



BCA GREEN MARK

BCA Green Mark for Existing Non-Residential Buildings

Version 3.0

Framework – BCA Green Mark for Existing Non-Residential Buildings (version 3.0)

To achieve Green Mark Award



Pre-requisite Requirement
 All relevant pre-requisite requirements for the specific Green Mark Rating are to be complied with



Energy Related Requirements
Minimum 30 points

Other Green Requirements
Minimum 20 points

Elective Requirement for Energy Improvement
 (Combination of the following items to meet 30 points)

Part 1 - Energy Efficiency

- ENRB 1-1 Thermal Performance of Building Envelope
- ENRB 1-2 Air Conditioning System
- ENRB 1-3 Natural Ventilation / Mechanical Ventilation
- ENRB 1-4 Artificial Lighting
- ENRB 1-5 Ventilation in Carparks
- ENRB 1-6 Ventilation in Common Areas
- ENRB 1-7 Lifts and Escalators
- ENRB 1-8 Energy Efficient Practices & Feature
- ENRB 1-9 Energy Policy & Management
- ENRB 1-10 Renewable Energy

Elective Requirement for Other Areas
 (Combination of the following items to meet 20 points)

Part 2 - Water Efficiency

- ENRB 2-1 Water Monitoring
- ENRB 2-2 Water Efficient Fittings
- ENRB 2-3 Alternative Water Sources
- ENRB 2-4 Water Efficiency Improvement Plans
- ENRB 2-5 Irrigation System and Landscaping
- ENRB 2-6 Cooling Towers

Part 3 – Sustainable Operation & Management

- ENRB 3-1 Building Operation & Maintenance
- ENRB 3-2 Post Occupancy Evaluation
- ENRB 3-3 Waste Management
- ENRB 3-4 Sustainable Products
- ENRB 3-5 Greenery
- ENRB 3-6 Environmental Protection
- ENRB 3-7 Green Transport

Part 4 - Indoor Environmental Quality

- ENRB 4-1 Indoor Air Quality Performance
- ENRB 4-2 Indoor Air Pollutants
- ENRB 4-3 Lighting Quality
- ENRB 4-4 Thermal Comfort
- ENRB 4-5 Internal Noise Level

Part 5 – Other Green Features

- ENRB 5-1 Green Features & Innovations

POINT ALLOCATION – BCA Green Mark for Existing Non-Residential Buildings (Version 3.0)

| Category | | Point Allocations | |
|---|---|-------------------|-----------|
| (I) ENERGY EFFICIENCY | | | |
| Minimum 30 points to be scored | Part 1 – Energy Efficiency | | |
| | ENRB 1-1 Thermal Performance of Building Envelope | 5 | |
| | ENRB 1-2 Air Conditioning System (applicable to air-conditioned areas) | } | |
| | ENRB 1-3 Natural Ventilation / Mechanical Ventilation (applicable to non air-conditioned areas excluding carparks and common areas) | | |
| | ENRB 1-4 Artificial Lighting | 13 | |
| | ENRB 1-5 Ventilation in Carparks | 4 | |
| | ENRB 1-6 Ventilation in Common Areas | 5 | |
| | ENRB 1-7 Lifts and Escalators | 2 | |
| | ENRB 1-8 Energy Efficient Practices & Features | 12 | |
| | ENRB 1-9 Energy Policy & Management | 1 | |
| | ENRB 1-10 Renewable Energy | 15 | |
| Category Score for Part 1 – Energy Efficiency | | 89 | |
| (II) OTHER GREEN REQUIREMENTS | | | |
| Minimum 20 points to be scored | Part 2 - Water Efficiency | | |
| | ENRB 2-1 Water Monitoring | 4 | |
| | ENRB 2-2 Water Efficient Fittings | 12 | |
| | ENRB 2-3 Alternative Water Sources | 3 | |
| | ENRB 2-4 Water Efficiency Improvement Plans | 1 | |
| | ENRB 2-5 Irrigation System and Landscaping | 2 | |
| | ENRB 2-6 Cooling Towers | 2 | |
| | Category Score for Part 2 – Water Efficiency | | 24 |
| | Part 3 - Sustainable Operation & Management | | |
| | ENRB 3-1 Building Operation & Maintenance | 4 | |
| | ENRB 3-2 Post Occupancy Evaluation | 3 | |
| | ENRB 3-3 Waste Management | 7 | |
| | ENRB 3-4 Sustainable Products | 8 | |
| | ENRB 3-5 Greenery | 10 | |
| | ENRB 3-6 Environmental Protection | 3 | |
| | ENRB 3-7 Green Transport | 4 | |
| | Category Score for Part 3 – Sustainable Operation and Management | | 39 |
| | Part 4 - Indoor Environmental Quality | | |
| | ENRB 4-1 Indoor Air Quality Performance | 8 | |
| | ENRB 4-2 Indoor Air Pollutants | 2 | |
| | ENRB 4-3 Lighting Quality | 5 | |
| | ENRB 4-4 Thermal Comfort | 2 | |
| | ENRB 4-5 Internal Noise Level | 1 | |
| Category Score for Part 4 – Indoor Environment Quality | | 18 | |
| Part 5 – Other Green Features | | | |
| ENRB 5-1 Green Features & Innovations | 10 | | |
| Category Score for Part 5 – Other Green Features | | 10 | |
| Category Score for Other Green Requirements | | 91 | |
| Green Mark Score | | 180 | |

