

BPD_GM02

As-Built GM Submission before TOP for Non-Residential Building

Sample Forms Attached For Viewing Only

Applicable for projects with 1st submission date for URA planning permission on or after 1st Dec 2010

All these forms and calculations are to be generated from the Green Mark (GM) e-filing system.

The forms spell out all the elective requirements which the QPs and the other practitioners can choose for their design to meet the environmental sustainability requirement.

QPs are only required to provide salient information pertaining to the items that are relevant to their design and the GM e-filing system will automatically compute the score to be allocated for the items selected.

Documentary evidences need not be submitted together with these forms. However, QPs are advised to maintain such records. BCA may require such evidences to be submitted for auditing purpose.

**SUBMISSION OF AS-BUILT GREEN MARK SCORE CALCULATIONS
Regulation 9 of the Building Control (Environmental Sustainability) Regulations 2008 (Cap. 29)**

Commissioner of Building Control Building & Construction Authority 5 Maxwell Road #02-00 Tower Block, MND Complex Singapore 069110	<p><i>INSTRUCTIONS</i></p> (1) Please refer to the Explanatory Notes attached before completing these forms via Green Mark (GM) e-Filing system. (2) Submit one copy of this form together with Form BPD_GM02_Appendix 1 (for residential building) and/or Form BPD_GM02_Appendix 2 (for non-residential building) before making an application for TOP or CSC (if TOP is not applied for).
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Section I (To be completed by Qualified Person)

1. Project Reference No. : _____ GM e-Filing No.: _____

Description of building works: _____

2. I hereby declare that the completed building works or parts thereof assessed and the numerical scores assigned to these building works or parts thereof using the scoring methodology specified in the Code for Environmental Sustainability of Buildings are correct. I further declare that the as-built Green Mark score submitted herewith complies with the minimum environmental sustainability standard under the Building Control (Environmental Sustainability) Regulations and the Green Mark score calculations are as stated in Form BPD_GM02_Appendix 1 and/or Form BPD_GM02_Appendix 2. The as-built Green Mark score for the completed building works is _____ for residential buildings and/or _____ for non-residential buildings respectively.

Name & Address of Professional Firm	Name & Signature of Qualified Person
Date:	Tel No.:

Section II (To be completed by Appropriate Practitioners)

3. We hereby declare that the completed building works or parts thereof assessed and the numerical scores assigned to these building works or parts thereof using the scoring methodology specified in the Code for Environmental Sustainability of Buildings are correct.

Name & Address of Professional Firm	Name & Signature of Practitioner for Mechanical Works
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Date:	Tel No.:
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Name & Address of Professional Firm	Name & Signature of Practitioner for Electrical Works
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Date:	Tel No.:
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CALCULATIONS OF AS-BUILT GREEN MARK SCORE FOR NON-RESIDENTIAL BUILDINGS Regulation 9 of the Building Control (Environmental Sustainability) Regulations 2008 (Cap. 29)			
SECTION I : SUMMARY			
Project Reference No.:		GM e-Filing No.:	
The Gross Floor Area (GFA) for the building works, where applicable :			
Building Works	New GFA in m ²	Existing GFA in m ² (Major Retrofitting)	
Residential		Not Applicable	
Non-Residential			
Total			
Pls indicate Non-Residential Floor Area & Percentage (%), where applicable :			
Non-Residential Floor Area	Floor Area in m ²	% Floor Area	% Prorate by Scoring
Air-conditioned spaces			
Non Air-conditioned spaces excluding carparks and common areas			
Total			
Category Items		Max Points Allocated	Points Scored
(I) Energy Related Requirements			
Part 1 : Energy Efficiency			
NRB 1-1	Thermal Performance of Building Envelope – ETTV	12	
NRB 1-2	Air-Conditioning System	30	
Sub-Total (A) - For NRB 1-1 to 1-2 :		42	
Prorate Sub-Total (A) :			
NRB 1-3	Building Envelope – Design/Thermal Parameters	35	
NRB 1-4	Natural Ventilation / Mechanical Ventilation	20	
Sub-Total (B) - For NRB 1-3 to 1-4 :		55	
Prorate Sub-Total (B) :			
NRB 1-5	Daylighting	6	
NRB 1-6	Artificial Lighting	12	
NRB 1-7	Ventilation in Carparks	4	
NRB 1-8	Ventilation in Common Areas	5	
NRB 1-9	Lifts and Escalators	2	
NRB 1-10	Energy Efficient Practices & Features	12	
NRB 1-11	Renewable Energy	20	
Sub-Total (C) - For NRB 1-5 to 1-11 :		61	
Category Score for Part 1 – Energy Efficiency (Min 30 points)		116	
Prorate Sub-Total (A) + Prorate Sub-Total (B) + Sub-Total (C) :			

