based on ASHRAE adaptive comfort model for HK's climate and enables comfy 28°C internal temperatures





Wind speed at 50 mpd



$$U = U_0 \left(\frac{Z}{Z_0} \right)^{0.35}$$

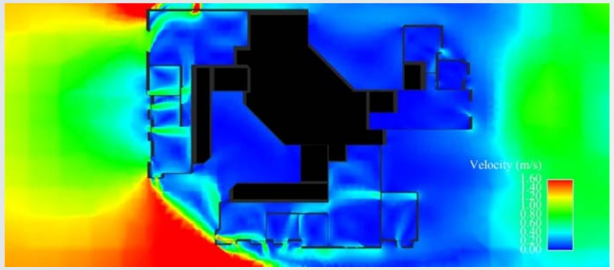
U_0 = wind speed measured at observatory station
Z_0 = height of the observatory station

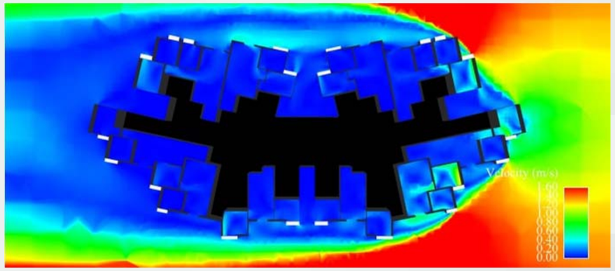
	measured height mpd	Measured wind speed (m/s)	interpolated wind speed at 50 mpd using power law (m/s)
二东山 Yi Tun shan	752	7.9	3.06
天文台 HK Observatory	32	2.4	2.81
京是柏 King's Park	65	2.6	2.37
北角 North Point	26	3.47	4.36
Average =			3.15

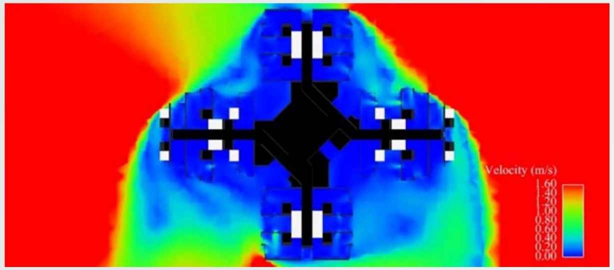
The average wind speed in urban areas at 50mpd is approximately 3.15m/s.

Assessing Ventilation Performance

- Focus on the permeability of apartments; site wind availability is addressed by credits – site planning
- Assess the performance of a typical floor plate with incoming wind velocity of 3 m/s
- Calculate the Average Area Weighted Velocity (AAWV) within individual rooms
- Performed Sensitivity Tests on 200+ room combinations of window sizes, re-entrant arrangements, wind direction, covering 3 typical apartment forms representing typical private and public housing

