Green Mark 2021

EE

Energy Efficiency

Environmental Sustainability Group

Building and Construction Authority

52 Jurong Gateway Road

#11-01, Singapore 608550

(Above JEM)

Revision	Description	Effective Date
R0	Launch for Pilot	22 April 2021
R1	1st Edition	1 November 2021
R2	2nd Edition with minor updates	1 January 2024

The Energy Efficiency section provides a set of harmonised, parallel routes for buildings to demonstrate their energy performance, from Gold^{PLUS} through to Positive Energy Buildings. The levels are aligned for both new and existing building and complement our national commitments 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 2021 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'.

GM: 2021 is a key national lever under Singapore's Long-Term Low-Emissions Development Strategy (LEDS) aligned to meeting our international obligations under the Paris Agreement, and part of an aggressive move towards the necessary climate action within our sector.

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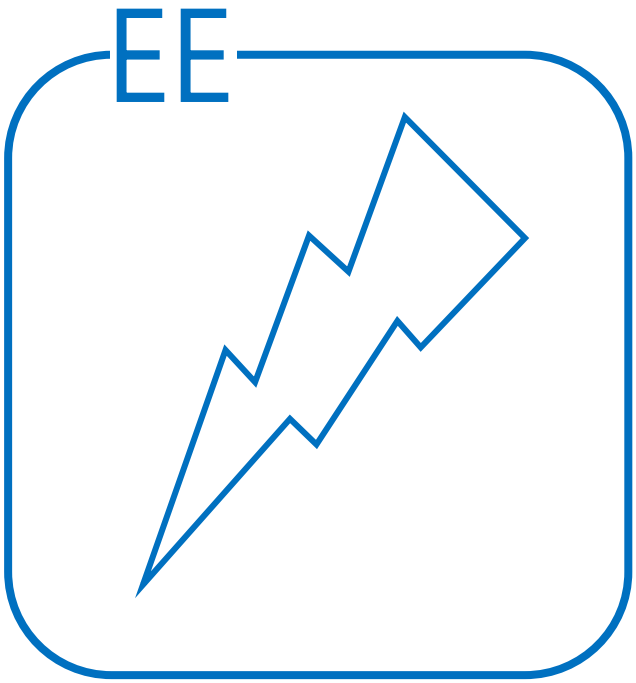