Green Mark Award Rating

BCA Green Mark Award Rating and Pre-requisite Requirements

| Green Mark Score | Green Mark Rating |
|------------------|---------------------------------|
| 90 and above | Green Mark Platinum |
| 85 to <90 | Green Mark Gold ^{Plus} |
| 75 to <85 | Green Mark Gold |
| 50 to <75 | Green Mark Certified |

Pre-requisite Requirements for Existing Non-residential Building Criteria

PART 1 - ENERGY EFFICIENCY

1. ENERGY EFFICIENCY

| Green Mark Rating | Minimum points achievement from Part 1 – Energy Efficiency |
|---------------------------------|--|
| Green Mark Certified | 30 points |
| Green Mark Gold | 35 points |
| Green mark Gold ^{Plus} | 40 points |
| Green Mark Platinum | 45 points |

2. MINIMUM SYSTEMS' EFFICIENCY

Minimum Design System Efficiency/Operating System Efficiency (DSE/OSE)

(i) For buildings using Water-Cooled Chilled-Water Plant

| Green Mark Rating | Building Cooling Load (RT) | |
|----------------------|----------------------------|-------|
| | < 500 | ≥ 500 |
| | Efficiency (kW/RT) | |
| Certified | 0.85 | 0.75 |
| Gold | 0.80 | 0.70 |
| Gold ^{Plus} | 0.75 | 0.68 |
| Platinum | 0.70 | 0.65 |

(ii) For Buildings using Air Cooled Chilled-water Plant or Unitary Air-Conditioner

| Green Mark Rating | Building Cooling Load (RT) | |
|----------------------|----------------------------|----------------|
| | < 500 | ≥ 500 |
| | Efficiency (kW/RT) | |
| Certified | 1.1 | 1.0 |
| Gold | 1.0 | Not applicable |
| Gold ^{Plus} | 0.85 | |
| Platinum | 0.78 | |

For building with building cooling load of more than 500 RT, the use of air cooled central chilled-water plant or other unitary air-conditioners are not applicable for Gold and higher ratings.

Note: The performance of the overall air-conditioning system for the building is based on the Operating System Efficiency (OSE) of the system during the normal building operating hours as defined below:

| | |
|--|---|
| <u>Office Building:</u> Monday to Friday: 9am to 6pm <u>Retail Mall:</u> Monday to Sunday: 10am to 9pm <u>Institutional:</u> Monday to Friday: 9am to 5pm | <u>Hotel and Hospital:</u> 24-hour <u>Industrial and Other Building Types:</u> To be determined based on the operating hours |
|--|---|

3. CHILLER PLANT M&V INSTRUMENTATION

- (i) Provision of permanent measuring instruments for monitoring of water-cooled chilled-water system and air-cooled chilled water system operating system efficiency. The installed instrumentation shall have the capability to calculate resultant plant operating system efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590. Heat balance test for water-cooled chilled-water system is required for verification of the accuracy of the M&V instrumentation.

4. NATURAL VENTILATION AREA (only applicable to occupied areas, excluding circulation, plant rooms and transit areas):

Pre requisite requirement for Platinum - At least 75% of natural ventilated areas with effective cross ventilation with North and South facing window opening

PART 4 - INDOOR ENVIRONMENTAL QUALITY

- 1. IAQ Audit - to conduct an full IAQ audit three yearly that complies with NEA's Guidelines for Good Indoor Air Quality in Office Premises or SS554:2009 Code of Practice for 'Indoor air quality for air-conditioned buildings' **[4 points]** [ENRB 4-1(a)]