Project Reference No.: _____		GM e-Filing No.: _____	
Category Items	Max Points Allocated	Points Scored	
(II) Other Green Related Requirements			
Part 2 : Water Efficiency			
NRB 2-1 Water Efficient Fittings	10		
NRB 2-2 Water Usage and Leak Detection	2		
NRB 2-3 Irrigation System and Landscaping	3		
NRB 2-4 Water Consumption of Cooling Tower	2		
Category Score for Part 2 – Water Efficiency :	17		
Part 3 : Environmental Protection			
NRB 3-1 Sustainable Construction	10		
NRB 3-2 Sustainable Products	8		
NRB 3-3 Greenery Provision	8		
NRB 3-4 Environmental Management Practice	7		
NRB 3-5 Green Transport	4		
NRB 3-6 Refrigerants	2		
NRB 3-7 Stormwater Management	3		
Category Score for Part 3 – Environmental Protection :	42		
Part 4 : Indoor Environmental Quality			
NRB 4-1 Thermal Comfort	1		
NRB 4-2 Noise Level	1		
NRB 4-3 Indoor Air Pollutants	2		
NRB 4-4 Indoor Air Quality (IAQ) Management	2		
NRB 4-5 High Frequency Ballasts	2		
Category Score for Part 4 – Indoor Environmental Quality :	8		
Part 5 : Other Green Features			
NRB 5-1 Green Features & Innovations	7		
Category Score for Part 5 – Other Green Features :	7		
Category Score for Part 2 to Part 5 (Min 20 points) :	74		
Category Score for Part 1 – Energy Efficiency (Min 30 points) Prorate Sub-Total (A) + Prorate Sub-Total (B) + Sub-Total (C) :	116		
Green Mark Score (Min 50 points) - {Category Score for Part 1 (Min 30 points) + Category Score for Part 2 to Part 5 (Min 20 points)} :	190		

The as-built Green Mark score for the completed building works is _____ for non-residential buildings

SECTION II : GREEN MARK SCORE CALCULATIONS DETAILS																				
Project Reference No.: _____	GM e-Filing No.: _____																			
(I) Energy Related Requirements																				
Part 1 : Energy Efficiency	Max Points Allocated	Points Scored																		
Section (A) Applicable to Air-Conditioned Building Areas (with an aggregate air-conditioned areas > 500 m²)																				
Air-conditioned spaces and percentage floor area if applicable :																				
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NRB 1-1 Thermal Performance of Building Envelope – ETTV																				
<i>For Buildings that are underground, NRB 1-1 may be excluded in the computation, the score obtained under NRB 1-2 will be prorated accordingly</i>																				
ETTV = W/m ²																				
<i>Green Mark Points : Points scored = 1.2 x (50 - ETTV); Max 12 points Max Permissible ETTV (Envelope Thermal Transfer Value)=50 W/m²;</i>																				
NRB 1-2 Air-Conditioning System																				
<i>Where there is a combination of centralised air-con system with unitary air-con system, the computation is based on the air-conditioning system with the larger aggregate capacity</i>																				
(a) Water Cooled Chilled-Water Plant 																				
Peak Building Cooling Load = RT																				
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(b) Air Cooled Chilled-Water Plant / Unitary Air-Conditioners 																				
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Project Reference No.: _____		GM e-Filing No.: _____	
(I) Energy Related Requirements			
Part 1 : Energy Efficiency cont'd		Max Points Allocated	Points Scored
NRB 1-2 Air-Conditioning System cont'd			
<p>(c) Air Distribution System [Green Box] % improvement in the air distribution system efficiency over baseline standard (SS553) = % <i>Green Mark points - 0.2 point for every % improvement; Max 6 points.</i> Buildings using <u>district cooling system</u>. [Green Box] <i>Note : No need to compute plant efficiency in item (a), (b), points obtained will be prorated based on the air distribution system efficiency under item (c).</i></p>			
<p>(d) Prerequisite Requirement : Provision of permanent measuring instruments for monitoring of water cooled chilled-water plant efficiency (1 point). [Green Box]</p>			
<p>(e) Verification of central chilled-water plant instrumentation for water cooled chilled-water plant using the heat balance substantiating test (1 point). [Yellow Box]</p>			
<p>(f) Provision of variable speed controls for chilled-water pumps and cooling tower fans to ensure better high part-load plant efficiency (1 point). [Yellow Box]</p>			
<p>(g) Sensors or similar automatic control devices are used to regulate outdoor air flow rate to maintain the concentration of carbon dioxide within an acceptable range of 700 ppm above outdoor (1 point). [Yellow Box]</p>			
Sub-Total (A) – For NRB 1-1 to 1-2 :		42	
Prorate Sub-Total (A) - For buildings that are underground where NRB 1-1 is excluded			
Prorate Sub-Total (A) -by percentage of air-conditioned areas where applicable:			

