Building and Construction Authority

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment.

Our Ref.: BCA BC 15.0.3 Building Plan and Management Division

01 Sep 2010

See Distribution

Dear Sir/Madam

ADOPTION OF NEW CODES AND STANDARD –
(A) BCA GREEN MARK CERTIFICATION STANDARD FOR NEW BUILDINGS (GM VERSION 4);
(B) CODE FOR ENVIRONMENTAL SUSTAINABILITY OF BUILDINGS (SECOND EDITION);
(C) SS 531: CODE OF PRACTICE FOR LIGHTING OF WORK PLACES;
(D) SS 553: CODE OF PRACTICE FOR AIR-CONDITIONING AND MECHANICAL VENTILATION IN BUILDING

Objective

This circular is to inform the industry on the adoption of the following new codes and standards:

a) New standards for Green Mark under the Building Control (Environmental Sustainability) Regulations:

   i) BCA Green Mark Certification Standard for New Buildings (GM Version 4); and
   ii) Code for Environmental Sustainability of Buildings (2nd Edition).

b) New Singapore Standards:

   i) SS 531: Code of Practice for Lighting of Work Places; and
   ii) SS 553: Code of Practice for Air-Conditioning and Mechanical Ventilation in Buildings.

Building works affected by BCA Green Mark Certification Standard for New Buildings (GM Version 4)

2 The BCA Green Mark Certification Standard for New Buildings (GM Version 4) will apply to building works relating to any building on land sold under the Government Land Sales (GLS) Programme where the GLS tender closes on or after **1 December 2010** in the following selected strategic areas:

a) Marina Bay and Downtown Core;

b) Jurong Gateway in Jurong Lake District;

c) Kallang Riverside; and

d) Paya Lebar Central,

3 The building works mentioned in **paragraph 2** above must meet the relevant minimum Green Mark certification as set out in The Schedule of the Building Control (Environmental Sustainability) Regulations before a TOP may be granted. The BCA Green Mark Certification Standard for New Buildings (GM Version 4) is available in our website at http://www.bca.gov.sg/EnvSusLegislation/others/GM_Certification_Std2010.pdf. A summary of the main changes in comparison with the current version is attached at **Annex A**.

Building works affected by Code for Environmental Sustainability of Buildings (2nd Edition)

4 The Code for Environmental Sustainability of Buildings (2nd Edition) will apply to any of the following building works which do not fall under **paragraph 2** above and where planning permissions are first submitted to Urban Redevelopment Authority (URA) on or after **1 December 2010**:

a) Building works which involve a gross floor area of 2,000m^2 or more;

b) Building works which involve increasing the gross floor area of an existing building by 2,000m^2 or more; and

c) Building works relating to an existing building which involve –

i) a gross floor area of 2,000m^2 or more; and
ii) the provision, extension or substantial alteration of the building envelope and building services.

5 The building works mentioned in **paragraph 4** above must comply with the Building Control (Environmental Sustainability) Regulations by meeting a minimum Green Mark score of 50 points prior to obtaining building plan approval. These building works must also meet a minimum as-built Green Mark score of 50 points before a TOP may be granted.

6 The Code for Environmental Sustainability of Buildings (2nd Edition) is available in our website at http://www.bca.gov.sg/EnvSusLegislation/others/Env_Sus_Code2010.pdf. A summary of the main changes in comparison with the current Code is attached at **Annex B**.

New Singapore Standards SS 531 and SS 553

7 With effect from **1 December 2010**, the Singapore Standards listed in Column 1 of Table 1 will be replaced with the corresponding Singapore Standards listed in Column 2 of Table 1. Projects submitting to BCA for building plan approval on or after this date must comply with the new standards.

