



Green Mark International

**EE**

Energy Efficiency

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R1	1 <sup>st</sup> Edition	01/09/2022
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The Energy Efficiency section provides a set of harmonised, parallel routes for buildings to demonstrate their energy performance, from Gold<sup>PLUS</sup> through to Positive Energy Buildings. The levels are aligned for both new and existing building and complements to carbon abatement within the built environment. The energy savings levels are a significant step up from previous versions of Green Mark. Projects are encouraged to look holistically at their energy systems from passive design solutions, active system efficiencies and right sizing, energy management and opportunities for renewable energy,

The GM International Energy Efficiency section (EE) has been created leveraging our vast database of building energy performance, using AI calculation tools to ensure correlation between the standards, leveraging our work within the international community and refined through a collaborative approach with our Singapore Green Building Masterplan Taskforces. It is a data driven standard, that maps the longer-term vision towards super low energy and zero energy buildings. The approach is aligned and been an integral part of the development of ISO draft technical standard 23764 'Approach for non-residential Zero Energy Buildings'.



Green Mark International



Energy Efficiency

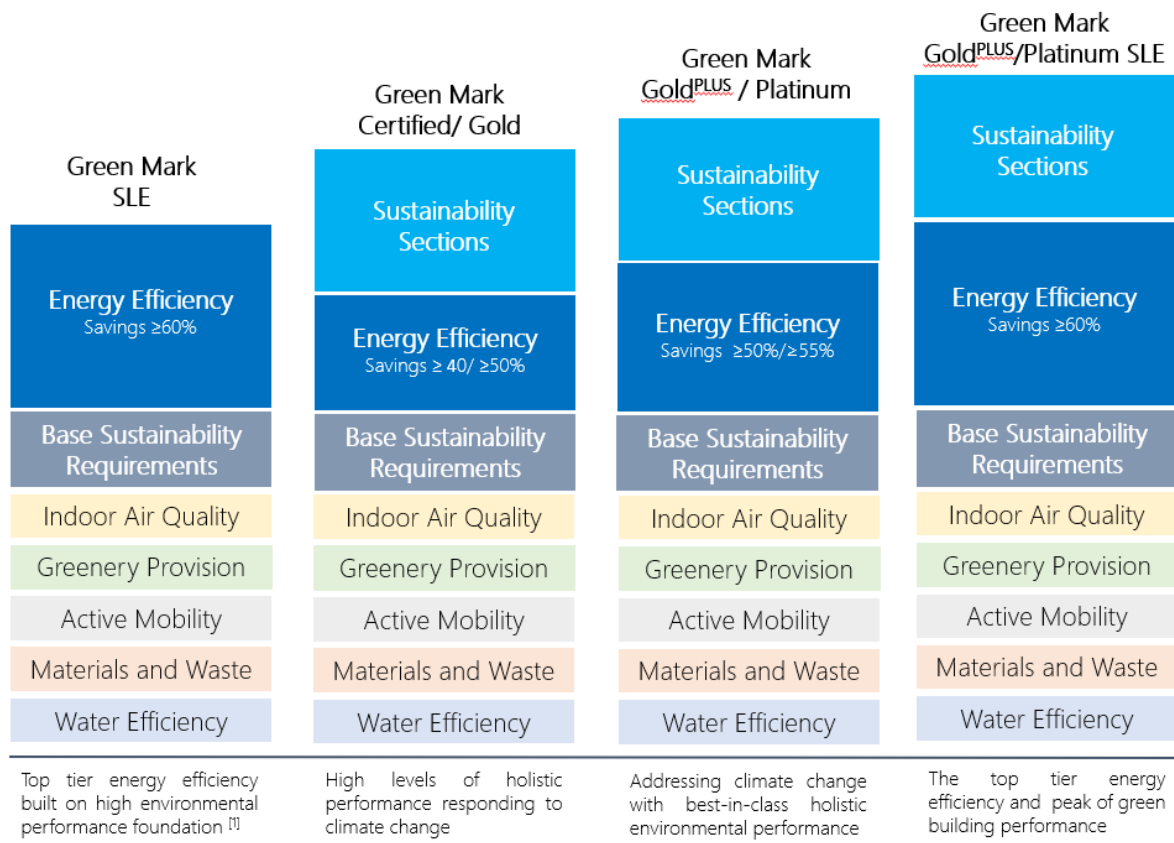


## Contents

Green Mark International Ecosystem .....	3
Energy Efficiency Pathways.....	5
Green Mark International EE Criteria.....	7
Energy Efficiency Assessment .....	8
TABLE 1A Energy Efficiency Pathways .....	10
Pathway 1: Energy Use Intensity (International) .....	11
TABLE 1B Pathway 1 Energy Use Intensity (EUI) Quick look up table (International) .....	12
TABLE 1C Pathway 1 Energy Use Intensity (EUI) Quick look up table – DCS/DDC/CCS (International) .....	13
Pathway 2: Fixed Metrics (International).....	14
Office Buildings (International).....	15
Retail Mall (International).....	16
Hotel (International) .....	17
Schools and Colleges (International) .....	18
Tertiary Institutions - University and Polytechnics (International).....	19
Hospitals (International) .....	20
Polyclinics (International) .....	21
Nursing and Youth Homes (International).....	22
Industrial – High Technology (International) .....	23
Light Industrial (International).....	24
Warehouses, Workshops/Logistics and Others (International).....	25
Other Non-Residential Building Types (International).....	26
Community Buildings (International).....	27
Civic Buildings (International) .....	28
Cultural Institutions (International) .....	29
Sports and Recreation Centres (International).....	30
Religious / Places of Worship (International) .....	31
Worker’s Dormitories (International).....	32
Residential (International) .....	34
Pathway 3: Energy Savings (International) .....	36
TABLE 1D Pathway 3 Energy Savings Details (International).....	37
TABLE 2A Lighting Power Budget (International) .....	38
TABLE 2B Mechanical Ventilation (International).....	399

# Green Mark International Ecosystem

## Green Mark Framework



[1] Base Sustainability Requirements (ND) or Base Sustainability Requirements (EB) and Energy Efficiency are compulsory for all GM International.

GM International is applicable to New developments and Existing buildings in operation with no previous Green Mark certification.

GM International In-Operation is applicable for Existing Buildings with previous Green Mark certification and coming in for re-certification and has no major change in energy use.