Project Reference No.: _____	GM e-Filing No.: _____																															
(I) Energy Related Requirements																																
Part 1 : Energy Efficiency cont'd	Max Points Allocated	Points Scored																														
Section (B) -Applicable to Non Air-Conditioned Building Areas (with an aggregate non air-conditioned areas > 10% of total floor area excluding carparks and common areas)																																
Non Air-conditioned spaces and percentage floor area if applicable :																																
NRB 1-3 Building Envelope - Design/Thermal Parameters																																
<i>For Existing Buildings, NRB 1-3(a) may be excluded in the computation, the total score obtained under NRB 1-3(b), NRB 1-3(c) and NRB 1-3(d) will be prorated accordingly</i>																																
<p>(a) Minimum direct west facing through building design orientation [Green Box] Percentage of west facing façade areas over total façade areas = % <i>Green Mark Points : Points = 15 – [0.3 x (% of west facing external facade areas)]; Max 15 points.</i></p> <p>Where there is <u>no west facing</u>, the total points for this item will be 30 points; the items NRB 1-3 (b) and NRB (c) as listed below will be not applicable [Green Box]</p> <p>(b) (i) Minimum west facing window openings [Green Box] Percentage of west facing window areas over total west facing façade areas = % <i>Green Mark Points : Points = 10 – [0.1 x (% of west facing window areas)].</i></p> <p>(ii) Effective sunshading provision for windows on the west façade with minimum shading of 30%. [Green Box] Percentage of west facing window areas with sunshading devices over total west facing facade areas = % <i>Green Mark Points : Points = 0.1 x (% of west facing window areas with sunshading devices); Max 10 points for NRB 1-3(b).</i></p> <p>(c) Better Thermal Transmittance (U-value) of external west facing walls [Green Box] Percentage of external west facing walls areas with U-value of 2 W/m²K or less over total west facing façade areas = % <i>Green Mark Points : Points = 0.05 x (% of external west facing walls areas that meet the criteria); Max 5 points.</i></p> <p>(d) Better Thermal Transmittance (U-value) of roof [Green Box]</p> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Roof Weight Group</th> <th>Max U-value of Roof (W/m²K)</th> <th>U-value of Roof (W/m²K)</th> <th>Roof Area (m²)</th> <th>Reduction from baseline Roof U-value (W/m²K)</th> <th>Average Reduction prorated based on roof areas (W/m²K)</th> </tr> <tr> <td></td> <td>(A)</td> <td>(B)</td> <td>(C)</td> <td>D=A-B</td> <td>$E = \frac{D \times C}{\sum C}$</td> </tr> </thead> <tbody> <tr> <td>Light</td> <td>0.8</td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> <td style="background-color: green;"></td> <td style="background-color: green;"></td> </tr> <tr> <td>Medium</td> <td>1.1</td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> <td style="background-color: green;"></td> <td style="background-color: green;"></td> </tr> <tr> <td>Heavy</td> <td>1.5</td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> <td style="background-color: green;"></td> <td style="background-color: green;"></td> </tr> </tbody> </table> <p><i>Green Mark Points : 1 point for every 0.1 W/m²K reduction from baseline, Max 5 points.</i></p>	Roof Weight Group	Max U-value of Roof (W/m ² K)	U-value of Roof (W/m ² K)	Roof Area (m ²)	Reduction from baseline Roof U-value (W/m ² K)	Average Reduction prorated based on roof areas (W/m ² K)		(A)	(B)	(C)	D=A-B	$E = \frac{D \times C}{\sum C}$	Light	0.8					Medium	1.1					Heavy	1.5					35	
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Project Reference No.: _____		GM e-Filing No.: _____		
(I) Energy Related Requirements				
Part 1 : Energy Efficiency cont'd			Max Points Allocated	Points Scored
NRB 1-4 Natural Ventilation / Mechanical Ventilation			20	
<i>Where there is a combination of naturally ventilated and mechanical ventilated spaces, the points scored will be based on the predominant ventilation modes of normally occupied spaces.</i>				
(a) <u>Natural Ventilation</u>				
(i) Proper design of building layout that utilises prevailing wind conditions to achieve adequate cross ventilation (<i>Max 10 points</i>)				
* <u>Building Layout Design</u>				
Total No. of units/ rooms in the development		Units/ Rooms with windows facing north and south directions (<i>1.0 point for every 10 %</i>)		
		Total No.	Percentage	Points Scored
(ii) Use of ventilation simulation software				
- identification of the most effective building design and layout (<i>5 points</i>)				
- recommendations to implement design optimisation (<i>5 points</i>)				
(b) <u>Mechanical Ventilation</u>				
Use of energy efficient mechanical ventilation system design				
Percentage improvement in the air-distribution system efficiency				
= _____ %				
<i>Green Mark Points : 0.6 point for every % improvement over baseline SS553; Max 15 points.</i>				
Sub-Total (B) – For NRB 1-3 to 1-4 :			55	
Prorate Sub-Total (B) - For existing building where NRB 1-3(a) is excluded :				
Prorate Sub-Total (B) - by percentage of non air-conditioned areas where applicable:				