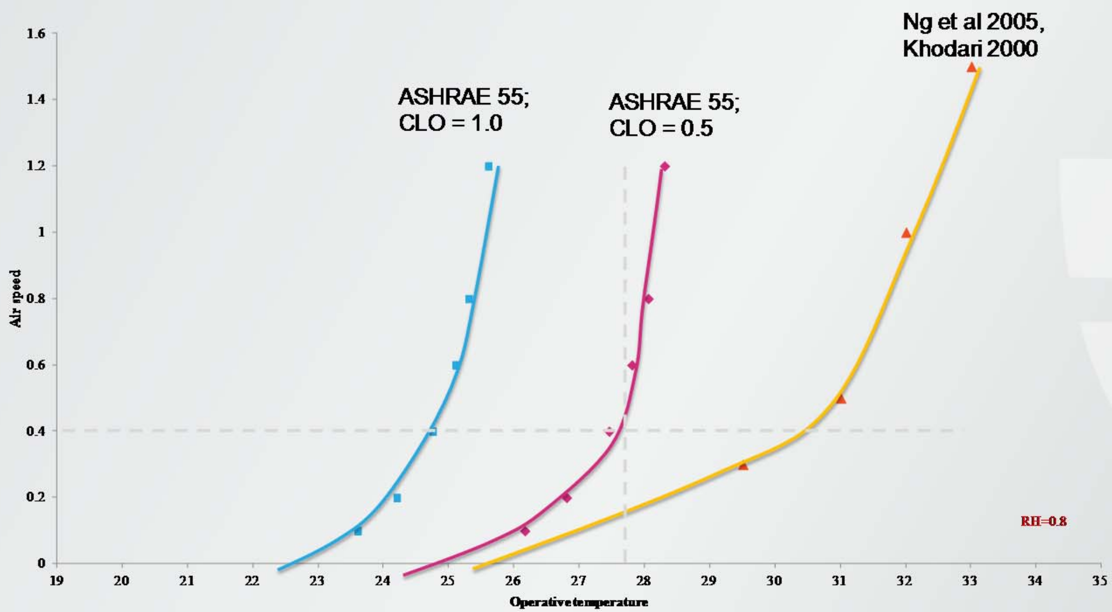






Energy Reduction through Natural Ventilation

- A room velocity with average 0.4 m/s will allow subjects to feel comfortable at 28°C under natural ventilation environment
- A room that allows such a level of air movement will require 15% less air-conditioning (from a BEAM plus baseline); resulting in 2 to 5% reduction in overall energy use.
- Local studies (Ng et al 2005) suggests that further behavioral changes can increase the reduction to 30% less air-conditioning (corresponding to 6 to 10% reduction in overall energy use)



EU 1 Alternative route - implementation

Credit	ASSESSMENT
EU1 Option 2 Alternative Route	**Daylight** 1 credit if 80% of the habitable areas have glazing with a vertical daylight factor (VDF) 50% higher than the minimum requirement in APP 130.

Daylight– Reasoning

•Daylight offsets the use and artificial lighting and improves occupant health and wellbeing.

•APP130 current legislates for daylight design, BEAM plus is intended to improve performance beyond this.

•APP130 considers the potential access of a window to daylight and not the passage of daylight through the glass and across the room. Such assessment is considered in the IEQ section of this methodology.

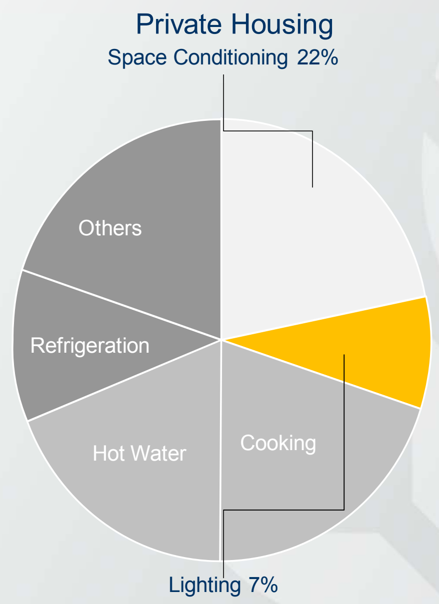
•The requirement can be achieved by:

1.Orientating buildings to increase the view of the sky with respect to neighbors and topography.

2.Massing the site to increase building separation.

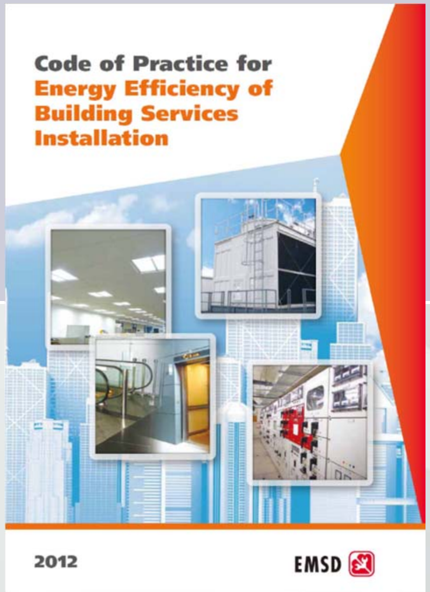
3.Positioning windows so as limit the self shading affect of the building.