Table 1

Column 1 ***Existing Singapore Standards to be replaced***	***Column 2*** ***New Singapore Standards***
CP 38: Code of Practice for Artificial Lighting of Buildings	SS 531: Code of Practice for Lighting of Work Places
CP 13: Code of Practice for Mechanical Ventilation and Air-Conditioning in Buildings	SS 553: Code of Practice for Air-Conditioning and Mechanical Ventilation in Buildings

8 These standards are referred to in the Approved Document under the Building Control Regulations as well as the Building Control (Environmental Sustainability) Regulations.

For Clarification

9 I would appreciate it if you could convey the contents of this circular to the members of your organisation. For clarification, you may email to bca_enquiry@bca.gov.sg or call the following hotline/contact persons:

Hotline/Contact Person	**Contact Number**
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Yours faithfully

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BCA Green Mark Criteria for New Buildings

Summary of Main Changes

The revised BCA Green Mark Criteria for New Buildings (Non-Residential and Residential) GM Version 4.0 sets to achieve greater energy and resource efficency in building developments. The proposed changes include the following :

1. **Maximum Cap of 50 points no longer applicable**
   The cap of 50 points for both Energy Related Requirement and other Green Requirement will be removed to encourage design team to explore more energy or resource efficient design options. However, the minimum scoring required for both sections (i.e. Energy Related Requirement – 30 points & Other Green Requirement – 20 points) will still be applicable.

2. **Additional Pre-requisite Requirement – Residential Building Criteria**

   2-1 To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout. The simulation results and the recommendations derived are to be implemented to ensure good natural ventilation. A minimum 80% of the selected typical dwelling units should have a weighted average wind velocity of 0.60 m/s. Details and submission requirements on ventilation simulation can be found in Appendix C of the Certification Standard. *(Note : Requirement similar to GM Version 3.0 but there is a change in methodology as outlined in Appendix C).* Other than the dwelling units, common areas like staircases and lobbies (excluding those that are located in basement areas) should also be designed to be naturally ventilated (i.e. to provide openable windows or other openings with aggregate area of not less than 5% of the space required to be ventilated).

   2-2 Prescribed system efficiency of air–conditioning system for all dwelling units to be as follows:

   Green Mark Gold^{Plus}
Green Mark Platinum } Air-conditioners with 4-ticks that are certified under the Singapore Energy Labelling Scheme or equivalent COP

   2-3 Minimum score under RB 3-1 Sustainable Construction

   Green Mark Gold^{Plus} ≥ 3 points

   Green Mark Platinum ≥ 5 points

3. Additional Pre-requisite Requirement – Non-Residential Building Criteria

Air-Conditioned Buildings

3-1 Prescribed system efficiency of air–conditioning system to be as follows:

(i) For Buildings using Water Cooled Chilled-Water Plant:

Green Mark Rating	Peak Building Cooling Load (RT)	
	< 500	≥ 500
	Efficiency[(1)] (kW/RT)	
Certified	0.80	0.70
Gold	0.80	0.70
Gold^{Plus}	0.70	0.65
Platinum	0.70	0.65

(ii) For Buildings using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners:

Green Mark Rating	Peak Building Cooling Load (RT)	
	< 500	≥ 500
	Efficiency[(1)] (kW/RT)	
Certified	0.90	0.80
Gold	0.90	Not applicable[(2)]
Gold^{plus}	0.85	
Platinum	0.78	

Note [(1)] The performance of the overall air-conditioning system for the building can either be based on the efficiency at full installed capacity (exclude standby) of the system or expected operating efficiency of the system at part-load condition during the normal building operation hours as defined in the following :

Office Building: Monday to Friday: 9 am to 6 pm Saturday: 9 am to 11 pm Retail Mall: Monday to Sunday: 10 am to 10 pm Institutional: Monday to Friday: 9 am to 6 pm	Hotel and Hospital: 24-hour Industrial and Other Building Types: To be determined based on the operating hours

Note [(2)] For building with peak 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. In general, the system efficiency of the air-cooled chilled-water plant and unitary air-conditioners are to be comparable with the stipulated efficiency for water-cooled central chilled-water plant. Buildings that are designed with air-cooled systems and for higher Green Mark rating will be assessed on a case by case basis.