Green Mark 2021

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EE

Energy Efficiency

Helps projects meet targets under the following SDGs

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Green Mark 2021 Ecosystem

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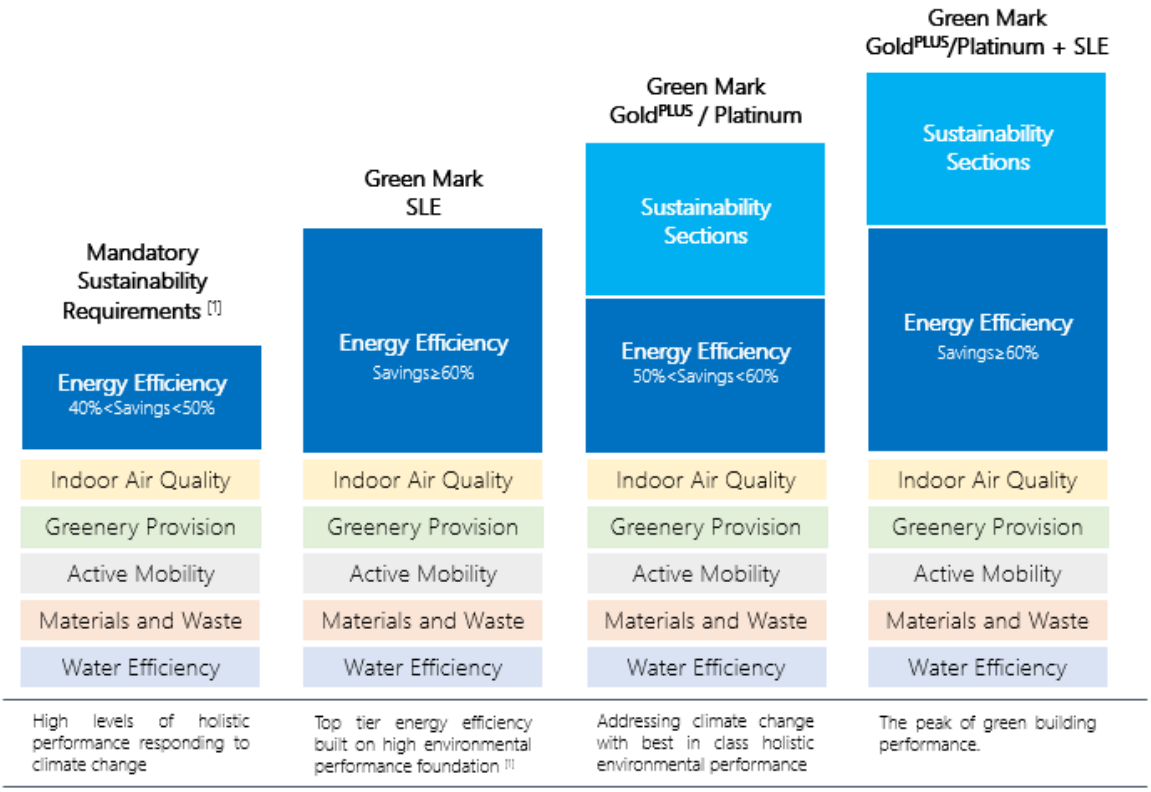

[1] Mandatory requirements are based on development control and building plan provisions for new buildings, for existing buildings under retrofit, the requirements would vary depending on the type and extent of the works being undertaken.

Green Mark Certification

Project teams can choose either to follow the Green Mark Gold^{PLUS} or Platinum certification, or Green Mark SLE certification, or choose to do both by demonstrating world leading environmental asset performance.

GM Series	GM SLE Series
-	SLE, ZE, PE
Gold^{PLUS}	Gold^{PLUS} SLE/ZE/PE
Platinum	Platinum SLE/ZE/PE

Green Mark for Super Low Energy (SLE) buildings is an Energy (EE) focused series with robust holistic underpinnings from mandatory sustainability requirements through the national regulatory and policy system.

Energy Efficiency Pathways

GM: 2021 and GM: SLE 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^2/yr). Based on:

- Energy modelling (Design) for new buildings
- Energy Calculation and measured data (for existing buildings with major retrofit)
- Measurement – In operation

Additional Notes	New	Existing
AC Total System Efficiency (kW/RT)	0.8	0.9
Airside efficiency for buildings supplied by DCS/DDC/CCS (kW/RT)	0.2	0.25
Occupancy rate for EUI	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:

Green Mark Certification level	Air distribution system efficiency requirement (kW/RT) *For projects Using DCS/DDC/CCS*
Gold^{PLUS}	0.2
Platinum	0.18
SLE	0.16

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	Existing
AC Total System Efficiency (kW/RT)	0.8	0.9
Airside efficiency for buildings supplied by DCS/DDC/CCS (kW/RT)	0.2	0.25
Savings from onsite Renewable Energy	no cap	
Savings from Passive Design	no cap	

Green Mark EE Criteria

Certification Level	Requirement
Gold^{PLUS}	• To achieve more than 50% of energy saving through adopting energy efficient measures and onsite renewable energy. • Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.
Platinum	• To achieve more than 55% of energy saving through adopting energy efficient measures and onsite renewable energy. • Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.
SLE	• To achieve at least 60% of energy saving through adopting energy efficient measures and onsite renewable energy. • Through demonstrating the stipulated performance through the relevant pathways indicated in Table 1A.