•There is a trade off to made between daylight and solar heat gain. The practitioner must carefully weigh to pros and cons of each design to decide where the project specific priority lies



EU 1 Alternative route - implementation

Credit	ASSESSMENT
EU1 Option 2 Alternative Route:	**Active Building Systems** Two pre-requisites must be achieved to gain the credits: Compliance with the latest Building Energy Codes (BEC) by Prescriptive Option; and In the case where air-conditioning units are provided by the developer, units selected shall either be Grade 1 or 2 under the Government's energy efficiency labelling scheme for room coolers. Three different categories fall under the section Active Building Systems, HVAC systems in common areas: 1 credit for a 20% energy reduction compared to current BEC. 2 credits for a 25% energy reduction compared to current BEC. Artificial lighting system in common areas: 1 credit for a 20% energy reduction compared to current BEC. 2 credits for a 25% energy reduction compared to current BEC. 3 credits for a 30% energy reduction compared to current BEC. Vertical transportation in common areas: 1 credit for a 10% reduction from the maximum allowable electrical power rating.



There will be active systems within the developments.
This energy accounts for 5-10% of building energy, and can be reduced significantly.

Three different categories fall under the section for Active Building Systems,

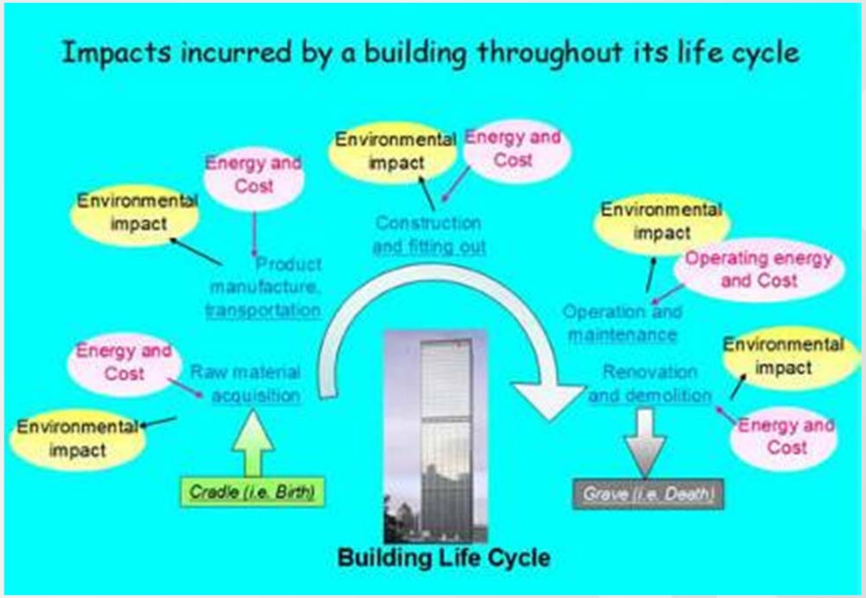
- HVAC in common areas.
- Artificial lighting systems in common areas.
- Efficient vertical transportation system in common areas.

This is assessed against the most recent version of the BEC.
The use of passive design, natural ventilation and daylight can be incorporated into the calculation and as such the benefits quantified.