Instrumentations for monitoring the water cooled chilled water plant efficiency

3-2 For buildings that are designed with water cooled chilled-water plant, permanent measuring instruments for monitoring the plant efficiency shall be provided in accordance with the following requirement:

(i) The installed instrumentation shall have the capability to calculate the resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.
(ii) The location and installation of the measuring devices to meet the manufacturer's recommendation.
(iii) Data acquisition system to have a minimum resolution of 16 bit.
(iv) All data logging with capability to trend at 1 minute sampling time interval.
(v) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.
(vi) Temperature sensors with minimum accuracy of ± 0.05 °C @ 0°C. All thermo-wells shall be installed in a manner which 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.

Non Air-Conditioned Buildings

3-3 To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout. The simulation results and the recommendations derived are to be implemented to ensure good natural ventilation. Details and submission requirements on ventilation simulation can be found in Appendix C of the Certification Standard. *(Note : Requirement similar to GM Version 3.0 but there is a change in methodology as outlined in Appendix C).*

General

3-4 Minimum score under NRB 3-1 Sustainable Construction

Green Mark Gold^{Plus} ≥ 3 points
Green Mark Platinum ≥ 5 points

4. Enhance the scoring and weightage of the following criteria

- Greater emphasis on the use of passive design strategies and more natural ventilated space. Refer NRB 1-3 & NRB 1-4 and RB 1-2 & RB 4-4.
- More weightage on Sustainable Construction to encourage recycling and the adoption of more concrete efficient design. Refer NRB3-1 and RB 3-1.
- Better water efficient fittings. Refer to NRB 2-1 and RB 2-1
- Better scoring for projects with extensive greenery provision. Refer to NRB 3-3 and RB 3-3

5. **Reduce the scoring of the criteria that are now regulated or becoming a standard practice with due consideration of the technology advancement**
    - Artifical lighting
    - Lift and Escalators
    - Ventilation in Carparks
    - Thermal Comfort
    - Noise Level

6. **New Items (where applicable)**
    - Mechanical Ventilation
    - Daylighting Provision
    - Stormwater Management
    - Use of Drought Tolerant Plants
    - Indoor Air Quality Management
    - Carbon Footprint of Development
    - Buildability Score
    - Demolition Protocol

The specific details of the criteria and changes are listed as follows :

Document Ref	Description
Annex A-1	Comparsion of Changes between Current Green Mark Version 3.0 and the Revised Green Mark Version 4.0 - For Non- Residential Buildings
Annex A-2	Comparsion of Changes between Current Green Mark Version 3.0 and the Revised Green Mark Version 4.0 - For Residential Buildings

Annex A - 1

Residential Building Criteria

Prerequisite Requirements	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
1. RETV REQUIREMENT Refer to RB 1-1	Building envelope design with Envelope Thermal Transfer Value (RETV) computed based on the methodology and guidelines stipulated in the Code on Envelope Thermal Performance for Buildings and this Standard. Green Mark Gold^{Plus} – RETV of 22 W/m^2 or lower Green Mark Platinum – RETV of 20 W/m^2 or lower	No change
2. VENTILATION SIMULATION Refer to RB 1-2	To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout.	No change Ventilation Simulation Methodology Revised Refer to Appendix C of Certification Standard for details *Common areas like staircases and lobbies (excluding those that are located in basement areas) are to be designed as naturally ventilated spaces.*
3. PRESCRIBED SYSTEM EFFICIENCY OF AIR-CONDITIONING SYSTEMS Refer RB 1-2	-	NEW REQUIREMENT For Green Mark Gold^{Plus} and Platinum projects, the prescribed system efficiency of air-conditioning system for all dwelling units to be as follows : Air-conditioners should have 4-ticks that are certified under the Singapore Energy Labelling Scheme or equivalent COP
4. MINIMUM SCORE UNDER SUSTAINABLE CONSTRUCTION Refer to RB 3-1	-	NEW REQUIREMENT Minimum score under NRB 3-1 Sustainable Construction Green Mark Gold^{Plus} ≥ 3 points Green Mark Platinum ≥ 5 points