### Green Mark International Certification

Project teams have the option to pursue either Green Mark Certified, Gold, Gold<sup>PLUS</sup> or Platinum certification which are comprehensive certification that covers various aspects of sustainability, and/or Green Mark SLE certification which is focused solely on energy efficiency. Projects that meet the requirements for Green Mark SLE series certification will be certified as Green Mark SLE/ZE/PE.

GM International Series	GM International SLE Series (SLE, PE, ZE)
-	SLE, PE, ZE
Platinum	Platinum SLE/ZE/PE
Gold <sup>PLUS</sup>	Gold <sup>PLUS</sup> SLE/ZE/PE
Gold	-
Certified	-

*GM International is applicable to New developments and Existing buildings in operation with no previous Green Mark certification.*

*GM International In-Operation is applicable for Existing Buildings with previous Green Mark certification and coming in for re-certification and has no major change in energy use.*

## Energy Efficiency Pathways

Green Mark International use the same parallel pathways for projects to demonstrate their energy performance. The GM SLE Criteria groups these together in one place for each building typology. **For buildings not covered, Pathway 3, Energy Savings would be the default compliance route.** However, BCA could work with the project team on bespoke arrangements for the other pathways. Bespoke pathways will be updated periodically and will be made available.

The Green Mark Energy Pathways are:

- Data driven and flexible – aligned to real project performance with validated data. Flexible routes for projects to demonstrate their performance.
- Outcome based – full recognition of passive design strategies and renewable energy systems’ contribution to energy savings.
- Supportive of innovation, encourage the use of new technologies approaches, and solutions to energy performance.

### Pathway 1 – EUI

Total Building annual energy consumption over the gross floor area of the building (kWh/m<sup>2</sup>/yr). Based on:

- Energy modelling (Design)
- Energy Calculation and measured data (Retrofit)
- Building’s annual electricity consumption based on actual utility bills (for existing buildings in operation)

Additional Notes	New Buildings (Certified and Gold)	New Buildings (Gold <sup>PLUS</sup> and Platinum)	Existing Buildings
AC Total System Efficiency	0.85	0.8	0.9
Airside efficiency for buildings supplied by DCS/DDC/CCS (KW/RT)	0.25	0.2	0.25
EUI occupancy rate	100% (design)		≥ 60%
Renewable Energy included	On-Site		

### Pathway 2 – Fixed Metrics

- Key performance metrics (ingredients) that make an energy efficient project. All aspects must be met individually.
- Any shortfall in performance can be made up with the use of onsite renewables, subject to the building typology multiplication factor.
- For projects utilising a District Cooling System (DCS), Distributed District Cooling (DDC) or Centralised Cooling System (CCS), the airside performance shall be used in lieu of Total System Efficiency (TSE) and shall be as follows:

• Additional Notes	New Buildings & Existing Buildings			
	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Airside efficiency for buildings supplied by DCS/DDC/CCS (KW/RT)	0.25	0.2	0.18	0.16

*Note: Onsite renewables refers to renewable energy generated within the project boundary under the scope of Green Mark Assessment.*

### Pathway 3 – Energy Savings

Demonstrated energy savings following the Green Mark Energy Modelling guideline which looks at holistic energy performance against a reference model. This is the default pathway for projects not covered in Table 1A.