Project Reference No.: _____		GM e-Filing No.: _____																
(I) Energy Related Requirements																		
Part 1 : Energy Efficiency cont'd		Max Points Allocated	Points Scored															
Section (C) General																		
NRB 1-5 Daylighting		6																
<p>(a) Use of daylighting and glare simulation analysis to verify the adequacy of ambient lighting levels in all normally occupied areas [Green Box]</p> <p>Extent of coverage : At least 75% of the units with effective daylighting provisions</p> <p>Distance from façade perimeter meeting minimum required illuminance level = [Yellow Box] m</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: left;">Green Mark Points</th> </tr> <tr> <td style="width: 40%;">Distance from the façade perimeters (m)</td> <td style="width: 15%;">≥ 3.0</td> <td style="width: 15%;">4.0 - 5.0</td> <td style="width: 30%;">> 5.0</td> </tr> <tr> <td>Points Allocated</td> <td>1</td> <td>2</td> <td>3</td> </tr> </table>		Green Mark Points				Distance from the façade perimeters (m)	≥ 3.0	4.0 - 5.0	> 5.0	Points Allocated	1	2	3					
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<p>(b) Daylighting in Common Areas [Green Box]</p> <p>Extent of coverage : At least 80% of the applicable areas</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Common Areas</th> <th style="width: 30%;">Daylighting (0.5 point)</th> </tr> </thead> <tbody> <tr><td>(i) Toilets</td><td>[Yellow Box]</td></tr> <tr><td>(ii) Staircases</td><td>[Yellow Box]</td></tr> <tr><td>(iii) Corridors</td><td>[Yellow Box]</td></tr> <tr><td>(iv) Lifts</td><td>[Yellow Box]</td></tr> <tr><td>(v) Atriums</td><td>[Yellow Box]</td></tr> <tr><td>(vi) Carparks</td><td>[Yellow Box]</td></tr> </tbody> </table>		Common Areas	Daylighting (0.5 point)	(i) Toilets	[Yellow Box]	(ii) Staircases	[Yellow Box]	(iii) Corridors	[Yellow Box]	(iv) Lifts	[Yellow Box]	(v) Atriums	[Yellow Box]	(vi) Carparks	[Yellow Box]			
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NRB 1-6 Artificial Lighting		12																
<p>Use of better efficient lighting to minimise energy consumption from lighting usage while maintaining proper lighting level. [Green Box]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="text-align: center;">Percentage improvement in lighting power budget (as compared with SS 530 requirement) (0.30 point for every percentage improvement)</th> </tr> <tr> <td style="width: 33%;">Include tenants' lighting provision (Max 12 points)</td> <td style="width: 10%; text-align: center;">OR</td> <td style="width: 57%;">Exclude tenants' lighting provision (Max 5 points)</td> </tr> <tr> <td>[Yellow Box]</td> <td></td> <td>[Yellow Box]</td> </tr> </table>		Percentage improvement in lighting power budget (as compared with SS 530 requirement) (0.30 point for every percentage improvement)			Include tenants' lighting provision (Max 12 points)	OR	Exclude tenants' lighting provision (Max 5 points)	[Yellow Box]		[Yellow Box]								
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(I) Energy Related Requirements																						
Part 1 : Energy Efficiency cont'd			Max Points Allocated	Points Scored																		
NRB 1-8 Ventilation in Common Areas			5																			
Use of energy efficient design and control ventilation systems in common areas with at least 90% of each applicable area.																						
<table border="1"> <thead> <tr> <th>Common Areas</th> <th>Natural Ventilation (1.5 points)</th> <th>Mechanical Ventilation (0.5 point)</th> </tr> </thead> <tbody> <tr> <td>(a) Toilets</td> <td></td> <td></td> </tr> <tr> <td>(b) Staircases</td> <td></td> <td></td> </tr> <tr> <td>(c) Corridors</td> <td></td> <td></td> </tr> <tr> <td>(d) Lift lobbies</td> <td></td> <td></td> </tr> <tr> <td>(e) Atriums</td> <td></td> <td></td> </tr> </tbody> </table>			Common Areas	Natural Ventilation (1.5 points)	Mechanical Ventilation (0.5 point)	(a) Toilets			(b) Staircases			(c) Corridors			(d) Lift lobbies			(e) Atriums				
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<i>Green Mark Points : Max 5 points.</i>																						
NRB 1-9 Lifts and Escalators			2																			
Use of lifts and escalators with AC variable voltage and variable frequency (VVVF) motor drive and sleep mode features.																						
<table border="1"> <tbody> <tr> <td>(a) Lifts (1 point)</td> <td></td> </tr> <tr> <td>(b) Escalators (1 point)</td> <td></td> </tr> </tbody> </table>			(a) Lifts (1 point)		(b) Escalators (1 point)																	
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(b) Escalators (1 point)																						
NRB 1-10 Energy Efficient Practices & Features			12																			
(a) Computation of energy consumption based on design load in the form of Energy Efficiency Index (EEI) (1 point)																						
EEI = <input type="text"/> kWh/m ² /year																						
(b) Use of vertical greenery system on west and east façade to reduce the heat gain through the building envelope (1 point)																						
- more than 50% of the applicable facade areas (1.0 point)																						
- at least 25% of the applicable façade areas (0.5 point)																						

Project Reference No.: _____		GM e-Filing No.: _____																						
(I) Energy Related Requirements																								
Part 1 – Energy Efficiency cont'd		Max Points Allocated	Points Scored																					
NRB 1-10 Energy Efficient Practices & Features cont'd																								
<p>(c) The following energy efficient features are deemed acceptable [] (indicate where applicable)</p> <table border="1"> <tr><td>(i) Solar thermal heaters</td><td>[]</td></tr> <tr><td>(ii) Heat recovery devices</td><td>[]</td></tr> <tr><td>(iii) Light shelves</td><td>[]</td></tr> <tr><td>(iv) Motion sensors for staircases half landing</td><td>[]</td></tr> <tr><td>(v) Heat pumps</td><td>[]</td></tr> <tr><td>(vi) Sun pipes</td><td>[]</td></tr> <tr><td>(vii) Lifts with gearless drive</td><td>[]</td></tr> <tr><td>(viii) Re-generative lift</td><td>[]</td></tr> <tr><td>(ix) Photocell sensors to maximise the use of daylighting</td><td>[]</td></tr> <tr><td>(x) Gas water heaters</td><td>[]</td></tr> </table> <p>Items that are not listed above but with clearance from BCA</p> <p>(i) _____</p> <p>(ii) _____</p> <p>(iii) _____</p> <p>(iv) _____</p> <p>(v) _____</p> <p>Based on the energy efficient features selected, the percentage of energy savings over the total building energy consumption = [] %</p> <p><i>Green Mark Points : 3 points to 1% energy saving ; Max 10 points.</i></p>		(i) Solar thermal heaters	[]	(ii) Heat recovery devices	[]	(iii) Light shelves	[]	(iv) Motion sensors for staircases half landing	[]	(v) Heat pumps	[]	(vi) Sun pipes	[]	(vii) Lifts with gearless drive	[]	(viii) Re-generative lift	[]	(ix) Photocell sensors to maximise the use of daylighting	[]	(x) Gas water heaters	[]			
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NRB 1-11 Renewable Energy		20																						
<p>Application of renewable energy sources in buildings []</p> <table border="1"> <tr><td colspan="3">Percentage of replacement of electricity by renewable energy (based on total electricity consumption)</td></tr> <tr><td>Include tenants' usage</td><td>OR</td><td>Exclude tenants' usage</td></tr> <tr><td>[]</td><td></td><td>[]</td></tr> </table> <table border="1"> <tr><td colspan="3"><i>Green Mark Points : Max 20 points</i></td></tr> <tr><td><i>Expected EEI as in NRB 1-10(a) in kWh/m²/year</i></td><td><i>≥ 30</i></td><td><i><30</i></td></tr> <tr><td><i>Include tenants' usage - Points for every % replacement</i></td><td><i>5.0</i></td><td><i>3.0</i></td></tr> <tr><td><i>Exclude tenants' usage - Points for every % replacement</i></td><td><i>3.0</i></td><td><i>1.5</i></td></tr> </table>		Percentage of replacement of electricity by renewable energy (based on total electricity consumption)			Include tenants' usage	OR	Exclude tenants' usage	[]		[]	<i>Green Mark Points : Max 20 points</i>			<i>Expected EEI as in NRB 1-10(a) in kWh/m²/year</i>	<i>≥ 30</i>	<i><30</i>	<i>Include tenants' usage - Points for every % replacement</i>	<i>5.0</i>	<i>3.0</i>	<i>Exclude tenants' usage - Points for every % replacement</i>	<i>3.0</i>	<i>1.5</i>		
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Sub-Total (C) – For NRB 1-5 to 1-11 :		61																						
Prorate Sub-Total (A) - by % of air-conditioned areas where applicable :																								
Prorate Sub-Total (B) - by % of non air-conditioned areas where applicable :																								
Category Score for Part 1 – Energy Efficiency (Min 30 points)		116																						
Prorate Sub-Total (A) + Prorate Sub-Total (B) + Sub-Total (C) :																								