Energy Use Aspects

Energy Use - New Buildings:

- ***Credit Eu 3 – Embodied energy in major elements of building structure***
  - The assessed building has been studied through a Life Cycle Assessment (LCA).
  - 1 Bonus credit for utilizing the LCA results.



www.emsd.gov.hk/emsd/eng/pee/lceac.shtml

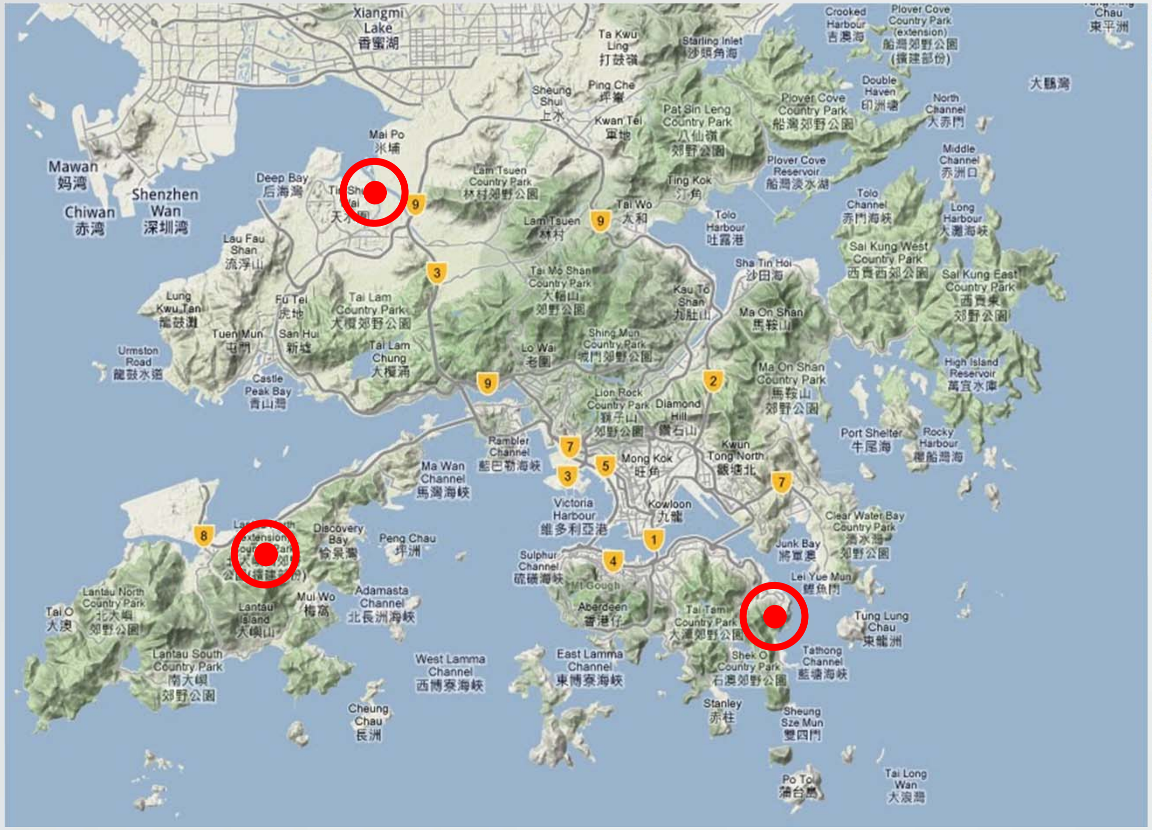
Energy Use Aspects

Energy Use - New Buildings:

- ***Credit Eu 6 - Renewable Energy Systems***
  - 1 to 5 credits where 0.5% to 2.5% or more of **building energy consumption** is obtained from renewable energy sources; or
  - 1 to 5 credits where 20% to 100% of the **building footprint** is being covered/used by PV panels respectively and/or other renewable power facility generation equivalent renewable power output.

Renewable Energy Consideration

- Villa in the New Territories
- Holiday house in Lantau
- Mansion in South Island