Additional Notes	New Buildings & Existing Buildings			
	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Airside efficiency for buildings supplied by DCS /DDC/CCS (KW/RT) (kW//RT)	0.25	0.2	0.18	0.16

*Note: Onsite renewables refers to renewable energy generated within the project boundary under the scope of Green Mark Assessment.*



## Green Mark International EE Criteria

Certification Level	Requirement
Certified	<ul style="list-style-type: none"> <li>To achieve 40% and 50% energy saving of Existing buildings and new development respectively, through adopting energy efficient measures and onsite renewable energy.</li> <li>Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.</li> <li>SLE Series is not applicable.</li> </ul>
Gold	<ul style="list-style-type: none"> <li>To achieve 40% and 50% energy saving of Existing buildings and new development respectively, through adopting energy efficient measures and onsite renewable energy.</li> <li>Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.</li> <li>SLE Series is not applicable.</li> </ul>
Gold <sup>PLUS</sup>	<ul style="list-style-type: none"> <li>To achieve at least 50% of energy saving through adopting energy efficient measures and onsite renewable energy.</li> <li>Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.</li> </ul>
Platinum	<ul style="list-style-type: none"> <li>To achieve at least 55% of energy saving through adopting energy efficient measures and onsite renewable energy.</li> <li>Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.</li> </ul>
SLE	<ul style="list-style-type: none"> <li>To achieve at least 60% of energy saving through adopting energy efficient measures and onsite renewable energy.</li> <li>Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.</li> </ul>
ZE	<ul style="list-style-type: none"> <li>Use of onsite and off-site renewable energy to generate more than 100% of energy needed for building operation, including all process/ receptacle loads.</li> <li>SLE performance shall be demonstrated.</li> <li>Off-site renewables can be used to offset the energy only where:               <ul style="list-style-type: none"> <li>SLE performance has been achieved through onsite measures.</li> <li>Onsite renewables have been maximised.</li> <li>Where the project is using Renewable Energy Certificate (REC), the REC's need not to be generated from the same country of the project. The length of time of REC commitment is minimally three years with commitment of re-certification.</li> </ul> </li> </ul>
PE	<ul style="list-style-type: none"> <li>Use of onsite renewable energy to generate more than 115% of energy needed for building operation, including all process/ receptacle loads.</li> <li>SLE performance shall be demonstrated.</li> </ul>



### New Buildings under Design and Existing Buildings Pre-retrofit

All projects shall demonstrate the stipulated performance through the relevant pathways indicated in Table 1A.

**Pathway 1 - Benchmark EUI** (Table 1B and Table 1C), detailed measurement and calculation (Existing buildings) or energy model (new buildings) shall be used to calculate and justify the design EUI. Benchmark EUI is not applicable to non-tropical climate requiring space heating such as China and etc...

**Pathway 2 – Fixed Metrics**, the prescriptive performance values shall be met in all areas. Where there is a shortfall of performance, this shall be annualised and required to be off set through onsite renewables with the listed multiplication factor. Detailed calculations, drawings and specifications would be required to substantiate the declared performance.

Fixed Metrics can be applied to non-tropical climate, TSE and Air Fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019. The Thermal Performance of the Building Envelope and Façade of non-residential buildings shall refer to China national standard (GB 50189-2015) and requirements by the local/region authorities for residential developments.

**Pathway 3 - Energy Savings**, the energy modelling for evaluating the energy performance of a building shall be carried out in a prescribed manner to quantify the potential savings based on energy efficiency measures and improvements that reduce cooling load requirement over the Reference Model. Projects are to refer to the BCA Green Mark 2021 Energy Modelling Guide for details.

Pathway 3 is applicable to projects in non-tropical climate. Baseline of the heating system shall refer to the prevailing code in the country or district of the project. Baseline of other systems including air-conditioning system shall refer to GM 2021 Energy modelling Guidelines, including the requirements in AC TSE and Airside efficiency (for buildings supplied by DCS). Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China and/or local. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards (GB 21455-2019). The Thermal Performance of the Building Envelope and Façade of non-residential buildings shall refer to China national standard (GB 50189-2015).

#### Note on Renewable Energy:

During design or pre-retrofit stage, the expected renewable energy generated percentage and the total annual electricity consumption of the development shall be calculated. Technical product information of the renewable energy system and detailed drawings showing the location of the system shall be provided.

### Verification Stage

When the building has completed construction or its retrofit, a verification audit shall be carried out. For new buildings, there are two stages of verification; for existing buildings with commitment, only one stage verification is applicable. For Buildings in operation which has not been retrofitted, the assessment shall be based upon its operational data.

Stage 1 Verification (New Buildings and Existing Buildings with Commitment): The Green Mark verification shall demonstrate the implementation of the design stage strategies and note any deviance from these and their effect on the ability of the project to achieve the energy performance.