Energy Related Requirements

| Part 1 - Energy Efficiency | Green Mark Points | | | | | | | | |
|---|--|-----------------------|--|----------|---------|---|------------|------------|---|
| <p>ENRB 1-1 Thermal Performance of Building Envelope</p> <p>Enhance the overall thermal performance of building envelope to minimize heat gain thus reducing the overall cooling load requirement.</p> | <p>0.5 points for every reduction of 1 W/m² in ETTV from the baseline of 50 W/m²</p> <p>Point scored = 0.5 x (50 – ETTV)</p> <p>(Up to 5 points)</p> | | | | | | | | |
| <p>ENRB 1-2 Air-Conditioning System Applicable to Air-conditioned Building Areas (with an aggregate air-conditioned areas > 500m²)</p> <p>Encourage the use of better efficiency air-conditioned equipment to minimize the energy consumption. (System efficiency in kW/ton)</p> <p>(a) Water-Cooled Chilled-Water Plant:</p> <ol style="list-style-type: none"> a) Water-Cooled Chiller b) Chilled water pump c) Condenser water pump d) Cooling tower <table border="1" data-bbox="188 1081 836 1207"> <thead> <tr> <th rowspan="2">Baseline</th> <th colspan="2">Building Cooling Load</th> </tr> <tr> <th>< 500 RT</th> <th>≥500 RT</th> </tr> </thead> <tbody> <tr> <td><i>Pre-requisite Requirements</i> Minimum system efficiency of central chilled-water plant</td> <td>0.85 kW/RT</td> <td>0.75 kW/RT</td> </tr> </tbody> </table> <p style="text-align: center;">OR</p> <p>(b) Air Cooled Chilled-Water Plant / Unitary Air-Conditioners:</p> <p>Air cooled Chilled-Water Plant:</p> <ul style="list-style-type: none"> ▪ Air-Cooled Chiller ▪ Chilled Water Pump <p>Unitary Air-Conditioners:</p> <ul style="list-style-type: none"> ▪ Variable Refrigerant Flow (VRF) System ▪ Water-Cooled Package Unit ▪ Single-Split Unit ▪ Multi-Split Unit | Baseline | Building Cooling Load | | < 500 RT | ≥500 RT | <i>Pre-requisite Requirements</i> Minimum system efficiency of central chilled-water plant | 0.85 kW/RT | 0.75 kW/RT | <p>(a) Water-Cooled Chilled-Water Plant</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">Building cooling load ≥ 500RT</div> <p>14 points for achieving plant efficiency of 0.75 kW/ton</p> <p>0.35 point for every percentage improvement in the chiller plant efficiency better than 0.75 kW/ton</p> <p>Point scored = 0.35 x (% improvement)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">Building cooling load < 500RT</div> <p>14 points for achieving plant efficiency of 0.85 kW/ton</p> <p>0.3 point for every percentage improvement in the chiller plant efficiency better than 0.85 kW/ton</p> <p>Point scored = 0.3 x (% improvement)</p> <p>(Up to 20 points)</p> <p style="text-align: center;">OR</p> <p>(b) Air-Cooled Chilled-Water Plant/Unitary Air Conditioners</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">Building cooling load ≥ 500RT</div> <p>14 points for achieving plant efficiency of 1.0 kW/ton</p> <p>0.25 point for every percentage improvement in the chiller plant efficiency better than 1.0 kW/ton</p> <p>Point scored = 0.25 x (% improvement)</p> |
| Baseline | | Building Cooling Load | | | | | | | |
| | < 500 RT | ≥500 RT | | | | | | | |
| <i>Pre-requisite Requirements</i> Minimum system efficiency of central chilled-water plant | 0.85 kW/RT | 0.75 kW/RT | | | | | | | |

| | | |
|--|-----------------------|-----------|
| Baseline | Building Cooling Load | |
| | < 500 RT | ≥500 RT |
| <i>Pre-requisite Requirements</i> Minimum system efficiency of air cooled chilled water plant or unitary conditioners | 1.1 kW/RT | 1.0 kW/RT |

Note: Where there is a combination of centralised air-con system with unitary air-conditioned system, the computation for the points scored will only be based on the air-conditioning system with a larger aggregate capacity.

- (c) Air Distribution system:
- Air Handling Units (AHUs)
 - Fan Coil Units (FCUs)

Baseline – Fan power limitation in air conditioning system

| Allowable nameplate motor power | |
|---------------------------------|-----------------|
| Constant volume | Variable volume |
| 0.47 W/CMH | 0.74 W/CMH |

Note: For buildings using district cooling system, there is no need to compute the plant efficiency under Part 1-2 (a) and (b). The points obtained will be pro-rated based on the air distribution system efficiency under Part 1-2(c)

- (d) *Prerequisite requirements* : Provision of permanent measuring instruments for monitoring of water-cooled chilled-water plant and air-cooled chilled-water plant efficiency. The installed instrumentation shall have the capability to calculate a resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590. The following instrumentation and installation are also required to be complied with:

- Location and installation of the measuring devices to meet the manufacturer's recommendation.
- Data acquisition system to have a minimum resolution of 16 bit.
- All data logging with capability to trend at 1 minute sampling time interval.
- Dedicated digital power meters shall be provided for the following groups of equipment: chiller(s), chilled water pump(s), condenser water pump(s) and cooling tower(s).
- Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.
- Temperature sensors are to be provided for chilled water and condenser water loop and shall have an end-to-end measurement uncertainty not exceeding ± 0.05 °C over entire measurement or calibration range. All thermo-

Building cooling load < 500RT

14 points for achieving plant efficiency of 1.1 kW/ton

0.2 point for every percentage improvement in the chiller plant efficiency better than 1.1 kW/ton

Point scored = 0.2 x (% improvement)

(Up to 20 points)

- (c) Air Distribution System
0.15 Point for every percentage improvement in the air distribution system efficiency over the baseline