ZE	• Use of onsite and off-site renewable energy to generate at least 100% of energy needed for building operation, including all process/ receptacle loads.
	• SLE performance shall be demonstrated.
	• Off-site renewables can be used to offset the energy only where:
	  ○ SLE performance has been achieved through onsite measures.
	  ○ Onsite renewables have been maximised.
	  ○ Where the project is using REC's, these must be generated in accordance with SS 673: 2021 Code of practice for renewable energy certificates through renewable energy generated within Singapore. The length of time of REC commitment is minimally three years with commitment of re-certification

PE	• Use of onsite renewable energy to generate at least 115% of energy needed for building operation, including all process/ receptacle loads. • SLE performance shall be demonstrated.

Energy Efficiency Assessment

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.

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 offset through onsite renewables with the listed multiplication factor. Detailed calculations, drawings and specifications would be required to substantiate the declared performance.

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.

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.

New Building Verification Stage and Existing Buildings in Operation

When the building has completed construction or its retrofit, a verification audit shall be carried out. For new non-residential buildings, there are two stages of verification. For existing buildings with commitment, only stage 1 verification is applicable. For Buildings in operation, not undergoing retrofit, the assessment would 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 deviations 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 using 12-months of measured data with a requirement of minimum occupancy of 60% for the period of measurement. Deviation of less than 5% for the Energy Savings from energy modelling is allowed, otherwise a calibration would be required.

Note on Renewable Energy

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

TABLE 1A Energy Efficiency Pathways

Building Type	PATHWAY 1	PATHWAY 2	PATHWAY 3
Commercial			
Office Buildings	•	•	•
Hotels	•	•	•
Retail Buildings	•	•	•
Educational			
IHL (University, Polytechnics and ITE)	•	•	•
Private Schools and Colleges	•	•	•
Junior Colleges (MOE)	•	•	•
Secondary Schools (MOE)	•	•	•
Primary Schools (MOE)	•	•	•
Healthcare			
Hospitals (Private and General)	•	•	•
Community Hospitals	•	•	•
Polyclinics	•	•	•
Nursing Homes/ Youth Homes	•	•	•
Other Non-Residential			
Mixed Developments	*by GFA mix*		
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		•	
All Other Building Types		Bespoke	•

For Buildings not listed – <u>Pathway 3 would be the default route</u>, however BCA may be able to work with the project team to develop a bespoke pathway 2 set of requirements.

IHL – Institute of Higher Learning
ITE – Institute of Technical Education
MOE – Ministry of Education

EE1

Pathway 1: Energy Use Intensity

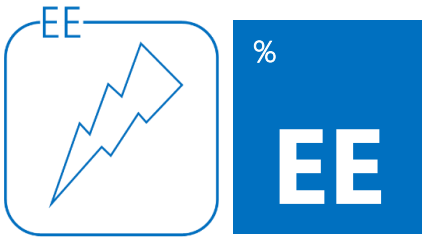

TABLE 1B Pathway 1 Energy Use Intensity (EUI) Quick look up table

Building Type	Gold^{PLUS} EE >50%	Platinum EE ≥55%	SLE EE ≥60%
Commercial			
Office Buildings (Large) (GFA ≥ 15,000sqm)	155	140	115
Office Buildings (Small) (GFA < 15,000sqm)	135	120	100
Hotels (Large) (GFA ≥ 15,000sqm)	230	220	190
Hotels (Small) (GFA < 15,000sqm)	180	160	140
Retail Malls	240	210	160
Educational			
IHL (University, Polytechnics and ITE)	130	120	90
Private Schools and Colleges	110	100	80
Junior Colleges (MOE)	60	50	40
Secondary Schools (MOE)	40	35	30
Primary Schools (MOE)	40	35	30
Healthcare			
Hospitals (Private and General)	375	340	300
Community Hospitals	230	210	185
Polyclinics	150	135	120
Nursing/Youth Homes	90	80	70
Other Non-Residential			
Mixed Developments	*by GFA mix*		
Community Centres	150	125	*110*
Civic Buildings	80	70	*60*
Cultural Institutions	180	140	120
Sports and Recreation Centres	110	80	50
Religious/ Places of Worship Workers' Dormitories Other Non-Residential buildings	N.A.		
Industrial			
High Tech Industrial Buildings	N.A.		
Light Industrial Buildings	50	45	35
Warehouses, Workshops/Logistics and Others	50	45	35