Stage 2 Verification (New Non-Residential Buildings): The building shall demonstrate compliance to the committed performance stated in the pathway through 12-months measured data with a requirement of minimum occupancy of 60% for the period of measurement. The Energy Savings from energy modelling would require deviance less than 5% else a calibration would be required.

#### Note on Renewable Energy

The generated renewable energy, using 12-month actual operation data, will be audited.

#### Note for Zero Energy Buildings

The building shall demonstrate compliance to the committed 100% net replacement through onsite and/or off-site renewable sources.

#### Note for Positive Energy Buildings

The building shall demonstrate compliance to the committed 115% net replacement through onsite renewable sources.

*Note: Onsite renewable sources refer to renewable energy generated within the project boundary under the scope of Green Mark Assessment.*

TABLE 1A Energy Efficiency Pathways

Building Type	PATHWAY 1	PATHWAY 2	PATHWAY 3
Commercial			
Office Buildings	•	•	•
Hotels	•	•	•
Retail Buildings	•	•	•
Educational			
Tertiary Institutions (University and Polytechnics)	•	•	•
Schools and Colleges	•	•	•
Healthcare			
Hospitals (Private and General)	•	•	•
Community Hospitals	•	•	•
Polyclinics	•	•	•
Nursing Homes/ Youth Homes	•	•	•
Other Non-Residential			
Mixed Developments	<i>by GFA mix</i>		
Community Centres	•	•	•
Civic Buildings	•	•	•
Cultural Institution	•	•	•
Sports and Recreation Centres	•	•	•
Religious/ Places of Worship		•	•
Workers' Dormitories		•	•
Other Non-Residential Buildings		•	•
Industrial			
High Tech Industrial Buildings		•	•
Light Industrial Buildings	•	•	•
Warehouses, Workshops/Logistics and Others	•	•	•
Residential			
All Residential Buildings (condominiums, private apartments, landed and cluster housing)		•	
All Other Building Types		Bespoke	•

**For Buildings not listed – Pathway 3 would be the default route.**



# 1

## Pathway 1: Energy Use Intensity (International)

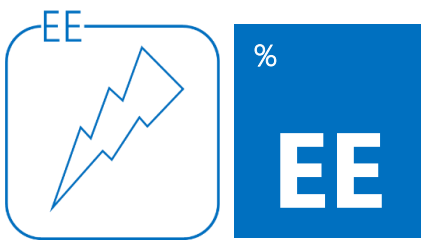


TABLE 1B Pathway 1 Energy Use Intensity (EUI) Quick look up table (International)

Building Type	New and Existing Buildings			
	Certified, Gold	Gold <sup>PLUS</sup>	Platinum EE	SLE EE
Commercial				
Office Buildings (Large) (GFA ≥ 15,000sqm)	155	155	140	115
Office Buildings (Small) (GFA < 15,000sqm)	135	135	120	100
Hotels (Large) (GFA ≥ 15,000sqm)	230	230	220	190
Hotels (Small) (GFA < 15,000sqm)	180	180	160	140
Retail Malls	240	240	210	160
Educational				
Tertiary Institutions (University and Polytechnics)	130	130	120	90
Schools and Colleges	110	110	100	80
Healthcare				
Hospitals (Private and General)	375	375	340	300
Community Hospitals	230	230	210	185
Polyclinics	150	150	135	120
Nursing/Youth Homes	90	90	80	70
Other Non-Residential				
Mixed Developments	by GFA mix			
Community Centres	150	150	125	110
Civic Buildings	80	80	70	60
Cultural Institutions	180	180	140	120
Sports and Recreation Centres	110	110	80	50
Religious/ Places of Worship	N.A.			
Industrial				
High Tech Industrial Buildings	N.A.			
Light Industrial Buildings	50	50	45	35
Warehouses, Workshops/Logistic and Others	50	50	45	35

Additional Notes	New Buildings (Certified & Gold)	New Buildings (Gold <sup>PLUS</sup> & Platinum)	Existing Buildings
AC Total System Efficiency (kW/RT)	0.85	0.8	0.9
EUI occupancy rate	100% (design)		≥ 60%
Renewable Energy included	On-Site		

Note: Pathway 1 - EUI is not applicable to non-tropical climate requiring space heating such as China and etc...