Project Reference No.: _____		GM e-Filing No.: _____																
(II) Other Green Requirements																		
Part 2 : Water Efficiency			Max Points Allocated	Points Scored														
NRB 2-1 Water Efficient Fittings			10															
Use of water fittings that are certified under the Water Efficiency Labelling Scheme (WELS).																		
<table border="1"> <thead> <tr> <th rowspan="2">Water Fittings</th> <th colspan="2">Rating based on WELS</th> <th rowspan="2">Others</th> </tr> <tr> <th>Excellent</th> <th>Very Good</th> </tr> </thead> <tbody> <tr> <td>No. of Fittings (A)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Weightage (B)</td> <td>10</td> <td>8</td> <td>0</td> </tr> </tbody> </table>			Water Fittings	Rating based on WELS		Others	Excellent	Very Good	No. of Fittings (A)				Weightage (B)	10	8	0		
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No. of Fittings (A)																		
Weightage (B)	10	8	0															
<i>Green Mark Points : Points scored = $\sum(A \times B) / \sum A$; Max 10 points</i>																		
NRB 2-2 Water Usage and Leak Detection			2															
(a)	Provision of private meters to monitor major water usage system such as irrigation, cooling tower and tenant's usage (1 point).	<input type="checkbox"/>																
(b)	Linking all private meters to the Building Management System (BMS) for leak detection (1 point).	<input type="checkbox"/>																
NRB 2-3 Irrigation System and Landscaping			3															
(a)	Use of non-potable water including rainwater for landscape irrigation (1 point)	<input type="checkbox"/>																
(b)	Use of automatic water efficient irrigation system with rain sensor for at least 50% of the landscape areas served by the system (1 point)	<input type="checkbox"/>																
(c)	Use of drought tolerant plants require minimal irrigation for at least 80% of the landscape areas (1 point)	<input type="checkbox"/>																
NRB 2-4 Water Consumption of Cooling Tower			2															
(a)	Use of cooling tower water treatment system which can achieve 7 or better cycles of concentration at acceptable water quality (1.0 point)	<input type="checkbox"/>																
(b)	Use of NEWater or on-site and recycled water from approved sources (1 point)	<input type="checkbox"/>																
Category Score for Part 2 - Water Efficiency :			17															