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
Part 1: Energy Efficiency		
RB 1-1 Building Envelope – Thermal Performance		No change

RB 1-2 Natural Ventilation and A/C Design	Dwelling Unit Indoor Comfort
	
	(a) A/C or Natural Ventilation Design
	• Up to 12 points for A/C certified under Singapore Energy Labelling Scheme
	  • 2 points for A/C with 2-ticks
	  • 6 points for A/C with 3-ticks
	  • 12 points for A/C with 4-ticks
	
	OR
	
	• Up to 12 points for building layout and units designed for natural ventilation (application to development where A/C are not provided)
	
	(b) 4 points for using ventilation simulation to ensure good natural ventilation design
	
	Natural Ventilation in Common Areas
	• 1 point for lift lobbies and corridors
	• 1 point for staircases
	(Extent of coverage: all applicable areas)
		Naturally Ventilated Design and Air-Conditioning System
		
		Option 1 – Ventilation Simulation Analysis
		• 0.2 point for every % of typical units with good natural ventilation
		• Up to 20 points
		
		Option 2 – Ventilation Design and Efficient use of Air-conditioning system
		• Up to 8 points for building layout and units designed for natural ventilation
		• Up to 8 points for A/C certified under Singapore Energy Labelling Scheme
		  • 4 points for A/C with 3-ticks
		  • 8 points for A/C with 4-ticks
		
		Natural Ventilation in Common Areas
		• 1 point for lift lobbies and corridors
		• 1 point for staircases
		(Extent of coverage: at least 80% of applicable areas)

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td>RB 1-3 Daylighting</td><td>Daylighting in the following common areas
• 1 point for lift lobbies and corridors
• 1 point for staircases
• 1 point for carparks
• (Extent of coverage : all applicable areas)</td><td>New Item
(a) Use of daylighting and glare simulation analysis to ensure ambient lighting levels in meeting the level stated in CP38 and SS531.
• Extent of coverage: At least 80% of the units with daylighting provisions meet the minimum illuminance level and are within the acceptable glare exposure.

Points awarded based on the extent of perimeter daylight zones (Up to 3 points)
<table><tr><th>Distance from the Façade Perimeters (m)</th><th>Points Allocation</th></tr><tr><td>≥ 3.0</td><td>1</td></tr><tr><td>4.0 – 5.0</td><td>2</td></tr><tr><td>> 5.0</td><td>3</td></tr></table>
• Daylighting in the following common areas
• 1 point for lift lobbies and corridors
• 1 point for staircases
• 1 point for carparks
(Extent of coverage : At least 80% of the applicable areas)</td></tr>
<tr><td>RB 1-4 Artificial Lighting</td><td>• 0.3 point for every % improvement in the lighting power budget (Up to 12 points)</td><td>0.25 point for every % improvement in the lighting power budget (Up to 10 points)</td></tr>
<tr><td>RB 1-5 Ventilation in Carparks</td><td>• 8 points for naturally ventilated carparks
• 6 points for using CO sensors to regulate MV carparks with fume extract design
• 4 points for using CO sensors to regulated MV carparks with or without supply</td><td>• 6 points for naturally ventilated carparks
• 4 points for using CO sensors to regulate MV carparks with fume extract design
• 3 points for using CO sensors to regulated MV carparks with or without supply</td></tr>
</table>