TABLE 1C Pathway 1 Energy Use Intensity (EUI) Quick look up table – DCS/DDC/CCS (International)

Building Type	New and Existing Buildings			
	Certified, Gold	Gold <sup>PLUS</sup>	Platinum EE	SLE EE
Commercial				
Office Buildings (Large) (GFA ≥ 15,000sqm)	100	100	90	80
Office Buildings (Small) (GFA < 15,000sqm)	90	90	80	75
Hotels (Large) (GFA ≥ 15,000sqm)	150	150	135	120
Hotels (Small) (GFA < 15,000sqm)	120	120	110	95
Retail Malls	160	160	140	125
Healthcare				
Hospitals (Private and General)	245	245	230	210
Community Hospitals	150	150	140	130
Polyclinic	100	100	90	85
Nursing/Youth Homes	60	60	55	50
Other Non-Residential				
Mixed Developments	<i>by GFA mix</i>			
Community Centres	100	100	90	80
Civic Buildings	50	50	45	40
Cultural Institutions	115	115	100	85
Sports and Recreation Centres	70	70	65	35
Religious/ Places of Worship	N. A			
Industrial				
High Tech Industrial Buildings	N. A			
Light Industrial Buildings				
Warehouses, Workshops/Logistic and Others				

Additional Notes	New Buildings (Certified & Gold)	New Buildings (Gold <sup>PLUS</sup> & Platinum)	Existing Buildings
Airside efficiency for buildings supplied by DCS/DDC/CCS (KW/RT)	0.25	0.2	0.25
EUI occupancy rate	100% (design)		≥ 60%
Renewable Energy included	On-Site		

The supply of chilled water for cooling purpose from a central source to multiple buildings through a network of pipes. Individual users purchase chilled water from the district cooling system operator and do not need to install their own chiller plant other than air distribution system. Operating conditions and business model of District Cooling System (DCS) Distributed District Cooling (DDCS), and Centralised Cooling System (CCS) are different from buildings' in-house air-conditioning system, in part or in full, being maintained and operated by a third party.

*Note: Pathway 1 - EUI is not applicable to non-tropical climate requiring space heating such as China and etc....*

# 2

## Pathway 2: Fixed Metrics (International)





## Office Buildings (International)

OFFICE				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	10%	25%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.74	0.68
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & Control Systems	-	-	Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.1			

*Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.*

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Retail Mall (International)

RETAIL				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	35
Non-AC Areas	-	-	5%	15%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.74	0.68
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & Control Systems	-	-	-	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.1			

*Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.*

<sup>1</sup> *For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum shall achieve at least 15% improvements, and SLE Platinum shall achieve at least 20% improvements on the Thermal Performance of the Façade from national local/region authorities.*

## Hotel (International)

HOTEL				
PARAMETER	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-	-	10%	30%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.74	0.68
Hot Water System Ratio (HWSR)	1.45			
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & Control Systems	<p>Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.</p> <p>A control device shall be installed in every guestroom for the purpose of automatically switching off the lighting and reducing the air conditioning loads when a guestroom is not occupied.</p>	<p>Energy consumption monitoring and benchmarking system.</p> <p>Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.</p> <p>Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.</p>		
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.1			

*Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.*

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Schools and Colleges (International)

PRIVATE SCHOOLS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	35
Non-AC Areas	-	-	20%	40%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	Energy consumption monitoring and benchmarking system.	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - <i>replacement to make up any deficiencies from the above list, with safety factor</i>	1.2			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum shall achieve at least 15% improvements, and SLE Platinum shall achieve at least 20% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Tertiary Institutions - University and Polytechnics (International)

INSTITUTE OF HIGHER LEARNING				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	20%	50%
ACMV TSE; <b>OR</b>	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.74	0.68
Lighting Power Budget	<a href="#">Table 2A</a>			
Mechanical Ventilation	<a href="#">Table 2B</a>			
Integrated Energy Management & control Systems	-	-	Energy consumption monitoring and benchmarking system.	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.2			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Hospitals (International)

HOSPITALS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	-	15%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Hot Water System Ratio (HWSR)	1.45			
Heat Recovery	-	Run-around coils / heat recovery from exhaust air or other system where reheat is needed for conditioned air		
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	Energy consumption monitoring and benchmarking system.	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.1			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Polyclinics (International)

POLYCLINIC				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-	10%	30%	50%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	Energy consumption monitoring and benchmarking system.	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.3			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Nursing and Youth Homes (International)

NURSING/ YOUTH HOME				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-	10%	40%	60%
ACMV TSE; <b>OR</b>	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	<p>Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.</p> <p>Youth Homes: A control device shall be installed in every bedroom for the purpose of automatically switching off the lighting and reducing the air-conditioning loads when a guestroom is not occupied.</p> <p>Nursing Homes: Motion sensors or equivalent sensors shall be deployed to common areas (e.g., lift lobbies and staircases), to dim lighting during period of no occupancy.</p>
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.5			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.