Point scored = 0.15 x (% improvement)

(Up to 8 points)

1 point

| <p>wells shall be installed in a manner that ensures that the sensors can be in direct contact with fluid flow. Provisions shall be made for each temperature measurement location to have two spare thermo-wells located at both side of the temperature sensor for verification of measurement accuracy.</p> <p>(e) <i>Prerequisite requirements</i> : Verification of central water cooled chilled-water plant instrumentation: Heat Balance – substantiating test for water cooled chilled-water plant to be computed in accordance with AHRI 550/590. The operating system efficiency and heat balance to be submitted to BCA upon commissioning.</p> <p>(f) Provision of variable speed controls for chiller plant equipment such as chilled-water pumps and cooling tower fans to ensure better part-load plant efficiency.</p> <p>(g) Sensors or similar automatic control devices are used to regulate outdoor air flow rate to maintain the concentration of carbon dioxide.</p> <p>Carbon dioxide acceptable range \leq 700 ppm above outdoor</p> | <p>1 point</p> <p>1 point</p> <p>1 point</p> | | | | | | |
|---|--|--|-----------------|-----------------|------------|------------|---|
| <p>ENRB 1-3 Natural Ventilation / Mechanical Ventilation</p> <p>Applicable to Non Air-Conditioned Building Areas (with an aggregate non air-conditioned areas > 10% of total floor area excluding carparks and common areas)</p> <p>(a) <u>Natural Ventilation</u> (only applicable to occupied areas, excluding circulation, plant rooms and transit areas) Encourage building that facilitates good natural ventilation. Proper design of building layout that utilises prevailing wind conditions to achieve adequate cross ventilation.</p> <p>(b) <u>Mechanical Ventilation</u> Encourage energy efficient mechanical ventilation system as the preferred ventilation mode to air-conditioning in buildings.</p> <p>Baseline: Fan power limitation I mechanical ventilation systems:</p> <table border="1" data-bbox="245 1796 778 1895"> <tr> <th colspan="2">Allowable nameplate motor power</th> </tr> <tr> <th>Constant volume</th> <th>Variable volume</th> </tr> <tr> <td>0.47 W/CMH</td> <td>0.74 W/CMH</td> </tr> </table> <p>Note : Where there is a combination of naturally ventilated and mechanical ventilated spaces, the points scored will only be based on the predominant ventilation modes of normally occupied spaces.</p> | Allowable nameplate motor power | | Constant volume | Variable volume | 0.47 W/CMH | 0.74 W/CMH | <p>20 based points will be awarded for use of natural ventilation</p> <p>1.6 points for every 10% of NV areas with window openings facing north and south directions and cross ventilation (Up to 32 points)</p> <p>0.6 point for every subsequent 1% improvement from the baseline (Up to 32 points)</p> |
| Allowable nameplate motor power | | | | | | | |
| Constant volume | Variable volume | | | | | | |
| 0.47 W/CMH | 0.74 W/CMH | | | | | | |

| | |
|--|---|
| <p>ENRB 1-4 Artificial Lighting</p> <p>Encourage the use of energy efficient lighting to minimize energy consumption from lighting usage while maintaining proper lighting level.</p> <p>Please refer to the Annex 1 for the baselines of lighting power budget</p> | <p>0.3 point for every percentage improvement in lighting power budget</p> <p>Point scored = 0.3 x (% improvement)</p> <p>(Up to 13 points)</p> <p>Excluding tenant lighting provision – Up to 5 points)</p> |
| <p>ENRB 1-5 Ventilation in Carparks</p> <p>Encourage the use of energy efficient design and control of ventilation systems in carparks.</p> <p>(a) Carparks designed with natural ventilation. (b) CO sensors are used to regulate the demand for mechanical ventilation (MV)</p> <p>Note: Where there is a combination of different ventilation mode adopted for carpark design, the points obtained will be prorated accordingly.</p> | <p>Naturally ventilated carparks – 4 points</p> <p>Points scored based on the mode of mechanical ventilation provided</p> <p>Fume extract – 2.5 points MV with or without supply – 2 points</p> <p>(Up to 4 points)</p> |
| <p>ENRB 1-6 Ventilation in Common Areas</p> <p>Encourage the use of energy efficient of ventilation systems in the following common areas:</p> <p>(a) Toilets (b) Staircases (c) Corridors (d) Lift lobbies (e) Atrium</p> | <p>Extent of Coverage: At least 90% of each applicable area</p> <p>Point scored based on the mode of ventilation provided in the applicable areas</p> <p>Natural ventilation – 1.5 points for each area Mechanical ventilation – 0.5 point for each area</p> <p>(Up to 5 points)</p> |
| <p>ENRB 1-7 Lifts and Escalators</p> <p>Encourage the use of energy efficient lifts and escalators.</p> <p>Lifts and/or escalators with AC variable voltage and variable frequency (VVVF) motor drive and sleep mode features.</p> | <p>Extent of Coverage: All lifts and escalators</p> <p>Lifts – 1 point Escalators- 1 point</p> |
| <p>ENRB 1-8 Energy Efficient Practices & Features</p> <p>Encourage the use of energy efficient practices and features which are innovative and/or have positive environmental impact.</p> <p>(a) Computation of the energy consumption in the form of energy efficiency index (EEI)</p> <p>(b) Use of energy efficiency product that are certified by approved local certification body</p> <p>(c) Use of energy efficient features Example:</p> | <p>1 point</p> <p>0.5 point for each equipment type (Up to 2 points)</p> <p>2 points for every 1% energy saving over the total building energy consumption (Up to 9 points)</p> |

