

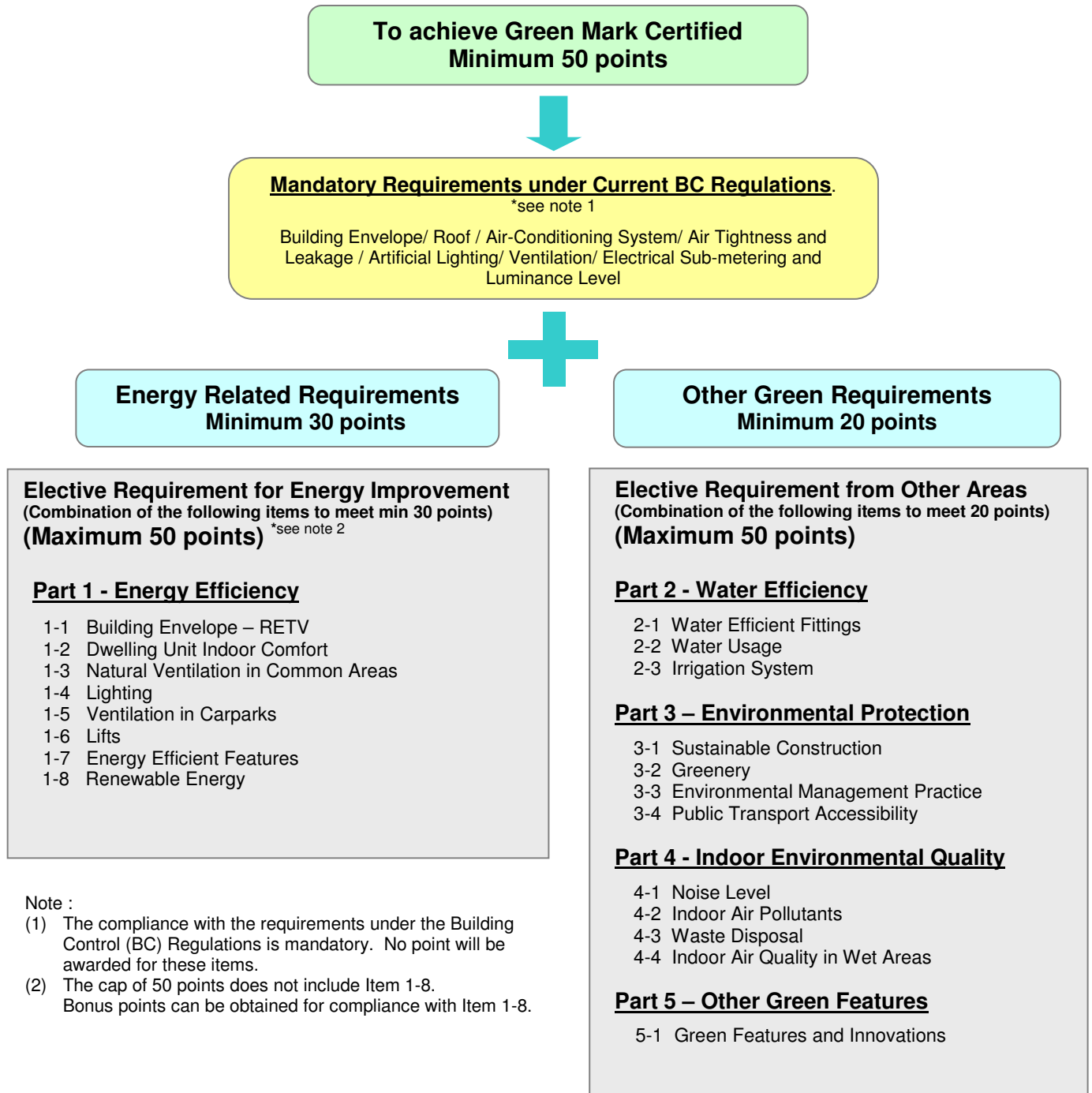


BCA GREEN MARK

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**BCA Green Mark for Residential Building  
Version RB/3.0**