## Industrial – High Technology (International)

HIGH TECH/HIGH INTENSITY				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	-	10%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.78	0.75
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables – <i>replacement to make up any deficiencies from the above list, with safety factor</i>	1.1			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Light Industrial (International)

LIGHT INDUSTRIAL				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-	-	15%	30%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Energy consumption monitoring and benchmarking system.
On-Site Renewables - <i>replacement to make up any deficiencies from the above list, with safety factor</i>	1.2			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Warehouses, Workshops/Logistics and Others (International)

WAREHOUSES/ WORKSHOPS/LOGISTICS/OTHERS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-	-	15%	30%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-			Energy consumption monitoring and benchmarking system
On-Site Renewables - <i>replacement to make up any deficiencies from the above list, with safety factor</i>	1.4			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Other Non-Residential Building Types (International)

OTHERS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-		30%	40%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-			Energy consumption monitoring and benchmarking system
On-Site Renewables - <i>replacement to make up any deficiencies from the above list, with safety factor</i>	1.4			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Community Buildings (International)

COMMUNITY BUILDINGS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	10%	30%	40%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.2			

Note 1: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

Note 2: Community Buildings include Community Centres, and Childcare Centres

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Civic Buildings (International)

CIVIC BUILDINGS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	15%	30%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.2			

Note 1: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

Note 2: Civic Buildings include Courts, Police Stations, and Fire Stations

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Cultural Institutions (International)

CULTURAL BUILDINGS				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	10%	20%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.2			

*Note 1: Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.*

*Note 2: Cultural Buildings include Performing Arts, Library, Museum and Art Gallery*

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

## Sports and Recreation Centres (International)

SPORTS AND RECREATION CENTRES				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	40	40
Non-AC Areas	-	-	15%	30%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Energy consumption monitoring and benchmarking system.  Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.2			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup>, Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.



## Religious / Places of Worship (International)

RELIGIOUS/ PLACES OF WORSHIP				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) <sup>1</sup> [New Development only]	45	40	38	38
Non-AC Areas	-	-	15%	25%
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Integrated Energy Management & control Systems	-	-	-	Automatic controls for the air-conditioning system to respond to periods of non-use, or reduced heat load.  Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment.
On-Site Renewables - replacement to make up any deficiencies from the above list, with safety factor	1.5			

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.

<sup>1</sup> For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

## Worker's Dormitories (International)

WORKER'S DORMITORIES				
PARAMETER	Certified & Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (ETTV) [New Development only]	45	40	38	38
Non-AC Areas	60%	70%	80%	90%
Ventilation Performance of Dwelling area	<p><b>30%</b> of dwelling area shall be designed to have good natural ventilation.</p> <p><u>OPTION 1: PLAN LEVEL</u> unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> average wind velocity of 0.4m/s or provision of ceiling fans can be included.</p>	<p><b>40%</b> of dwelling area shall be designed to have good natural ventilation.</p> <p><u>OPTION 1: PLAN LEVEL</u> unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> average wind velocity of 0.4m/s or provision of ceiling fans can be included.</p>	<p><b>50% of dwelling</b> area shall be designed to have good natural ventilation.</p> <p><u>OPTION 1: PLAN LEVEL</u> unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> average wind velocity of 0.4m/s or provision of ceiling fans can be included.</p>	<p><b>60%</b> of dwelling area shall be designed to have good levels of natural ventilation.</p> <p><u>OPTION 1: PLAN LEVEL</u> unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> average wind velocity of 0.6m/s or use of PMV where use of ceiling fans can be included.</p>
Ventilation Performance of Common Areas	80% of above ground lobbies and corridors to be naturally ventilated	All above ground lobbies and corridors are to be naturally ventilated		
ACMV TSE	0.85 (New Buildings) 0.9 (Existing Buildings)	0.8	0.75	0.7
Lighting Power Budget	Table 2A			
Mechanical Ventilation	Table 2B			
Energy Efficient Equipment Selection if any	3 Ticks / Grade 3 <sup>1</sup> where provided ( <b>100%</b> of applicable equipment)			5 Ticks / Grade 1 <sup>1</sup> where provided ( <b>100%</b> of applicable equipment)
Integrated Energy Management & control Systems	-			Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment
On-Site Renewables - <i>replacement to make up any deficiencies from the above list, with safety factor</i>	1.2			

*Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning.*

<sup>1</sup> *For projects in China, Certified and Gold shall meet the Thermal Performance of the Façade requirements by China national standard (GB 50189-2015). Gold<sup>PLUS</sup> shall achieve at least 10% improvements, Platinum and SLE shall achieve at least 15% improvements on the Thermal Performance of the Façade from national local/region authorities.*