| <ul style="list-style-type: none"> • Re-generative lift • Heat recovery system • Motion sensors • Sun pipes • Light shelves • Photocell sensors to maximize the use of daylight • Heat pumps, etc. | | | | | | | | | | | | |
|--|--|-------------------------------|---|--|------------------------|------------------------|-----------------------------|----------|----------|-----------------------------|----------|------------|
| <p>ENRB 1-9 Energy Policy and Management</p> <p>(a) Energy policy, energy targets and regular review with top management’s commitment as part of an environmental strategy</p> <p>(b) To show intent, measures and implementation strategies of energy efficiency improvement plans to achieve energy target set over the next three years. Committed energy savings accrued from proposed measures should be quantified.</p> | <p>0.5 point</p> <p>0.5 point</p> | | | | | | | | | | | |
| <p>ENRB 1-10 Renewable Energy</p> <p>Encourage the application of renewable energy sources in buildings.</p> | <p>Point scored based on the expected energy efficiency index (EEI) and % replacement of electricity by renewable energy source</p> <table border="1" data-bbox="874 1267 1434 1534"> <thead> <tr> <th rowspan="2">Energy Efficiency Index (EEI)</th> <th colspan="2">Every 1% replacement of electricity (based on total electricity consumption) by renewable energy source</th> </tr> <tr> <th>Include tenant’s usage</th> <th>Exclude tenant’s usage</th> </tr> </thead> <tbody> <tr> <td>≥ 50 kWh/m²/yr</td> <td>5 points</td> <td>3 points</td> </tr> <tr> <td>< 50 kWh/m²/yr</td> <td>3 points</td> <td>1.5 points</td> </tr> </tbody> </table> <p>(Up to 15 points)</p> | Energy Efficiency Index (EEI) | Every 1% replacement of electricity (based on total electricity consumption) by renewable energy source | | Include tenant’s usage | Exclude tenant’s usage | ≥ 50 kWh/m ² /yr | 5 points | 3 points | < 50 kWh/m ² /yr | 3 points | 1.5 points |
| Energy Efficiency Index (EEI) | Every 1% replacement of electricity (based on total electricity consumption) by renewable energy source | | | | | | | | | | | |
| | Include tenant’s usage | Exclude tenant’s usage | | | | | | | | | | |
| ≥ 50 kWh/m ² /yr | 5 points | 3 points | | | | | | | | | | |
| < 50 kWh/m ² /yr | 3 points | 1.5 points | | | | | | | | | | |
| <p>PART 1 – ENERGY EFFICIENCY CATEGORY SCORE:</p> | $\frac{(\text{Part 1-2}) \times \text{Air-conditioned Building Floor Area}}{\text{Total Floor Area}} + \frac{(\text{Part 1-3}) \times \text{Non Air-Conditioned Building Floor Area}}{\text{Total Floor Area}} + (\text{Part 1-1, Part 1-4 to Part 1-10})$ <p>Where Part 1-2 = Total Green Mark Points obtained under Part 1-2 Part 1-3 = Total Green Mark Points obtained under Part 1-3 Part 1-1, Part 1-4 to Part 1-10 = Total Green Mark Points obtained under Part 1-1, Part 1-4 to Part 1-10</p> | | | | | | | | | | | |