## Framework - BCA Green Mark for Residential Buildings (Version RB/3.0)



**Point Allocations - BCA Green Mark for Residential Buildings (Version RB/3.0)**

Category		Point Allocations		
<b>(I) Energy Related Requirements</b>				
<b>Maximum Cap of 50 points</b>	<b>Minimum 30 points</b>	<b>Part 1 : Energy Efficiency</b>		
		1-1 Building Envelope – RETV	15	
		1-2 Dwelling Unit Indoor Comfort	16	
		1-3 Natural Ventilation in Common Areas	2	
		1-4 Lighting	15	
		1-5 Ventilation in Carpark	8	
		1-6 Lifts	2	
	1-7 Energy Efficient Features	7		
<b>Category Score for Part 1 – Energy Efficiency (Exclude Bonus Points)</b>		<b>65</b>		
<b>Bonus 20 points</b>		1-8 Renewable Energy ( <i>Bonus Points</i> )	20	
<b>(II) Other Green Requirements</b>				
<b>Maximum Cap of 50 points</b>	<b>Minimum 20 points</b>	<b>Part 2 : Water Efficiency</b>		
		2-1 Water Efficient Fittings	10	
		2-2 Water Usage	1	
		2-3 Irrigation System	2	
		<b>Category Score for Part 2 – Water Efficiency</b>		<b>13</b>
		<b>Part 3 : Environmental Protection</b>		
		3-1 Sustainable Construction	12	
		3-2 Greenery	6	
		3-3 Environmental Management Practice	9	
		3-4 Public Transport Accessibility	2	
		<b>Category Score for Part 3 – Environmental Protection</b>		<b>29</b>
		<b>Part 4 : Indoor Environmental Quality</b>		
		4-1 Noise Level	1	
		4-2 Indoor Air Pollutants	3	
	4-3 Waste Disposal	1		
4-4 Indoor Air Quality in Wet Areas	1			
<b>Category Score for Part 4 – Indoor Environmental Quality</b>		<b>6</b>		
<b>Part 5 : Other Green Features</b>				
5-1 Green Features & Innovations	7			
<b>Category Score for Part 5 – Other Green Features</b>		<b>7</b>		
<b>Total Points Allocated :</b>		<b>120</b>		
<b>Total Point Allocated (Include BONUS points):</b>		<b>140</b>		
<b>Green Mark Score (Max) :</b>		<b>100 + Bonus 20 points</b>		

### BCA Green Mark Award Rating

Green Mark Score	Green Mark Rating
90 and above	Green Mark Platinum
85 to < 90	Green Mark Gold <sup>Plus</sup>
75 to < 85	Green Mark Gold
50 to < 75	Green Mark Certified

#### Pre-requisite Requirements for BCA Green Mark Gold<sup>Plus</sup> Rating

- Building envelope design with residential envelope thermal transmittance value (RETV) of 22 W/m<sup>2</sup> or lower.

#### Pre-requisite Requirements for BCA Green Mark Platinum Rating

- Building envelope design with residential envelope thermal transmittance value (RETV) of 20 W/m<sup>2</sup> or lower.
- Use of ventilation simulation software or wind tunnel testing to identify the most effective building design and layout and has implemented the recommendations derived to ensure good natural ventilation.

## BCA Green Mark for Residential Buildings (Version RB/3.0) Mandatory Requirements

### **M1 Building Envelope – RETV**

The residential envelope thermal transmittance value (RETV) of the building, as determined in accordance with the formula set out in the “Code on Envelope Thermal Performance for Buildings” issued by the Commissioner of Building Control, shall not exceed 25 W/m<sup>2</sup>.

### **M2 Roof – U Value**

In respect of roofs without skylight, the average thermal transmittance (U-value) for the gross area of the roof shall not exceed the limit prescribed in the following Table 2-1 for the corresponding weight group.