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
RB 1-6 Lifts	• 1 point for lifts with AC VVVF motor drive or equivalent • 1 point for lifts with sleep mode	• 1 point for lifts with AC VVVF motor drive or equivalent and energy efficient features such as sleep mode features or equivalent
RB 1-7 Energy Efficient Features		New Item • Provision of vertical greenery system that helps to reduce heat gain to the building • Lifts with gearless drive • Re-generative lifts
RB 1-8 Renewable Energy	• 1 point for every 3 KWp of solar energy Up to 20 points	• 3 points for every 1% replacement of electricity (exclude household's usage) by renewable energy Up to 20 points
Part 2- Water Efficiency		
RB 2-1 Water Efficient Fittings	• For each categories of water efficient fittings with Water Efficiency Labelling Scheme • 0.5 points for good rating • 1 point for very good rating • 2 points for excellent rating (Extent of coverage: at least 90% of the type of fittings used) • Up to 10 points	• No point for "Good" rating fittings -MWEL • 8 points for "Very Good" rating fittings • 10 points for "Excellent" rating fittings • Up to 10 Points
RB 2-2 Water Usage Monitoring		No change
RB 2-3 Irrigation System & Landscaping		New Item • 1 point for use of drought tolerant plants or plants that require minimal watering for ≥ 80% of the landscape areas

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td colspan="3">Part 3- Environmental Protection</td></tr>
<tr><td rowspan="2">RB 3-1 Sustainable Construction</td><td>Up to 1 point if at least 10% of the fine and/or coarse aggregate used for concrete production of structural application are replaced with recycled products from approved sources. 0.5 point for each recycled product used. Points can only be scored if the extent of implementation covers at least 50% of all concrete structural elements of the superstructures (by volume). (Requirement was previously under other green features)</td><td>• Up to 5 points for the use of Green Cements, Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS)
• 1 point for the use of Green Cements at least 10% by mass for superstructural works.
• 2 points for the use of RCA or WCS above or equal to the minimum usage requirement
4 points for the use of RCA or WCS above or equal to the minimum usage requirement</td></tr>
<tr><td>• 0.1 point for every percentage reduction in the prescribed CUI limit (Up to 4 points)</td><td>• Up to 5 points can be scored for more efficient concrete usage for building components based on CUI
<table>
<tr><th>Project CUI (m3/m2)</th><th>Points</th></tr>
<tr><td>≤ 0.70</td><td>1</td></tr>
<tr><td>≤ 0.60</td><td>2</td></tr>
<tr><td>≤ 0.50</td><td>3</td></tr>
<tr><td>≤ 0.40</td><td>4</td></tr>
<tr><td>≤ 0.35</td><td>5</td></tr>
</table></td></tr>
<tr><td>RB 3-2 Sustainable Products</td><td>• SGLS Products - 1 point for high impact item; 0.5 point for low impact item (Cap at 3 points)
• Products with at least 30% recycled content by weight or volume - 1 point for high impact item; 0.5 point for low impact item (Cap at 3 points)</td><td>Up to 8 points for the use of environmental friendly products that are certified by approved local certification body. Higher weightage will be given to products that are classified to be more environmental friendly.
<table>
<tr><th colspan="3">Weightage based on the extent of environmental friendliness of products</th><th rowspan="2">Points scored based on the weightage and the extent of coverage & impact
1 point for high impact item
0.5 point for low impact item
(Up to 8 points)</th></tr>
<tr><th>Good</th><th>Very Good</th><th>Excellent</th></tr>
<tr><td>1</td><td>1.5</td><td>2</td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td>RB 3-3 Greenery Provision</td><td>• Using Green Area Index (GAI) for computation of Greenery Provision (GnP)

<table><tr><th>GnP</th><th>Points</th></tr><tr><td>2 to < 3.0</td><td>1</td></tr><tr><td>3.0 to < 3.5</td><td>2</td></tr><tr><td>3.5 to < 4.0</td><td>3</td></tr><tr><td>≥4.0</td><td>4</td></tr></table></td><td>• Using Leaf Area Index (LAI) for computation of Green Plot Ratio (GnPR)