Additional Notes	New	Existing
AC Total System Efficiency (kW/RT)	0.8	0.9
Occupancy rate for EUI	100% (design)	≥60%
Renewable Energy included	On-Site	

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

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

Additional Notes	New	Existing
Airside efficiency for buildings supplied by DCS/DDC/CCS (kW/RT)	0.2	0.25
Occupancy rate for EUI	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. This is different from buildings' in-house air-conditioning system, in part or in full, being maintained and operated by a third party.

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Pathway 2: Fixed Metrics

Office Buildings

OFFICE			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	-	10%	25%
ACMV TSE	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		

Retail Mall

RETAIL			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	35
Non-AC Areas	-	5%	15%
ACMV TSE	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		

Hotel

HOTEL			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	-	10%	30%
ACMV TSE	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	Lighting controls shall be provided in accordance with SS 530: 2014 Code of Practice for Energy Efficiency Standard for Building Services and Equipment. 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.		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		

MOE Primary and Secondary Schools

MOE PRIMARY AND SECONDARY SCHOOLS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	30%	50%	70%
ACMV TSE	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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.5		

MOE Junior Colleges

MOE JUNIOR COLLEGE			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	20%	40%	60%
ACMV TSE	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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.5		

Private Schools and Colleges

PRIVATE SCHOOLS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	35
Non-AC Areas	-	20%	40%
ACMV TSE	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*	1.2		

Institute of Higher Learning

INSTITUTE OF HIGHER LEARNING			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	-	20%	50%
ACMV TSE	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.	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		

Hospitals

HOSPITALS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	-	-	15%
ACMV TSE	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		

Polyclinics

POLYCLINIC			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	10%	30%	50%
ACMV TSE	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		

Nursing and Youth Homes

NURSING/ YOUTH HOME			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	10%	40%	60%
ACMV TSE	0.8	0.75	0.7
Hot Water System Ratio (HWSR)	1.45 when it is applicable		
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. 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. 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.
On-Site Renewables - *replacement to make up any deficiencies from the above list, with safety factor*	1.5		

Industrial – High Technology

HIGH TECH/HIGH INTENSITY			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	-	-	10%
ACMV TSE	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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.1		

Light Industrial

LIGHT INDUSTRIAL			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	-	15%	30%
ACMV TSE	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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.2		

Warehouses, Workshops/Logistics and Others

WAREHOUSES/ WORKSHOPS/ LOGISTICS/ OTHERS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	-	30%	40%
ACMV TSE	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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.4		

Community Buildings

COMMUNITY BUILDINGS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	10%	30%	40%
ACMV TSE	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: *Community Buildings include: Community Centres, Childcare Centres*

Civic Buildings

CIVIC BUILDINGS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	-	15%	30%
ACMV TSE	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: *Civic Buildings include Courts, Police Stations, Fire Stations*

Cultural Institutions

CULTURAL BUILDINGS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC Areas	-	10%	20%
ACMV TSE	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: *Cultural Buildings include Performing Arts, Library, Museum, Art Gallery*

Sports and Recreation Centres

SPORTS AND RECREATION CENTRES			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	-	15%	30%
ACMV TSE	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		

Religious / Places of Worship

RELIGIOUS/ PLACES OF WORSHIP			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non AC Areas	-	15%	25%
ACMV TSE	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		