<sup>2</sup> *Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.*

## Residential (International)

RESIDENTIAL (PATHWAY 2 - FIXED METRICS)				
PARAMETER	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Reduced Heat Gain (RETV) <sup>1</sup> [Applicable to New Development only]	22	22	20	20
Ventilation Performance of Dwelling Units [Applicable to New Development only]	<p><u>OPTION 1: PLAN LEVEL</u> 30% of applicable spaces with unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> - Area weighted average wind speed 0.4m/s for 30% of applicable areas. OR - PMV of +/- 1.2</p>	<p><u>OPTION 1: PLAN LEVEL</u> 40% of applicable spaces with unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> - Area weighted average wind speed 0.4m/s for 40% of applicable areas. OR PMV of +/- 1</p>	<p><u>OPTION 1: PLAN LEVEL</u> 50% of applicable spaces with unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> Area weighted average wind speed 0.4m/s for 50% of applicable areas. OR - PMV of +/- 0.8</p>	<p><u>OPTION 1: PLAN LEVEL</u> 60% of applicable spaces with unobstructed air flow between spaces and the outside.</p> <p><u>OPTION 2: SIMULATION</u> Area weighted average wind speed 0.6m/s for 60% of applicable areas. OR - PMV of +/- 0.6</p>
<p><i>NOTE – For both options, the main entrance door (where the developer provides a lockable gate / grille), all windows and internal doors are assumed to be open. Simulations are to be conducted in accordance with the Green Mark 2021 Guideline for Computational Fluid Dynamics Simulation. PMV recognises the use of assisted ventilation where this is provided once minimum wind speeds are met.</i></p>				
ACMV	Single phase – 5 Ticks / Grade 1 <sup>2</sup> , where provided ( <b>80%</b> of the equipment)	Single phase - 4 Ticks / Grade 2 <sup>2</sup> , where provided ( <b>100%</b> of the equipment)	Single phase - 5 Ticks / Grade 1 <sup>2</sup> , where provided ( <b>100%</b> of the equipment)	
Energy Efficient Dwelling Unit Equipment Selection	3 Ticks /Grade 3 <sup>1</sup> where provided ( <b>100%</b> of applicable equipment)			5 Ticks / Grade 1 <sup>1</sup> where provided ( <b>100%</b> of applicable equipment)
Ventilation Performance – Common Areas	80% of above ground lobbies and corridors to be naturally ventilated	All above ground lobbies and corridors to be naturally ventilated		
Vertical Transportation System (Applicable to New Developments and Existing Development upon replacement of lift and escalators)	VVVF and Sleep Mode			VVVF & Sleep Mode Regenerative Drive for 12 Storeys or more.
Lighting Power Budget (All areas excluding dwelling units)	TABLE 2A			
Mechanical Ventilation	TABLE 2B			
Demand Control Systems	Lighting and ventilation controls (timer, sensor, dimming, switches) for common areas such as corridors, function rooms, gyms, pavilions etc ...			

RESIDENTIAL (PATHWAY 2 - FIXED METRICS) – CONTINUE				
PARAMETER	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Adoption of Renewables to offset energy consumption		-		Non-landed and cluster housing Development: 30% replacement of club house, function room, swimming pool pumps, gym, MCST office and Guard house electricity consumption.
				Landed house: 30% replacement of total building's energy consumption by onsite renewables.
On-Site Renewables - <i>replacement to make up any deficiencies from the above, excluding RETV and Dwelling Unit Ventilation Performance, with safety factor</i>		1.2		

Note: Pathway 2 - Fixed Metrics can be applied to non-tropical climate, TSE and Air fan System are not applicable to projects without air-conditioning. All other projects except China shall refer to Mandatory Energy Labelling Scheme (MELS) by National Environment Agency, Singapore.

<sup>1</sup> For projects in China, Certified, Gold and Gold<sup>PLUS</sup> shall meet the Thermal Performance of the Façade requirements by the local/region authorities. Platinum and SLE shall achieve at least 10% improvements on the Thermal Performance of the Façade from national local/region authorities.

<sup>2</sup> Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019.

# 3

## Pathway 3: Energy Savings (International)

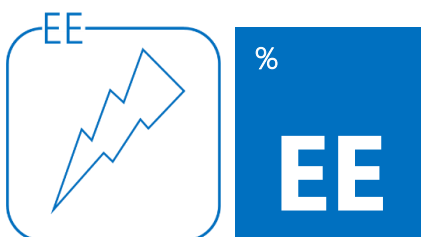


TABLE 1D Pathway 3 Energy Savings Details (International)

	Pathway 3 – Energy Savings			
	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Saving from BAU (2005 Code)	50% (New Buildings) 40% (Existing Buildings)	50%	55%	60%
Saving from Current Reference (Annex C) <i>*Including buildings supplied by DCS/DDC/CCS</i>	30% (New Buildings) 20% (Existing Buildings)	30%	35%	40%

Additional Requirements	New Buildings		Existing Buildings
	Certified and Gold	Gold <sup>PLUS</sup> and Platinum	
AC TSE (kW/RT)	0.85	0.8	0.9
Airside efficiency (for buildings supplied by DCS/DDC/CCS)	0.25	0.2	0.25
Savings from Renewable Energy	no cap		
Savings from Passive Design	no cap		