<table><tr><th>GnPR</th><th>Points</th></tr><tr><td>1.0 to < 2.0</td><td>1</td></tr><tr><td>2.0 to < 3.0</td><td>2</td></tr><tr><td>3.0 to < 4.0</td><td>3</td></tr><tr><td>4.0 to < 5.0</td><td>4</td></tr><tr><td>5.0 to < 6.0</td><td>5</td></tr><tr><td>≥ 6.0</td><td>6</td></tr></table></td></tr>
<tr><td>RB 3-4 Environmental Management Practice</td><td>• 1 point for project team comprises of GMM
• 2 points for project team comprises of GMP (Up to 3 points)
• 1 point for provision of facilities or recycling bins for collection and storage of different recyclable waste such as paper, glass, plastics etc</td><td>• 0.5 point for project team comprises of GMM
• 0.5 point for project team comprises of GMFM
• 1 point for project team comprises of GMP (Up to 1 point)
• 1 point for provision of recycling bins at each block of development for collection and storage of different recyclable waste such as paper, glass, plastics etc

New Item
1 point for main contractor with good track records in sustainable, environmentally friendly practices during the construction such as the Green and Gracious Builder Award.</td></tr>
<tr><td>RB 3-5 Green Transport</td><td>• 1 point for provision of adequate bicycles parking lots</td><td>• Provision of covered/sheltered bicycles parking lots
  • 0.5 point - at least 5% of no. of dwelling units
  • 1 point - at least 10% of dwelling units</td></tr>
</table>

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
RB 3-6 Stormwater Management		New Item Points awarded based on the the extent of the stormwater treatment. • 3 points for treatment of run-off from more than 35% of total site area or paved area • 2 points for treatment of run-off from 10% to 35% of total site area • 1 point for treatment of run-off from up to 10% of total site area (Up to 3 points)
Part 4- Indoor Environmental Quality		
RB 4-1 Noise Level		No change
RB 4-2 Indoor Air Pollutants	• 2 points for use of low-VOC paints certified under the Singapore Green Labelling Scheme	• 1 point for use of low-VOC paints certified under approved local or overseas certification body
RB 4-3 Waste Disposal		No change
RB 4-4 Indoor Air Quality in Wet Areas	• 1 point for provision of natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets	Provision of natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets • 1 point for 50%-90% of all applicable areas • 2 points for more than 90% of all applicable areas

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
Part 5- Other Green Features		
RB 5-1 Green Features and Innovations		New Items • Carbon footprint of development • Conservation of existing building structure such as structural elements or building envelope *(this item previously under RB3-1)* • Buildability Score • Demolition Protocol • Water efficient washing machines with Good rating and above.etc

Annex A - 2

<table>
<tr><th>Prerequisite Requirements</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td colspan="3">(A) Air-Conditioning Buildings</td></tr>
<tr><td>A1. ETTV REQUIREMENT
Refer to NRB 1-1</td><td>Building envelope design with Envelope Thermal Transfer Value (ETTV) computed based on the methodology and guidelines stipulated in the Code on Envelope Thermal Performance for Buildings and this Standard.
Green Mark Gold^{Plus} – ETTV of 42 W/m^2 or lower
Green Mark Platinum – ETTV of 40 W/m^2 or lower</td><td>No change</td></tr>
<tr><td>A2. ENERGY MODELING</td><td>To demonstrate the stipulated energy savings over its reference model using the energy modeling framework set out. Details and submission requirements on energy modeling can be found in Appendix E of the Certification Standard.
Green Mark Gold^{Plus} – At least 25% energy savings
Green Mark Platinum – At least 30% energy savings</td><td>No change