Table 2-1 – Maximum Thermal Transmittance for Roof of Non Air-Conditioned Building

Weight Group	Weight range (kg/m <sup>2</sup> )	Maximum Thermal Transmittance (W/m <sup>2</sup> K)
Light	Under 50	0.8
Medium	50 to 230	1.1
Heavy	Over 230	1.5

This requirement does not apply to building with an aggregate floor area not exceeding 500 m<sup>2</sup>, open sided sheds, covered walkways and linkways, store rooms and utility rooms or plants and equipment rooms.

### **M3 Air-Conditioning System**

(a) Where the cooling capacity of any air-conditioning system exceeds 30 kW, the equipment shall comply with the relevant provisions of SS 530 – Code of Practice for Energy Efficiency Standard for Building Services and Equipment.

(b) Air-conditioning system shall be equipped with manual switches, timers or automatic controllers for shutting off part of the air-conditioning system to reduce energy use whenever conditions permit.

### **M4 Air Tightness and Leakage**

All windows on the building envelope shall not exceed the air leakage rates specified in SS 212 – Specification for Aluminium Alloy Windows.

### **M5 Artificial Lighting**

(a) The maximum lighting power budget in a building shall comply with SS 530 – Code of Practice for Energy Efficiency Standard for Building Services and Equipment.

(b) Lighting control for artificial lighting shall be provided in accordance with SS 530.

### **M6 Ventilation**

Ventilation shall be adequately provided in a building for its intended occupancy.

(a) Where natural ventilation is applicable, it shall be provided by means of openable windows or other openings with an aggregate area of not less than -

- (i) 5% of the floor area of the room or space required to be ventilated; and
- (ii) 15% of the floor area of the aboveground car parking area required to be ventilated.

(b) Where mechanical ventilation or air-conditioning systems are used, the ventilation rates of these systems shall comply with SS CP 13 – Code of Practice for Mechanical Ventilation and Air-Conditioning in Buildings.

### **M7 Electrical Sub-Metering**

Provision of sub-metering to monitor energy consumption of key building services and energy usage of end users or tenants.

### **M8 Luminance Level**

Building lighting is maintained at luminance level as stated in SS CP 38 – Code of Practice for Artificial Lighting in Buildings for various types of occupancy.

Source: Building Control Regulations /Approved Document

**Elective Requirements**

<b>Part 1 - Energy Efficiency</b>	<b>Green Mark Points</b>
<p><b><u>1-1 Building Envelope – RETV</u></b></p> <p>Enhance the overall thermal performance of building envelope to minimise heat gain thus reducing the overall cooling load when required.</p> <p><u>Baseline</u> : Maximum Permissible RETV = 25 W/m<sup>2</sup></p>	<p>3 points for every reduction of 1 W/m<sup>2</sup> in RETV from the baseline</p> <p>Points awarded = 75 – 3(RETV) where RETV ≤ 25 W/m<sup>2</sup> (Up to 15 points)</p>
<p><b><u>1-2 Dwelling Unit Indoor Comfort</u></b></p> <p>Enhance dwelling unit indoor comfort either through the provision of better efficient air-conditioners or good natural ventilation design.</p> <p>(a)(i) Use of energy efficient air-conditioners that are certified under the Singapore Energy Labelling Scheme.</p> <p style="text-align: center;">OR</p> <p>(a)(ii) Design for natural ventilation (applicable to development where air-conditioners are not provided).</p> <ul style="list-style-type: none"> <li>• <u>Building layout design</u> : Proper design of building layout that utilizes prevailing wind conditions to achieve adequate cross ventilation.</li> <li>• <u>Dwelling unit design</u> : Good ventilation in indoor units through sufficient openings.</li> </ul> <p>(b) Use of ventilation simulation software to identify the most effective building design and layout to achieve good natural ventilation.</p>	<p>Extent of Coverage : At least 90% of the air-conditioners used in all dwelling units</p> <p>Air-conditioners labelled with :</p> <p style="padding-left: 40px;">Two Ticks – 2 points Three Ticks – 6 points Four Ticks – 12 points</p> <p style="text-align: center;">OR</p> <p>0.6 point for every 10% of units with window openings facing north and south directions Points awarded = 0.6 x (% of units/10) (Up to 6 points)</p> <p>0.6 point for every 10 % of living rooms and bedrooms designed with true cross ventilation Points awarded = 0.6 x (% rooms /10) ( Up to 6 points)</p> <p>Points will only be awarded provided that the recommendations from ventilation simulations are implemented 4 points</p>
<p><b><u>1-3 Natural Ventilation in Common Areas</u></b></p> <p>Design for natural ventilation in following common areas :</p> <p>(a) Lift lobbies and corridors</p> <p>(b) Staircases</p>	<p>Extent of Coverage : All applicable areas</p> <p style="text-align: right;">1 point</p> <p style="text-align: right;">1 point</p>