*Note: Pathway 3 is applicable to projects in non-tropical climate. Baseline of the heating system shall refer to the prevailing code in the country or district of the project. Baseline of other systems including air-conditioning system shall refer to GM 2021 Energy modelling Guidelines, including the requirements in AC TSE and Airside efficiency (for buildings supplied by DCS). Projects in China shall refer to the Minimum Energy Performance Standards (MEPS) and the Energy Efficiency Labels required by Energy Efficiency Label Management Law in China and/or local. The minimum allowable values of the energy efficiency and energy grades for room air conditioners shall refer to the standards for GB 21455-2019. The Thermal Performance of the Building Envelope and Façade of non-residential buildings shall refer to China national standard (GB 50189-2015).*

*\*Based on Energy Modelling Guidelines.*

TABLE 2A Lighting Power Budget (International)

Description	Pathway 2 - LPB Targets (W/m <sup>2</sup> )				SS 530
	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE	Reference Lighting Power Budget (W/m <sup>2</sup> )
<b>Office, Work and Study</b>					
Offices	7.2	6	5.5	5	12
Meeting Room	7.2	6	5.5	5	12
Copy/Print Rooms	7.2	6	5.5	5	12
Classrooms	7.2	6	5.5	5	12
Lecture Theatre	7.2	6	5.5	5	12
Computer Rooms	7.2	6	5.5	5	12
Reading Areas	7.2	6	5.5	5	12
Laboratories	9.6	8	7	6	16
<b>Atria, Halls and Retail</b>					
Entrance Hall	6.0	6	5	4	10
Atriums	6.0	6	5	4	10
Retail Atriums	6.0	6	5	4	10
Retail Corridors (Interior)	4.2	4	3.5	3	7
Concourse	6.0	5	4.5	3.5	10
Lobby	6.0	5	4.5	3.5	10
Auditorium	6.0	5	4.5	3.5	10
Concert Hall	6.0	6	5	4	10
Multi Purpose Hall	9.6	8	7	6	16
Conference Hall	9.6	8	7	6	16
Retail (General Lighting)	9.0	10	7	6	15
Retail - Jewellery (Total)	21.0	23	19	14	35
Retail - Furniture, clothing & accessories, cosmetics, art (Total)	15.0	18	14	10	25
Retail - Supermarket, vehicle, sporting goods, stationary, hardware, others (Total)	12.0	15	11	8	20
<b>Food &amp; Beverage Areas</b>					
Food Courts & Hawker Centres	6.0	6	5	4	10
Canteens	6.0	6	5	4	10
Restaurants	7.2	7	6	5	12
Lounges	7.2	7	6	5	12
Bars	7.2	7	6	5	12



TABLE 2A Lighting Power Budget (International) continued

Description	Pathway 2 - LPB Targets (W/m <sup>2</sup> )				SS 530
	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE	Reference Lighting Power Budget (W/m <sup>2</sup> )
<b>Transport and Goods</b>					
Corridors	4.2	4	3.5	3	7
Stairs, Escalators, Travelators	3.6	6	4.2	3.5	6
Lift Lobbies	4.2	4	3.5	3	7
Warehouses	4.2	6	5	4	7
Storage Areas	6.0	6	5	4	10
Carpark	1.8	2.5	2.25	2	3
<b>Rest, Clean, Exercise and Play</b>					
Hotel Guest Rooms <sup>1</sup>	7.2	9	7	5	12
Toilets	6.0	6	5	4	10
Changing Rooms	6.0	6	5	4	10
Laundries	6.0	6	5	4	10
Washing Areas	6.0	6	5	4	10
Gymnasium & Physical Exercise Areas	6.6	7	6	4.5	11
<b>Manufacturing &amp; Maintenance</b>					
Mechanical & Electrical Rooms	6.0	6	5	4	10
Manufacturing (general)	7.8	8	6.5	5.5	13
Manufacturing (electronic, fine detail or assembly)	8.4	8	7	6	14

The maximum lighting power budget for landscape lighting shall at minimum comply with Singapore Standard Code of Practise for Energy Efficiency Standard for Building Services and Equipment (SS 530:2014).

TABLE 2B Mechanical Ventilation (International)

Fan System	Efficiency (W/CMH)			
	Certified and Gold	Gold <sup>PLUS</sup>	Platinum	SLE EE
Fan nameplate power	0.32		0.28	0.25

For Pathway 1, 2 & 3 Mechanical ventilation systems for normally occupied spaces shall be designed to be at least 10% more energy efficient than the prescribed standard stated in SS 553; and meet the efficiency requirements in the table above.

<sup>1</sup> In hotel buildings, a control device shall be installed in every guestroom to automatically switch off the lighting when unoccupied.

**Developed by:**

Building and Construction  Authority