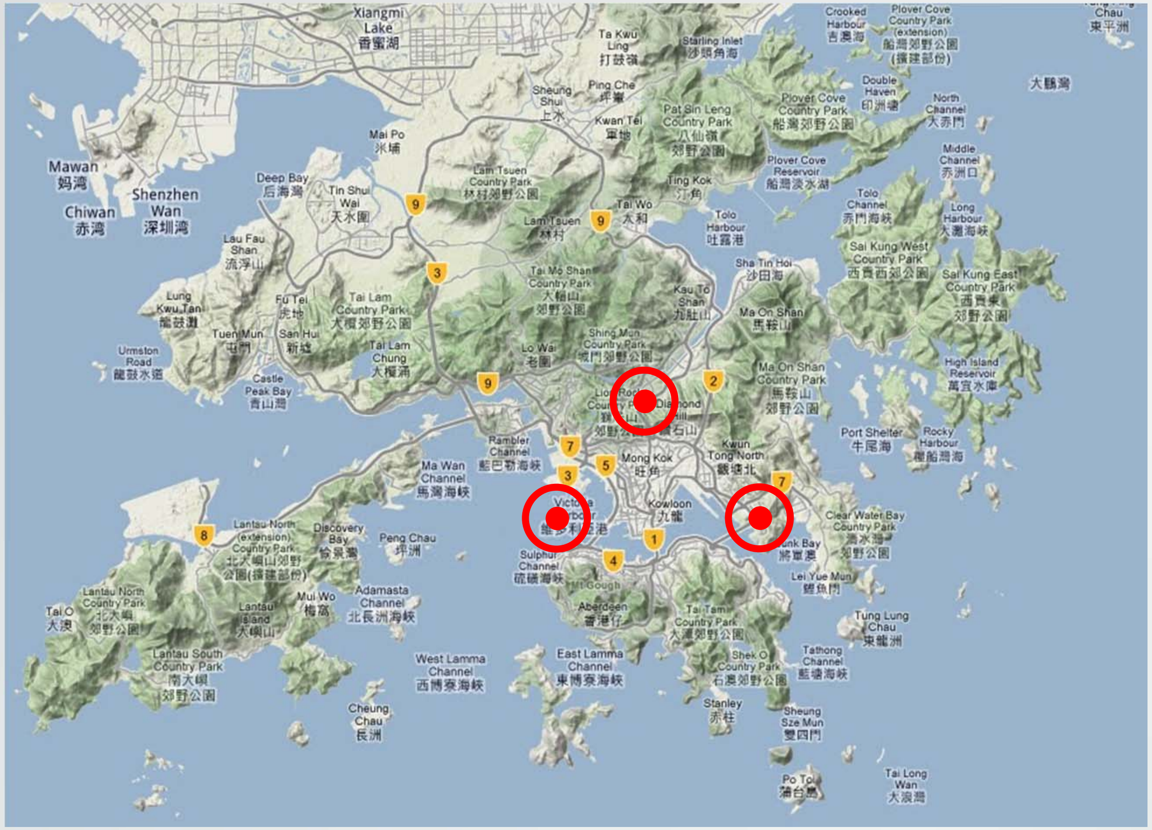


Source: Arup

- Low rise 1-3 stories
- Available Roof Area 80%
- Plot Ratio : > 1
- Energy ~ 100%