Other Green Requirements

| Part 2 - Water Efficiency | Green Mark Points | | | | | | | | | | |
|--|---|---|--|---|-----------|-----------|-----------|--|---|----|--|
| <p>ENRB 2-1 Water Monitoring</p> <p>Provide private-metering and leak detection system for better control and monitoring.</p> <p>(a) To monitor the water consumption on monthly basis</p> <p>(b) Provision of private-meters for major water uses (e.g. cooling tower, water features, irrigation, swimming pools, tenants' usage)</p> <p>(c) Provision of automated / smart metering for monitoring and leaking detection</p> | 1 point | | | | | | | | | | |
| | 1 point | | | | | | | | | | |
| <p>ENRB 2-2 Water Efficient Fittings</p> <p>Encourage the use of water efficient fittings under Water Efficiency Labelling Scheme (WELS) or adopt equivalent water efficient flow-rate/flush volumes for water fittings:-</p> <ul style="list-style-type: none"> ▪ Basin taps and mixers ▪ Showers ▪ Sink/Bib taps and mixers ▪ Urinals and Urinal Flush Valves ▪ Dual flushing cistern for WC <p style="text-align: center;">Or</p> <p>To have PUB Water-Efficient Building Certificate</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">Rating based on Water Efficiency Labeling Scheme (WELS)</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">Points scored based on the number and water efficiency rating of the fitting type used (up to 12 points)</td> </tr> <tr> <td style="text-align: center;">Very Good</td> <td style="text-align: center;">Excellent</td> </tr> <tr> <td colspan="2" style="text-align: center;">Weightage</td> </tr> <tr> <td style="text-align: center;">9</td> <td style="text-align: center;">12</td> </tr> </table> | Rating based on Water Efficiency Labeling Scheme (WELS) | | Points scored based on the number and water efficiency rating of the fitting type used (up to 12 points) | Very Good | Excellent | Weightage | | 9 | 12 | |
| Rating based on Water Efficiency Labeling Scheme (WELS) | | Points scored based on the number and water efficiency rating of the fitting type used (up to 12 points) | | | | | | | | | |
| Very Good | Excellent | | | | | | | | | | |
| Weightage | | | | | | | | | | | |
| 9 | 12 | | | | | | | | | | |
| <p>ENRB 2-3 Alternative Water Sources</p> <p>Use of suitable systems that utilize alternative water sources for non-potable uses: irrigation, washing, water features, toilet flushing, etc (excluding cooling tower make up water) to reduce use of potable water. Alternative sources can include rainwater, greywater (for toilet flushing only), NEWater, AHU condensate and recycled water from approved sources.</p> | <p>Points awarded based on % reduction in total potable water usage of the applicable uses</p> <p>> 50 % - 3 points</p> <p>≥ 10 % to 50 % - 2 points</p> <p>< 10 % - 1 point</p> <p>(Up to 3 points)</p> | | | | | | | | | | |
| <p>ENRB 2-4 Water Efficiency Improvement Plans</p> <p>Targets to improve building water performance against own building water performance baseline should be set. To show intent, measures and implementation strategies of water efficiency improvement plans over the next three years. Committed water savings accrued from proposed measures should be quantified. (PUB water efficiency management plan is acceptable as evidence)</p> | 1 point | | | | | | | | | | |

| | |
|---|--|
| <p>ENRB 2-5 Irrigation System and Landscaping</p> <p>(a) Use of automatic water efficient irrigation system with rain sensor, soil moisture sensor or equivalent control system.</p> <p>(b) Use of drought tolerant plants that require minimal irrigation.</p> | <p>Extent of Coverage: At least 50% of the landscape areas are served by the system 1 point</p> <p>Extent of Coverage: At least 50% of the landscape areas 1 point</p> |
| <p>ENRB 2-6 Cooling Towers</p> <p>Reduce potable water use for cooling purpose.</p> <p>(a) Use of cooling tower water treatment system which can achieve 7 or better cycles of concentration at acceptable water quality.</p> <p>(b) Use of NEWater or on-site recycled water from approved sources.</p> | <p>1 point</p> <p>1 point</p> |
| <p>PART 2 – WATER EFFICIENCY CATEGORY SCORE :</p> | <p>Sum of Green Mark Points obtained from ENRB 2-1 to 2-6</p> |

| Part 3 - Sustainable Operation & Management | Green Mark Points |
|--|---|
| <p>ENRB 3-1 Building Operation & Maintenance</p> <p>(a) The environmental policy that reflects the sustainability goals set.</p> <p>(b) A green guide for the occupants or visitors should be disseminated through various channels. Best practices to reduce energy use, water use and maintain a good indoor environment should be documented in this green guide. To demonstrate evidences of occupant involvement in environmental sustainability.</p> <p>(c) In-house building management team comprises one Certified Green Mark Facilities Manager (GMFM), Singapore Certified Energy Manager (SCEM) / Green Mark Professional (GMP).</p> <p>(d) The environmental management system of the building is ISO14000 or ISO 50001 certified.</p> | <p>1 point</p> <p>1 point</p> <p>0.5 point for certified GMFM 1 point for certified SCEM/GMP (Up to 1 point)</p> <p>1 point</p> |
| <p>ENRB 3-2 Post Occupancy Evaluation</p> <p>(a) Conduct post occupancy survey for occupant's satisfaction on energy and environmental performance.</p> <p>Required number of people surveyed shall be</p> <ul style="list-style-type: none"> - 10% of total occupancy and up to 100 maximum. - minimum 5 people shall be surveyed if total occupancy is less than 50. <p>(b) List of corrective actions taken following the post occupancy evaluation, if any.</p> | <p>2 points</p> <p>1 point</p> |
| <p>ENRB 3-3 Waste Management</p> <p>a) Provision of facilities or recycling bins for collection and storage of different recyclable waste such as paper, glass, plastic, food waste, etc.</p> <p>b) Promote and encourage waste minimization and recycling among occupants, tenants and visitors through various avenues</p> <p>c) Provide the proper storage area for the recyclable waste</p> <p>d) To quantify and monitor the recycling programme for continuous improvement.</p> | <p>2 points</p> <p>2 points</p> <p>1 point</p> <p>2 points</p> |