Part 1 - Energy Efficiency	Green Mark Points
<p><b><u>1-4 Lighting</u></b></p> <p>Encourage the use of better efficient lighting or daylighting in common areas to minimise energy consumption from lighting usage while maintaining proper lighting level.</p> <p>(a) Artificial lighting in common areas.</p> <p><u>Baseline</u> = Maximum lighting power budget stated in SS 530</p> <p>(b) Daylighting in the following areas :</p> <ul style="list-style-type: none"> <li>(i) Lift lobbies and corridors</li> <li>(ii) Staircases</li> <li>(iii) Carparks</li> </ul>	<p>0.3 point for every percentage improvement in the lighting power budget</p> <p>Points awarded = 0.3 x (% improvement)</p> <p>(Up to 12 points)</p> <p style="text-align: right;">1 point</p> <p style="text-align: right;">1 point</p> <p style="text-align: right;">1 point</p>
<p><b><u>1-5 Ventilation in Carparks</u></b></p> <p>Encourage the use of energy efficient design and control of ventilation systems in carparks.</p> <p>(a) Carparks designed with natural ventilation.</p> <p>(b) CO sensors are used to regulate the demand for mechanical ventilation (MV).</p> <p>Note (1) : Where there is a combination of different ventilation mode adopted for carpark design, the points obtained under this item will be prorated accordingly.</p>	<p>Naturally ventilated carparks - 8 points</p> <p>Points awarded based on the mode of mechanical ventilation provided</p> <p style="text-align: center;">Fume extract – 6 points</p> <p style="text-align: center;">MV with or without supply - 4 points</p>
<p><b><u>1-6 Lifts</u></b></p> <p>Encourage the use of lifts with the following energy efficient features :</p> <p>(a) AC variable voltage and variable frequency (VVVF) motor drive or equivalent.</p> <p>(b) Sleep mode features or equivalent.</p>	<p>Extent of Coverage : All lifts</p> <p style="text-align: right;">1 point</p> <p style="text-align: right;">1 point</p>

<b>Part 1 - Energy Efficiency</b>	<b>Green Mark Points</b>
<p><b><u>1-7 Energy Efficient Features</u></b></p> <p>Encourage the use of energy efficient features which are innovative and/or have positive environmental impact.</p> <p>Examples :</p> <ul style="list-style-type: none"> <li>■ Heat recovery devices</li> <li>■ Cool paints</li> <li>■ Motion sensors at staircase half landing</li> <li>■ Heat elevators</li> <li>■ Gas heaters</li> <li>■ Sun pipes</li> <li>■ etc</li> </ul>	<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 7 points)</p>
<p><b>Sub-Total (A) :</b></p>	<p>Sum of Green Mark Points obtained from Item 1-1 to 1-7</p>
<p><b><u>1-8 Renewable Energy</u></b></p> <p>Encourage the application of renewable energy sources in buildings.</p> <p>(a) Solar energy</p> <p>(b) Other renewable energy</p>	<p style="text-align: center;"><b><i>(Bonus points)</i></b></p> <p>1 point for every 3 kWp of solar energy</p> <p>1 point for every 1% replacement of electricity (exclude household's usage) by renewable energy</p> <p>(Up to 20 points)</p>
<p><b>PART 1 – ENERGY EFFICIENCY CATEGORY SCORE :</b></p>	<p style="text-align: center;">Sub-total (A) + Bonus points (Item 1-8)</p> <p>where Sub-Total (A) = Sum of Green Mark Points obtained from Item 1-1 to 1-7</p>