Renewable Energy Consideration

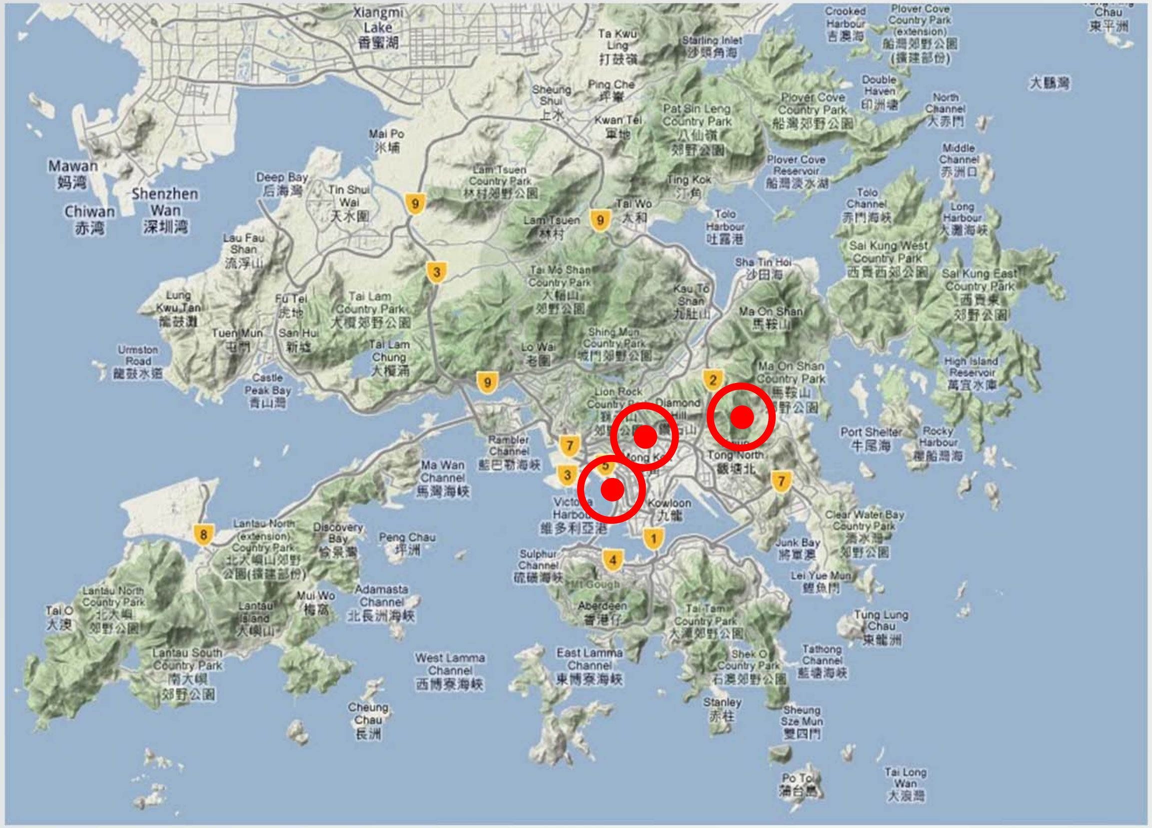
- Tong Lau in Kowloon City, Sham Shui Po
- Medium Density Developments East and West Island



- Mid-rise 5 – 30 stories
- Available Roof Area ~ 50%
- Plot ratio ~ 3
- Energy 1 – 10%

Renewable Energy Consideration

- Central Business Districts
- New Residential Developments



- Mid-rise 30-100 stories
- Available Roof Area ~ 20%
- Plot ratio > 10
- Energy < 0.5%

Energy Use Aspects

Renewable Energy in Hong Kong

- Typical available area is 20% for most building types while can be as low as 3.5% for some Government offices

Building Category	Confidence Level	Building Roof: Range of Allowable PV Panels in Percentage of Building footprint Area (%), R_r	Range of Potential Annual Energy output per Unit Building footprint Area (kWh/yr/m²)[1], O_r	
			System Efficiency = 9.3%	System Efficiency = 3.8%
G	Confidence Level 70%	3.5 ± 2.1	4.3 ± 2.6	1.8 ± 0.7
	Confidence Level 80%	3.5 ± 2.6	4.3 ± 3.1	1.8 ± 1.3
	Confidence Level 90%	3.5 ± 3.3	4.3 ± 4.0	1.8 ± 1.6
	Confidence Level 95%	3.5 ± 3.4	4.3 ± 4.2	1.8 ± 1.8
I	Confidence Level 70%	18.1 ± 6.2	22.1 ± 7.6	9.0 ± 3.1
	Confidence Level 80%	18.1 ± 7.6	22.1 ± 9.3	9.0 ± 3.8
	Confidence Level 90%	18.1 ± 9.8	22.1 ± 12.0	9.0 ± 4.9
	Confidence Level 95%	18.1 ± 11.6	22.1 ± 14.2	9.0 ± 5.8
C	Confidence Level 70%	20.6 ± 6.0	25.0 ± 7.3	10.2 ± 3.0
	Confidence Level 80%	20.6 ± 7.4	25.0 ± 8.9	10.2 ± 3.6
	Confidence Level 90%	20.6 ± 9.5	25.0 ± 11.5	10.2 ± 4.7
	Confidence Level 95%	20.6 ± 11.3	25.0 ± 13.6	10.2 ± 5.6
CO	Confidence Level 70%	20.7 ± 8.2	25.1 ± 10.0	10.3 ± 4.1
	Confidence Level 80%	20.7 ± 10.0	25.1 ± 12.1	10.3 ± 5.0
	Confidence Level 90%	20.7 ± 12.9	25.1 ± 15.6	10.3 ± 6.4
	Confidence Level 95%	20.7 ± 15.4	25.1 ± 18.6	10.3 ± 7.6