Worker's Dormitories

WORKER'S DORMITORIES			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	38	38
Non-AC area	70%	80%	90%
Ventilation Performance of Dwelling area	**40%** of dwelling area shall be designed to have good natural ventilation OPTION 1: PLAN LEVEL unobstructed air flow between spaces and the outside OPTION 2: SIMULATION average wind velocity of 0.4m/s or provision of ceiling fans can be included	**50% of dwelling area** hall be designed to have good natural ventilation OPTION 1: PLAN LEVEL unobstructed air flow between spaces and the outside OPTION 2: SIMULATION average wind velocity of 0.4m/s or provision of ceiling fans can be included	**60%** of dwelling area shall be designed to have good levels of natural ventilation OPTION 1: PLAN LEVEL unobstructed air flow between spaces and the outside OPTION 2: SIMULATION average wind velocity of 0.6m/s or use of PMV where use of ceiling fans can be included
Ventilation Performance of Common Areas	All above ground lobbies and corridors are to be naturally ventilated		
ACMV TSE	0.8	0.75	0.7
Lighting Power Budget	Table 2A		
Mechanical Ventilation	Table 2B		
Energy Efficient Equipment Selection if any	3 Tick or the highest tick available		5 Tick or the highest tick available

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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.2		

Other Non-Residential Building Types

OTHERS			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (ETTV) [New Development only]	40	40	40
Non-AC Areas	-	30%	40%
ACMV TSE	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 - *replacement to make up any deficiencies from the above list, with safety factor*	1.4		

Residential

RESIDENTIAL			
PARAMETER	Gold^{PLUS} EE >50%	Platinum EE ⩾55%	SLE EE ⩾60%
Reduced Heat Gain (RETV) [Applicable to New Development only]	22	20	20
Ventilation Performance of Dwelling Units [Applicable to New Development only]	**40%** of Living rooms, bedrooms (including home office spaces) shall be designed to have good natural ventilation OPTION 1: PLAN LEVEL unobstructed air flow between spaces and the outside OPTION 2: SIMULATION average wind velocity of 0.4m/s or provision of ceiling fans can be included	**50%** of Living rooms, bedrooms (including home office spaces) shall be designed to have good natural ventilation OPTION 1: PLAN LEVEL unobstructed air flow between spaces and the outside OPTION 2: SIMULATION average wind velocity of 0.4m/s or provision of ceiling fans can be included	**60%** of Living rooms, bedrooms (including home office spaces) shall be designed to have good levels of natural ventilation OPTION 1: PLAN LEVEL unobstructed air flow between spaces and the outside OPTION 2: SIMULATION average wind velocity of 0.6m/s or use of PMV where use of ceiling fans can be included
ACMV	4 Ticks	5 Ticks	
Energy Efficient Dwelling Unit Equipment Selection	3 Tick - or the highest tick available		5 Tick - or the highest tick available
Ventilation Performance – Common Areas	All above ground lobbies and corridors are to be naturally ventilated		
Vertical Transportation System [Applicable to New Developments and Existing Development upon replacement of lift and escalators]	VVVF & 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 all common areas.		
Adoption of Renewables to offset energy consumption	-	-	[For non-landed and cluster housing Development] 30% replacement of club house, function room, swimming pool pumps, gym, MCST office and Guard house electricity consumption [For landed house] 30% replacement of total building's energy consumption by onsite renewables
On-Site Renewables - *replacement to make up any deficiencies from the above, excluding RETV and Dwelling Unit Ventilation Performance, with safety factor*	1.2		

3

Pathway 3: Energy Savings

TABLE 1D Pathway 3 Energy Savings Details

	Pathway 3 – Energy Savings		
	Gold^{PLUS} EE >50%	**Platinum EE ≥55%**	**SLE EE ≥60%**
Saving from BAU (2005 Code)	50	55	60
Saving from Current Reference **Including buildings supplied by DCS/DDC/CCS*	30	35	40

Additional Requirements	New	Existing
AC Total System Efficiency (kW/RT)	0.8	0.9
Airside efficiency for buildings supplied by DCS/DDC/CCS (kW/RT)	0.2	0.25
Savings from onsite Renewable Energy	no cap	
Savings from Passive Design	no cap	