Project Reference No.: _____		GM e-Filing No.: _____																																		
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Part 3 : Environmental Protection		Max Points Allocated	Points Scored																																	
NRB 3-1 Sustainable Construction		10																																		
<p>(a) Use of Sustainable and Recycled Materials (<i>Max 5 points</i>) [Green Box]</p> <p>(i) Green Cements with approved industrial by-products [Yellow Box] (that is Ground Granulated Blastfurnace Slag (GGBS), silica fume, fly ash) to replace Ordinary Portland Cement (OPC) by at least 10% by mass for superstructure works. (<i>1 point</i>)</p> <p>(ii) Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS) from approved sources to replace coarse and fine aggregates for concrete production of main building elements [Green Box]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Use of RCA and WCS to replace coarse and fine aggregates</th> <th>Total Quantity Used in tonnage</th> <th>Minimum Usage Requirement in tonnage [0.03 x (GFA in m²)]</th> </tr> </thead> <tbody> <tr> <td>* RCA (replace coarse)</td> <td>[Yellow Box]</td> <td>[Yellow Box]</td> </tr> <tr> <td>* WCS (replace fine)</td> <td>[Yellow Box]</td> <td>[Yellow Box]</td> </tr> </tbody> </table> <p><i>Green Mark Points : 2 points when total quantity used is at least equal to minimum requirement; 4 points when total quantity used ≥ 2 x minimum requirement</i></p> <p>(b) Concrete Usage Index (CUI) [Green Box]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Concrete Volume in m³ (A)</td> <td>[Yellow Box]</td> </tr> <tr> <td>Total Constructed Floor Area in m² (B)</td> <td>[Yellow Box]</td> </tr> <tr> <td>CUI (C = A / B)</td> <td>[Green Box]</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6">Green Mark Points</th> </tr> <tr> <th>Project CUI (m³/m²)</th> <th>≤ 0.70</th> <th>≤ 0.60</th> <th>≤ 0.50</th> <th>≤ 0.40</th> <th>≤ 0.35</th> </tr> </thead> <tbody> <tr> <td>Points Allocated</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </tbody> </table>		Use of RCA and WCS to replace coarse and fine aggregates	Total Quantity Used in tonnage	Minimum Usage Requirement in tonnage [0.03 x (GFA in m ²)]	* RCA (replace coarse)	[Yellow Box]	[Yellow Box]	* WCS (replace fine)	[Yellow Box]	[Yellow Box]	Concrete Volume in m ³ (A)	[Yellow Box]	Total Constructed Floor Area in m ² (B)	[Yellow Box]	CUI (C = A / B)	[Green Box]	Green Mark Points						Project CUI (m ³ /m ²)	≤ 0.70	≤ 0.60	≤ 0.50	≤ 0.40	≤ 0.35	Points Allocated	1	2	3	4	5		
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NRB 3-2 Sustainable Products		8																																		
<p>Use of environmental friendly products that are certified by approved local certification body and are applicable for non-structural building components and construction [Green Box]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Environmental friendly products</th> <th colspan="3">Weightage based on extent of environmental friendliness</th> </tr> <tr> <th>Good</th> <th>Very Good</th> <th>Excellent</th> </tr> </thead> <tbody> <tr> <td>Points (A)</td> <td>[Green Box]</td> <td>[Green Box]</td> <td>[Green Box]</td> </tr> <tr> <td>Weightage (B)</td> <td>1.0</td> <td>1.5</td> <td>2.0</td> </tr> </tbody> </table> <p><i>Green Mark Points : 1 point for high impact, 0.5 point for low impact; Points scored = ∑(A x B); Max 8 points</i></p>		Environmental friendly products	Weightage based on extent of environmental friendliness			Good	Very Good	Excellent	Points (A)	[Green Box]	[Green Box]	[Green Box]	Weightage (B)	1.0	1.5	2.0																				
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NRB 3-3 Greenery Provision		8																																		
<p>(a) Green Plot Ratio (GnPR) [Green Box]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Total Leaf Area in m² (A)</td> <td>[Yellow Box]</td> </tr> <tr> <td>Site Area in m² (B)</td> <td>[Yellow Box]</td> </tr> <tr> <td>GnPR (C = A / B)</td> <td>[Green Box]</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="7">Green Mark Points</th> </tr> <tr> <th>GnPR</th> <th>0.5 to <1.0</th> <th>1.0 to <1.5</th> <th>1.5 to <3.0</th> <th>3.0 to <3.5</th> <th>3.5 to <4.0</th> <th>≥ 4.0</th> </tr> </thead> <tbody> <tr> <td>Points Allocated</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> </tbody> </table> <p>(b) Restoration of trees on site, conserving or relocating of existing trees on site (<i>1 point</i>) [Yellow Box]</p> <p>(c) Use of compost recycled from horticulture waste (<i>1 point</i>). [Yellow Box]</p>		Total Leaf Area in m ² (A)	[Yellow Box]	Site Area in m ² (B)	[Yellow Box]	GnPR (C = A / B)	[Green Box]	Green Mark Points							GnPR	0.5 to <1.0	1.0 to <1.5	1.5 to <3.0	3.0 to <3.5	3.5 to <4.0	≥ 4.0	Points Allocated	1	2	3	4	5	6								
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Project Reference No.: _____		GM e-Filing No.: _____													
(II) Other Green Requirements															
Part 3 : Environmental Protection cont'd		Max Points Allocated	Points Scored												
NRB 3-4 Environmental Management Practice		7													
(a)	Implement effective environmental management programmes (1 point). <input type="checkbox"/>														
(b)	Main builder that has good track records in the adoption of sustainable, environmentally friendly and considerate practices during construction such as Green and Gracious Builder Award (1 point). <input type="checkbox"/>														
(c)	Building quality assessed under Construction Quality Assessment System (CONQUAS) (1 point) <input type="checkbox"/>														
(d)	Firms ISO 14000 certified (0.25 point for each firm) <input type="checkbox"/>														
	<table border="1"> <tr> <td>(i)</td> <td>Developer</td> <td><input type="checkbox"/></td> </tr> <tr> <td>(ii)</td> <td>Main builder</td> <td><input type="checkbox"/></td> </tr> <tr> <td>(iii)</td> <td>M&E consultant</td> <td><input type="checkbox"/></td> </tr> <tr> <td>(iv)</td> <td>Architect</td> <td><input type="checkbox"/></td> </tr> </table>	(i)	Developer	<input type="checkbox"/>	(ii)	Main builder	<input type="checkbox"/>	(iii)	M&E consultant	<input type="checkbox"/>	(iv)	Architect	<input type="checkbox"/>		
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(iii)	M&E consultant	<input type="checkbox"/>													
(iv)	Architect	<input type="checkbox"/>													
(e)	Project team comprises Green Mark Manager (GMM), Green Mark Facilities Manager (GMFM) and Green Mark Professional (GMP) (Max 1 point) <input type="checkbox"/>														
	<table border="1"> <tr> <td>(i)</td> <td>Certified GMM (0.5 point)</td> <td><input type="checkbox"/></td> </tr> <tr> <td>(ii)</td> <td>Certified GMFM (0.5 point)</td> <td><input type="checkbox"/></td> </tr> <tr> <td>(iii)</td> <td>Certified GMP (1 point)</td> <td><input type="checkbox"/></td> </tr> </table>	(i)	Certified GMM (0.5 point)	<input type="checkbox"/>	(ii)	Certified GMFM (0.5 point)	<input type="checkbox"/>	(iii)	Certified GMP (1 point)	<input type="checkbox"/>					
(i)	Certified GMM (0.5 point)	<input type="checkbox"/>													
(ii)	Certified GMFM (0.5 point)	<input type="checkbox"/>													
(iii)	Certified GMP (1 point)	<input type="checkbox"/>													
(f)	Provision of building users' guide (1 point). <input type="checkbox"/>														
(g)	Provision of facilities or recycling bins for collection and storage of different recyclable waste such as paper, glass, plastic, etc. (1 point). <input type="checkbox"/>														
NRB 3-5 Green Transport		4													
(a)	Good access to nearest MRT/LRT stations or bus stops (1 point). <input type="checkbox"/>														
(b)	Provision of covered walkway to facilitate connectivity and use of public transport (1 point). <input type="checkbox"/>														
(c)	Provision of hybrid/electric vehicle refueling/ recharge stations and priority parking lots within the development (1 point). <input type="checkbox"/>														
(d)	Provision of sheltered bicycles parking lots with shower and changing facilities (1 point). <input type="checkbox"/>														
	- bicycles parking lots for at least [3% x Gross Floor Area (GFA) / 10], cap at 50 where applicable (1.0 point)														
	- bicycles parking lots for at least [1.5% x Gross Floor Area (GFA) / 10], at minimum of 10, where applicable (0.5 point)														
NRB 3-6 Refrigerants		2													
(a)	Refrigerants with ozone depletion potential (ODP) of zero or with global warming potential (GWP) of less than 100 (1 point). <input type="checkbox"/>														
(b)	Use of refrigerant leak detection system at critical areas of plant rooms containing chillers and other equipments with refrigerants (1 point) <input type="checkbox"/>														
NRB 3-7 Stormwater Management		3													
	Treatment of stormwater runoff before discharge <input type="checkbox"/>														
	The extent of stormwater treatment														
	- more than 35% of total site area or paved area (3 points)														
	- more than 10% to 35% of total site area (2 points)														
	- up to 10% of total site area (1 point)														
Category Score for Part 3 - Environmental Protection :		42													