Part 2 – Water Efficiency	Green Mark Points		
<p><b><u>2-1 Water Efficient Fittings</u></b></p> <p>Encourage the use of water efficient fittings covered under the Water Efficiency Labelling Scheme (WELS).</p> <p>(a) Basin taps and mixers                      (b) Flushing cistern                      (c) Showers                      (d) Sink/Bib taps and mixers                      (e) All other water fittings</p>	<p><b>Rating based on Water Efficiency Labelling Scheme (WELS)</b></p>		<p>Extent of coverage :</p> <p>At least 90% of the fitting type used</p> <p>(Up to 10 points)</p>
<p>Good</p>	<p>V Good</p>	<p>Excellent</p>	
<p>0.5 points</p>	<p>1 points</p>	<p>2 points</p>	
<p><b><u>2-2 Water Usage</u></b></p> <p>Provision of sub-meters to monitor the major water usage such as irrigation, swimming pools and other water features.</p>	<p>1 point</p>		
<p><b><u>2-3 Irrigation System</u></b></p> <p>Provision of suitable systems that utilise rainwater or recycled water for landscape irrigation to reduce potable water consumption.</p> <p>(a) Use of non potable water including rainwater for landscape irrigation.                      (b) Use of water efficient irrigation system.</p>	<p>1 point</p> <p>Extent of Coverage : At least 50% of the landscape areas are served by the system</p> <p>1 point</p>		
<p><b>PART 2 – WATER EFFICIENCY CATEGORY SCORE :</b></p>	<p>Sum of Green Mark Points obtained from Item 2-1 to 2-3</p>		

Part 3 – Environmental Protection	Green Mark Points
<p><b><u>3-1 Sustainable Construction</u></b></p> <p>Encourage the adoption of building designs, construction practices and materials that are environmentally friendly and sustainable.</p> <p>(a) More efficient concrete usage for building components.</p> <p>(b) Conservation of existing building structure. Applicable to existing structural elements or building envelope.</p> <p>(c) Use of sustainable materials and products in building construction such as :</p> <p>(i) Environmental friendly products that are certified under The Singapore Green Labelling Scheme (SGLS).</p> <p>(ii) Products with at least 30% recycled content by weight or volume.</p> <p>Note (2) : For products that are certified under SGLS and with at least 30% recycled contents, points can only be awarded either from item (c)(i) or (c)(ii).</p>	<p>0.1 point for every percentage reduction in the prescribed Concrete Usage Index (CUI) limit for residential buildings</p> <p>(Up to 4 points)</p> <p>Extent of Coverage : Conserve at least 50 % of the existing structural elements or building envelope (by area)</p> <p>2 points</p> <p>1 point for high impact item 0.5 point for low impact item (Cap at 3 points)</p> <p>1 point for high impact item 0.5 point for low impact item (Cap at 3 points)</p> <p>(Up to 6 points)</p>
<p><b><u>3-2 Greenery</u></b></p> <p>Encourage greater use of greenery, restoration of trees 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) Restoration of trees on site, conserving or relocating of existing trees on site.</p> <p>(c) Use of compost recycled from horticulture waste.</p>	<p>GnP = 2.0 to &lt; 3.0 – 1 point GnP = 3.0 to &lt; 3.5 – 2 points GnP = 3.5 to &lt; 4.0 – 3 points GnP ≥ 4.0 – 4 points</p> <p>1 point</p> <p>1 point</p>