**Based on Energy Modelling framework guidelines.*

EE

Tables

TABLE 2A Lighting Power Budget

Description	Pathway 2 - LPB Targets (W/m2)			SS 530
	Gold^{PLUS} EE >50%	**Platinum EE ≥55%**	**SLE EE ≥60%**	**Reference Lighting Power Budget (W/m^2)**
Office, Work and Study				
Offices	*6*	*5.5*	*5*	*12*
Meeting Room	*6*	*5.5*	*5*	*12*
Copy/Print Rooms	*6*	*5.5*	*5*	*12*
Classrooms	*6*	*5.5*	*5*	*12*
Lecture Theatre	*6*	*5.5*	*5*	*12*
Computer Rooms	*6*	*5.5*	*5*	*12*
Reading Areas	*6*	*5.5*	*5*	*12*
Laboratories	*8*	*7*	*6*	*16*
Atria, Halls and Retail				
Entrance Hall	*6*	*5*	*4*	*10*
Atriums	*6*	*5*	*4*	*10*
Retail Atriums	*6*	*5*	*4*	*10*
Retail Corridors (Interior)	*4*	*3.5*	*3*	*7*
Concourse	*5*	*4.5*	*3.5*	*10*
Lobby	*5*	*4.5*	*3.5*	*10*
Auditorium	*5*	*4.5*	*3.5*	*10*
Concert Hall	*6*	*5*	*4*	*10*
Multi Purpose Hall	*8*	*7*	*6*	*16*
Conference Hall	*8*	*7*	*6*	*16*
Retail (General Lighting)	*10*	*7*	*6*	*15*
Retail - Jewellery (Total)	*23*	*19*	*14*	*35*
Retail - Furniture, clothing & accessories, cosmetics, art (Total)	*18*	*14*	*10*	*25*
Retail - Supermarket, vehicle, sporting goods, stationary, hardware, others (Total)	*15*	*11*	*8*	*20*
Food & Bevarge Areas				
Food Courts & Hawker Centres	*6*	*5*	*4*	*10*
Canteens	*6*	*5*	*4*	*10*
Restaurants	*7*	*6*	*5*	*12*
Lounges	*7*	*6*	*5*	*12*
Bars	*7*	*6*	*5*	*12*
Transport and Goods				

Corridors	*4*	*3.5*	*3*	7
Stairs, Escalators, Travelators	*6*	*4.2*	*3.5*	6
Lift Lobbies	*4*	*3.5*	*3*	7
Warehouses	*6*	*5*	*4*	7
Storage Areas	*6*	*5*	*4*	10
Carpark	2.5	2.25	2	5
Rest, Clean, Exercise and Play				
Hotel Guest Rooms[1]	*9*	*7*	*5*	*12*
Toilets	*6*	*5*	*4*	*10*
Changing Rooms	*6*	*5*	*4*	*10*
Laundries	*6*	*5*	*4*	*10*
Washing Areas	*6*	*5*	*4*	*10*
Gymnasium & Physical Exercise Areas	*7*	*6*	*4.5*	*11*
Manufacturing & Maintenance				
Mechanical & Electrical Rooms	*6*	*5*	*4*	*10*
Manufacturing (general)	*8*	*6.5*	*5.5*	*13*
Manufacturing (electronic, fine detail or assembly)	*8*	*7*	*6*	*14*

The maximum lighting power budget for landscape lighting shall at minimum comply with SS 530:2014.

[1] In hotel buildings, a control device shall be installed in every guestroom to automatically switch off the lighting when unoccupied.

TABLE 2B Mechanical Ventilation

	Efficiency (W/CMH)		
Fan System	Gold^{PLUS} EE >50%	Platinum EE ≥55%	SLE EE ≥60%
Fan nameplate power	0.32	0.28	0.25

Developed by:

Building and Construction Authority