Project Reference No.: _____		GM e-Filing No.: _____	
(II) Other Green Requirements			
Part 4 : Indoor Environmental Quality		Max Points Allocated	Points Scored
NRB 4-1 Thermal Comfort		1	
<p>Air-conditioning system is designed to allow cooling load variation due to fluctuations in ambient air temperature to ensure consistent indoor conditions for thermal comfort.</p> <p>Indoor operative temperature between 24 to 26° C Relative Humidity < 65%.</p>			
NRB 4-2 Noise Level		1	
<p>Occupied spaces in buildings are designed with good ambient sound levels as recommended in SS 553</p>			
NRB 4-3 Indoor Air Pollutants		2	
<p>(a) Use of low volatile organic compounds (VOC) paints certified by approved local certification body for at least 90% of the total internal areas (1 point). <input type="checkbox"/></p> <p>(b) Use of environmentally friendly adhesives certified by approved local certification body for at least 90% of the applicable areas (1 point). <input type="checkbox"/></p>			
NRB 4-4 Indoor Air Quality (IAQ) Management		2	
<p>(a) Provision of filtration media and differential pressure monitoring equipment in Air Handling Units (AHUs) in accordance with SS554 (1 point) <input type="checkbox"/></p> <p>(b) Implementation of effective IAQ management plan to ensure that building ventilation systems are clean and free from residuals left over from construction activities (including internal surfaces condition testing). (1 point) <input type="checkbox"/></p>			
NRB 4-5 High Frequency Ballasts		2	
<p>Use of high frequency ballasts in the fluorescent luminaries in at least 90% of all applicable areas</p>			
Category Score for Part 4 - Indoor Environmental Quality :		8	