Table 8-2. Ranges of allowable BIPV on roof in percentage of building footprint area and annual energy output per unit building footprint area

Energy Use Aspects

Energy Use - New Buildings:

Example

- ***Credit Eu 6 - Renewable Energy Systems***

  - A building (GFA = 40,000m^2; 25 storey; 1,600m^2 roof area/building footprint; Energy intensity index = 200 kWh/m2/yr) Energy consumption = 8,000,000 kWh/yr
  - An area of 20% of building footprint = 1,600m^2 x 20% = 320m^2
  - Maximum generation for PV panels is (125kWh/m2/yr x 320m^2) = 40,000kWh/yr. (Each m2 of PV panels can produce approximately 125 kWh net of electricity)
  - 0.5% of **building energy consumption** is obtained from renewable energy source from 20% of the **building footprint**

1 credit

Energy Use Aspects

Energy Use - New Buildings:

- ***Commissioning for Green Building Projects***

  - Building Commissioning Process is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems and assemblies meets defined objectives and criteria – ASHRAE Guide 0.

  - The process is performed specifically to ensure that the finished facility operates in accordance with the owner's documented project requirements and construction documents.

  - It begins in pre-design and continues through design, construction and occupancy of the facility.

  - HKGBC/ASHRAE Joint Workshop on 4 June 2010
    www.ashrae.org.hk/

Energy Use Aspects

Energy Use - New Buildings:

- ***What Commissioning is NOT***
  - Test and Balance
  - Start-up
  - Plan Review
  - Design
  - Contract Administration
  - Inspection

Energy Use Aspects

Commissioning Cx Authority

- Should have actual and perceived independence of action (an unbiased party)
- Should have a background and experience to match project expectations
- Will act in the best interests of the owner
- Will interact with owner's representatives, design team, contractor and subcontractors
- Will lead commissioning team and team meetings
- Authority (or provider) versus agent
  - An authority acts for the owner
  - An agent can act as the owner (this is not intended)
- Professional services contract must spell out roles and responsibilities for this crucial party
- The "authority" may be an independent entity, come from the owner's in-house staff

Energy Use Aspects

Energy Use - New Buildings:

- ***Credit Eu 10 – Testing and Commissioning***

  - Ensure that commissioning of electrical and mechanical systems that impact on energy use is adequate, that systems perform as specified, and can be operated as intended.

  – Requirement:

    a) Commissioning specification (1 credit for provision of appropriate specifications & cost provisions in contract docu detailing commissioning requirements for all systems and equipment that impact on energy use and IEQ)

    b) Commissioning plan (1 credit for appointment of a Cx and provision of a detailed commissioning plan that embraces all specified commissioning work)

Energy Use Aspects

Energy Use - New Buildings:

- ***Credit Eu 10 – Testing and Commissioning***
  - Requirement:

    c) Commissioning (1 credit for ensuring full and complete commissioning of all systems, equipment and components that impact on energy use and IEQ)

    d) Commissioning report (1 credit for providing fully detailed commissioning reports for all systems, equipment and components that impact on energy use and IEQ)

    e) Independent Commissioning authority (1 BONUS credit for engagement of an independent commissioning authority in the Testing and Commissioning process)

Thank you

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