| | | | | | | | | | | |
|---|--|---|-----------|------------------|------------|------------------|--------------|-----------|------------|--|
| <p>ENRB 3-4 Sustainable Products</p> <p>Promote use of environmentally friendly products that are certified by approved local certification body.</p> | <p>Weightage based on the extent of environmental friendliness of products</p> | <p>Points scored based on the weightage and the extent of coverage & impact</p> <p>1 point for high impact item 0.5 point for low impact item</p> <p>(Up to 8 points)</p> | | | | | | | | |
| <p>ENRB 3-5 Greenery</p> <p>Encourage greater use of greenery to reduce heat island effect.</p> <p>(a) Greenery Provision (GnP) is calculated by considering the 3D volume covered by plants using the following Green Area Index (GAI) : Grass GAI = 1 ; Shrubs GAI = 3; Palms Trees GAI = 4; Trees GAI = 6</p> <p>(b) Use of compost recycled from horticulture waste.</p> <p>(c) Provision of roof top greenery</p> <p>(d) Provision of Vertical Greenery</p> | <table border="0"> <tr> <td>GnP = 0.5 to < 1.0</td> <td>- 1 point</td> </tr> <tr> <td>GnP = 1.0 to < 2</td> <td>- 2 points</td> </tr> <tr> <td>GnP = 2 to < 3.0</td> <td>- 3.5 points</td> </tr> <tr> <td>GnP ≥ 3.0</td> <td>- 5 points</td> </tr> </table> <p>(Up to 5 points)</p> <p>1 point</p> <p>For roof top greenery areas ≥20% and 50% of useable roof areas 1 point ≥ 50% of useable roof areas 2 points</p> <p>Vertical greenery areas of ≥10m² and <50m² 1 point ≥ 50m² 2 points</p> | GnP = 0.5 to < 1.0 | - 1 point | GnP = 1.0 to < 2 | - 2 points | GnP = 2 to < 3.0 | - 3.5 points | GnP ≥ 3.0 | - 5 points | |
| GnP = 0.5 to < 1.0 | - 1 point | | | | | | | | | |
| GnP = 1.0 to < 2 | - 2 points | | | | | | | | | |
| GnP = 2 to < 3.0 | - 3.5 points | | | | | | | | | |
| GnP ≥ 3.0 | - 5 points | | | | | | | | | |
| <p>ENRB 3-6 Environmental Protection</p> <p>(a) Green procurement policy – Adoption of sustainable and environmental-friendly procurement and purchasing policy in the operation and maintenance of the building.</p> <p>(b) Reduce the potential damage to the ozone layer and the increase in global warming through the release of ozone depleting substances and greenhouse gases.</p> <ul style="list-style-type: none"> • Refrigerants with ozone depletion potential (ODP) of zero or with global warming potential (GWP) of less than 100. • Use of refrigerant leak detection system at critical areas of plant rooms containing chillers and other equipments with refrigerants. | <p>1 point</p> <p>1 point</p> <p>1 point</p> | | | | | | | | | |

| | |
|--|---|
| <p>ENRB 3-7 Green Transport</p> <p>Promote the use of public transport or bicycles to reduce pollution from individual car use with the following provision:</p> <p>(a) Good access to nearest MRT/LRT or bus stops.</p> <p>(b) Provision of covered walkway to facilitate connectivity and the use of public transport</p> <p>(c) Provision of priority parking lots for hybrid/electric vehicle within the development</p> <p>(d) Provision of sheltered bicycle parking lots with adequate shower and changing facilities.</p> | <p>1 point</p> <p>1 point</p> <p>1 point</p> <p>Extent of Coverage : Minimum 10 number of bicycle parking lots, cap at 30 where applicable</p> <p>Points scored based on the number of bicycle parking lots provided (with adequate shower and changing facilities)</p> <p>1 point if the number provided $\geq 1\% \times \text{GFA}/10$</p> <p>0.5 point if the number provided $\geq 0.5\% \times \text{GFA}/10$</p> |
| <p>PART 3 – SUSTAINABLE OPERATION AND MANAGEMENT</p> <p>CATEGORY SCORE :</p> | <p>Sum of Green Mark Points obtained from ENRB 3-1 to 3-7</p> |