Project Reference No.: _____		GM e-Filing No.: _____	
(II) Other Green Requirements			
Part 5 : Other Green Features		Max Points Allocated	Points Scored
NRB 5-1 Green Features and Innovations		7	
(a) The following green features are deemed acceptable :			
<u>(1) Water Efficiency</u>			
(i)	Use of self cleaning façade system - more than 75% of the applicable facade areas (2 points) - more than 50% of the applicable facade areas (1 point) - at least 25% of the applicable facade areas (0.5 point)	<input type="checkbox"/>	
(ii)	Use of grey water recycling system - all blocks of the development(2 points) - at least 1 block of the development (1 point)	<input type="checkbox"/>	
(iii)	Recycling AHU condensate - more than 75% of AHU condensate (1 point) - at least 50% of AHU condensate (0.5 point)	<input type="checkbox"/>	
(iv)	Provision of system to recycle runoff from vertical green wall - at least 25% of the green areas (1 point) - less than 25% of the green areas (0.5 point)	<input type="checkbox"/>	
(v)	Use of air-cooled variable refrigerant flow (VRF) systems as the main air-conditioning system (0.5 point)	<input type="checkbox"/>	
<u>(2) Environmental Protection</u>			
(i)	Provision of green roof and roof top garden - more than 50% of the roof areas (1 point) - at least 25% of the roof areas (0.5 point)	<input type="checkbox"/>	
(ii)	Provision of vertical greening in common areas - more than 75% of the applicable wall areas (2 points) - more than 50% of the applicable wall areas (1 point) - at least 25% of the applicable wall areas (0.5 point)	<input type="checkbox"/>	
(iii)	Provision of double refuse chutes to separate recyclable from non-recyclable waste (1 point).	<input type="checkbox"/>	
(iv)	Use of non-chemical termite treatment system such as termite baiting system, anti-termite mesh, etc (0.5 point).	<input type="checkbox"/>	
(v)	Use of at least 5 nos. of compost bins to recycle organic waste (0.5 point).	<input type="checkbox"/>	
(vi)	Use of non-chemical water treatment for swimming pools (0.5 point).	<input type="checkbox"/>	
(vii)	Conservation of existing buildings structure - more than 50 % of existing structure or building envelope (2 points) - at least 25% of existing structure or building envelope (1 point)	<input type="checkbox"/>	
(viii)	Project Buildability Score (Bscore) above prevailing minimum requirement stated in relevant COP on Buildable Design. - Bscore > 5 points above minimum requirement (1 point) - Bscore > 3 points above minimum requirement (0.5 point)	<input type="checkbox"/>	
(ix)	Calculation of carbon footprint of the development (1.0 point)	<input type="checkbox"/>	
(x)	Adoption of demolition protocol to maximise resource recovery of demolition materials for reuse or recycling - recovery rate of more than 35% crushed concrete waste to be sent to the approved recyclers with proper facilities (2 points) - recovery rate of at least 20% crushed concrete waste to be sent to the approved recyclers with proper facilities (1 point)	<input type="checkbox"/>	

Project Reference No.: _____		GM e-Filing No.: _____	
(II) Other Green Requirements			
Part 5 : Other Green Features cont'd		Max Points Allocated	Points Scored
NRB 5-1 Green Features and Innovations cont'd			
<u>(3) Indoor Air Quality</u>			
(i)	Use of pneumatic waste collection system. (1 point) <input type="checkbox"/>		
(ii)	Use of Ultraviolet light-C band (VC) emitters in all air handling units (AHUs) to improve indoor air quality (0.5 point). <input type="checkbox"/>		
<u>(4) Others</u>			
(i)	Use of siphonic rainwater discharge system at roof (0.5 point) <input type="checkbox"/>		
(ii)	Provision of carpark guidance system (0.5 point). <input type="checkbox"/>		
(b)	Items that are not listed above but with clearance from BCA :		
(i)	_____ <input type="checkbox"/>		
(ii)	_____ <input type="checkbox"/>		
(iii)	_____ <input type="checkbox"/>		
(iv)	_____ <input type="checkbox"/>		
(v)	_____ <input type="checkbox"/>		
Category Score for Part 5 – Other Green Features :		7	
Category Score for Part 2 to Part 5 (Min 20 points):		74	
Green Mark Score (Min 50 points)- {Category Score for Part 1 (Min 30 points) + Category Score for Part 2 to Part 5 (Min 20 points)} :		190	

Project Reference No.: _____ GM e-Filing No.: _____

ADDITIONAL INFORMATION

Summary of Sustainable Products used in NRB 3-2

Environmental friendly products	Weightage based on extent of environmental friendliness		
	Good	Very Good	Excellent
Points (A)			
Weightage (B)	1.0	1.5	2.0

List of sustainable products

S/No.	Description of environmental friendly products	Extent of coverage	Impact (1.0 point or 0.5 point)	Weightage (Good or Very Good or Excellent)

Explanatory Notes :

Forms BPD_GM02, BPD_GM02_Appendix 1 and BPD_GM02_Appendix 2

- 1) On completion of building works that are subject to the Building Control (Environmental Sustainability) Regulation 2008, the Form BPD_GM02 must be completed, accompanied with 1 set of Form BPD_GM02_Appendix 1 and/or 1 set of Form BPD_GM02_Appendix 2 where applicable. These forms are to be generated using the **Green Mark (GM) e-Filing System** and submitted before making an application for temporary work permit (TOP) or certificate of statutory completion (CSC) if TOP is not applied for.
- 2) For building works that involve mixed-use building which comprises both residential and non-residential buildings, the as-built Green Mark score calculation as in Form BPD_GM02_Appendix 1 and Appendix 2 will have to be submitted together with the Form BPD_GM02 unless the following condition apply :
 - Where any part of the building works that related to a non-residential building or residential building involve a gross floor area (GFA) of less than 2000m² and that of the other part of these building works, only the Green Mark score calculation of the larger part of these building works (Form BPD_GM02_Appendix 1 OR Appendix 2) are required to be submitted together with the Form BPD_GM02.
 - For example, if the gross floor area (GFA) of the non-residential buildings is less than 2000m² and that of the residential buildings, only the Green Mark score calculation for the residential buildings that is Form BPD_GM02_Appendix 1 will need to be submitted together with Form BPD_GM02. An illustration is shown in Table 2-1 below.

Table 2-1 – Applicable Criteria for Mixed-Use Buildings with New GFA ≥ 2000m²

Project Type	Total New GFA Residential (m ²)	Total New GFA Non-Residential (m ²)	Form BPD_GM02_Appendix 1	Form BPD_GM02_Appendix 2
Mixed-use building	≥ 2000	≥ 2000	1 set	1 set
	≥ 2000	< 2000	1 set	Not applicable
	< 2000	≥ 2000	Not applicable	1 set
	< 2000	< GFA for Residential	1 set	Not applicable
	< GFA for Non-Residential	< 2000	Not applicable	1 set