<b>Part 3 – Environmental Protection</b>	<b>Green Mark Points</b>
<p><b><u>3-3 Environmental Management Practice</u></b></p> <p>Encourage the adoption of environmental friendly practices during construction and building operation.</p> <p>(a) Implement effective environmental management programmes including monitoring and setting of targets to minimise energy use, water use and construction waste.</p> <p>(b) Building quality assessed under the Construction Quality Assessment System (CONQUAS) and Quality Mark Scheme.</p> <p>(c) Developer, main builder, M &amp; E consultant and architect that are ISO 14000 certified.</p> <p>(d) Project team comprises one Certified Green Mark Manager (GMM) and/or one Certified Green Mark Professional (GMP).</p> <p>(e) Provision of building users' guide including details of the environmental friendly facilities and features within the building and their uses in achieving the intended environmental performance during building operation.</p> <p>(f) Provision of facilities or recycling bins for collection and storage of different recyclable waste such as paper, glass, plastic etc.</p>	<p>1 point</p> <p>1 point each (Up to 2 points)</p> <p>0.25 point for each firm (Up to 1 point)</p> <p>1 point for GMM / 2 points for GMP (Up to 3 points)</p> <p>1 point</p> <p>1 point</p>
<p><b><u>3-4 Public Transport Accessibility</u></b></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) Adequate bicycles parking lots.</p>	<p>1 point</p> <p>1 point</p>
<p><b>PART 3 – ENVIRONMENTAL PROTECTION CATEGORY SCORE :</b></p>	<p>Sum of Green Mark Points obtained from Item 3-1 to 3-4</p>

<b>Part 4 – Indoor Environmental Quality</b>	<b>Green Mark Points</b>
<p><b><u>4-1 Noise Level</u></b></p> <p>Building design to achieve ambient internal noise level as specified :</p> <p style="padding-left: 40px;">55 dB ( 6am-10pm) LeqA 45 dB (10pm-6 am) LeqA</p>	1 point
<p><b><u>4.2 Indoor Air Pollutants</u></b></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 under The Singapore Green Labelling Scheme (SGLS).</p> <p>(b) Use of adhesives certified under The Singapore Green Labelling Scheme (SGLS) for composite wood products.</p>	<p>Extent of Coverage : At least 90% of the total internal wall areas</p> <p>2 points</p> <p>1 point</p>
<p><b><u>4-3 Waste Disposal</u></b></p> <p>Minimise airborne contaminants from waste by locating refuse chutes at open ventilation areas such as service balconies or common corridors.</p>	1 point
<p><b><u>4-4 Indoor Air Quality in Wet Areas</u></b></p> <p>Provision of adequate natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets.</p>	<p>Extent of Coverage : At least 90% of all applicable areas</p> <p>1 point</p>
<p><b>PART 4 – INDOOR ENVIRONMENTAL QUALITY</b></p> <p><b>CATEGORY SCORE :</b></p>	<p>Sum of Green Mark Points obtained from Item 4-1 to 4-4</p>

<b>Part 5 – Other Green Features</b>	<b>Green Mark Points</b>
<p><b><u>5-1 Green Features and Innovations</u></b></p> <p>Encourage the use of other green features which are innovative and/or have positive environmental impact.</p> <p>Examples :</p> <ul style="list-style-type: none"> <li>■ Pneumatic waste collection system</li> <li>■ Dual chute system</li> <li>■ Self cleaning façade system</li> <li>■ Infiltration trenches</li> <li>■ Integrated storm water retention/treatment into landscaping</li> <li>■ etc</li> </ul>	<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 7 points)</p>
<p align="center"><b>PART 5 – OTHER GREEN FEATURES CATEGORY SCORE :</b></p>	<p align="center">Sum of Green Mark Points obtained from Item 5-1</p>

### Green Mark Score

$$\text{Green Mark Score} = \sum \text{Category Score} [ (\text{Part 1 – Energy Efficiency}) + (\text{Part 2 – Water Efficiency}) + (\text{Part 3 – Environmental Protection}) + (\text{Part 4 – Indoor Environmental Quality}) + (\text{Part 5 – Other Green Features}) ]$$

where Category Score for Part 1 ≥ 30 Green Mark points and

∑ Category Score for Part 2, 3, 4 & 5 ≥ 20 Green Mark points