| Part 4 – Indoor Environmental Quality | Green Mark Points |
|--|--|
| <p>ENRB 4-1 Indoor Air Quality Performance</p> <p>To promote a healthy indoor environment.</p> <p>(a) <i>Prerequisite Requirements</i> : To conduct full IAQ audit once in three years that complies with NEA’s Guidelines for Good Indoor Air Quality in Office Premises or SS554:2009 Code of Practice for ‘Indoor air quality for air-conditioned buildings’ by an accredited laboratory under Singapore Accreditation Council.</p> <p>(b) Implement effective IAQ management plan to ensure building ventilation systems are frequently maintained to ensure clean delivery of air.</p> <p>(c) Use of high efficiency air filter (at least MERV 13) in AHU to reduce indoor contaminants and provide good protection for cooling coil and reducing frequency or eliminating duct cleaning</p> <p>(d) Room Temperature display (at least 1 unit per floor)</p> <p>(e) Additional carbon dioxide sensor display (at least 1 unit per floor)</p> | <p>4 points</p> <p>1 point</p> <p>1 point</p> <p>1 point</p> <p>1 point</p> |
| <p>ENRB 4-2 Indoor Air Pollutants</p> <p>Minimise airborne contaminants, mainly from inside sources to promote a healthy indoor environment.</p> <p>(a) Use of low volatile organic compounds (VOC) paints certified by approved local certification body.</p> <p>(b) Use of environmental friendly adhesives certified by approved local certification body.</p> | <p>1 point</p> <p>1 point</p> |
| <p>ENRB 4-3 Lighting Quality</p> <p>To encourage good workplace lighting quality to promote productivity and occupant comfort</p> <p>(a) Lighting level to comply with SS531:Part1:2006 or CP38:1999 for various uses.</p> <p>(b) Controllability of lighting system</p> | <p>1 point</p> <p>At least 90% of occupants are able to adjust lighting to suit their task needs and preference</p> <p>Controlled by light switches - 1 point Controlled by task lights - 2 points</p> <p>(Up to 2 points)</p> |

| | |
|---|---|
| <p>(c) High frequency ballast</p> | <p>All applicable areas in the entire building that are served by fluorescent lightings</p> <p>20% to < 40% - 0.5 point 40% to < 60% - 1 point 60% to < 80% - 1.5 points 80% and above - 2 points</p> <p>(Up to 2 points)</p> |
| <p>ENRB 4-4 Thermal Comfort</p> <p>(a) Ensure the consistent indoor conditions for thermal comfort: Indoor dry-bulb temperature within 22.5 °C to 25.5 °C and relative humidity <70%</p> <p>(b) Controllability of temperature</p> | <p>1 point</p> <p>1 point</p> |
| <p>ENRB 4-5 Internal Noise Level</p> <p>Ensure internal noise level are maintained at an appropriate levels and to comply with CP13:1999 or SS553:2009</p> | <p>1 point</p> |
| <p>PART 4 – INDOOR ENVIRONMENTAL QUALITY CATEGORY SCORE :</p> | <p>Sum of Green Mark Points obtained from ENRB 4-1 to 4-5</p> |

| Part 5 – Other Green Features (Total Points: 10) | Green Mark Points |
|--|--|
| <p>ENRB 5-1 Green Features and Innovations</p> <p>To encourage the use of other green features which are innovative or/and have positive environmental impact.</p> <p>Examples :</p> <ul style="list-style-type: none"> • Tenants with Green Mark for Office Interior or Restaurant certificate • Green Lease • Ultraviolet light-C band (UV) emitters in air handling units (AHUs) to improve indoor air quality • Provision of carpark guidance system • Use of self cleaning façade system • Use of grey water recycling system • Titanium Dioxide coating to remove odour in toilets • Use of pneumatic waste collection system • Use of double refuse chutes for separating recyclable from non-recyclable waste • Stormwater management | <p>2 points for high impact item</p> <p>1 point for medium impact item</p> <p>0.5 point for low impact item</p> <p>(Up to 10 Points)</p> |
| <p align="center">PART 5 – OTHER GREEN FEATURES CATEGORY SCORE :</p> | <p align="center">Sum of Green Mark Points obtained from ENRB 5-1</p> |
| <p>Green Mark Score (Existing Non-Residential)</p> <p>Green Mark Score = Σ Category Score [(Part 1 – Energy Efficiency) + (Part 2 – Water Efficiency) + (Part 3 – Sustainable Operation and Management) + (Part 4 – Indoor Environmental Quality) + (Part 5 – Other Green Features)]</p> <p>Where Category Score for Part 1 \geq 30 points and Σ Category score for Part 2, 3, 4 & 5 \geq 20 points</p> | |

Annex 1: Maximum lighting power budget (including ballast loss)

| Type of usage | Maximum lighting power budget (W/m ²) |
|---|---|
| Offices | 15 |
| Classrooms | 15 |
| Hotel guest room | 15 |
| Lecture theatres | 15 |
| Auditoriums / Concert halls | 10 |
| Shops / Supermarkets / Departmental stores (including general, accent & display lighting) | 25 |
| Restaurants | 15 |
| Lobbies / Atriums / Concourse | 10 |
| Stairs | 10 |
| Corridors | 10 |
| Car parks | 5 |
| Electronic manufacturing and fine detail / Assembly industries | 20 |
| Medium and heavy industries | 15 |
| Warehouses / Storage areas | 10 |