Energy Modeling Framework Revised
Refer to Appendix E of Certification Standard for details</td></tr>
<tr><td>A3. PRESCRIBED SYSTEM EFFICIENCY OF AIR-CONDITIONING SYSTEMS
Refer NRB 1-2</td><td>-</td><td>NEW REQUIREMENT
For Buildings using Water Cooled Chilled-Water Plant
<table>
<tr><th rowspan="2">Green Mark Rating</th><th colspan="2">Peak Building Cooling Load (RT)</th></tr>
<tr><th>< 500</th><th>≥ 500</th></tr>
<tr><th colspan="2">Efficiency (kW/RT)</th></tr>
<tr><td>Certified</td><td>0.80</td><td>0.70</td></tr>
<tr><td>Gold</td><td>0.80</td><td>0.70</td></tr>
<tr><td>Gold^{Plus}</td><td>0.70</td><td>0.65</td></tr>
<tr><td>Platinum</td><td>0.70</td><td>0.65</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Prerequisite Requirements</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td>A3. PRESCRIBED SYSTEM EFFICIENCY OF AIR-CONDITIONING SYSTEMS

Refer NRB 1-2</td><td>-</td><td>For Buildings using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners
<table>
<tr><th rowspan="2">Green Mark Rating</th><th colspan="2">Peak Building Cooling Load (RT)</th></tr>
<tr><th>< 500</th><th>≥ 500</th></tr>
<tr><th colspan="2">Efficiency (kW/RT)</th></tr>
<tr><td>Certified</td><td>0.90</td><td>0.80</td></tr>
<tr><td>Gold</td><td>0.90</td><td rowspan="3">Not applicable</td></tr>
<tr><td>Gold^{Plus}</td><td>0.85</td></tr>
<tr><td>Platinum</td><td>0.78</td></tr>
</table></td></tr>
<tr><td>A4. INSTRUMENTATION – MONITORING OF WATER COOLED CHILLED-WATER PLANT EFFICIENCY

Refer to NRB 1-2</td><td>-</td><td><u>NEW REQUIREMENT</u>
For buildings that are designed with Water Cooled Chilled-Water Plant, permanent measuring instruments for monitoring the plant efficiency shall be provided in accordance with the following requirement:
(i) 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.
(ii) The location and installation of the measuring devices to meet the manufacturer’s recommendation.
(iii) Data acquisition system to have a minimum resolution of 16 bit.
(iv) All data logging with capability to trend at 1 minute sampling time interval.
(v) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.</td></tr>
</table>

Prerequisite Requirements	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
A4. INSTRUMENTATION – MONITORING OF WATER COOLED CHILLED-WATER PLANT EFFICIENCY Refer to NRB 1-2	-	(vi) Temperature sensors with minimum accuracy of ± 0.05 °C @ 0°C. All thermo-wells shall be installed in a manner which 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.
A5. MINIMUM SCORE UNDER SUSTAINABLE CONSTRUCTION Refer to NRB 3-1	-	NEW REQUIREMENT Minimum score under NRB 3-1 Sustainable Construction Green Mark Gold^{Plus} ≥ 3 points Green Mark Platinum ≥ 5 points
Non Air-Conditioning Buildings		
B1. VENTILATION SIMULATION Refer to NRB 1-4	To be eligible for Green Mark Platinum rating, it is a requirement to use ventilation simulation modeling and analysis to identify the most effective building design and layout.	No change
B2. MINIMUM SCORE UNDER SUSTAINABLE CONSTRUCTION Refer to NRB 3-1	-	NEW REQUIREMENT Minimum score under NRB 3-1 Sustainable Construction Green Mark Gold^{Plus} ≥ 3 points Green Mark Platinum ≥ 5 points

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
Part 1 – Energy Efficiency		
NRB 1-1 ETTV	• 2 points for every reduction of 1 W/m^2 in ETTV from the baseline • 42.5 W/m^2 to achieve max 15 points	• 1.2 points for every reduction of 1 W/m^2 in ETTV from the baseline • 40 W/m^2 to achieve max 12 points
NRB 1-2 Air-Conditioning System	Air- Conditioned Plant • 1.45 points for every % improvement in chiller, chilled-water pump and condenser water pump • 0.05 point for every % improvement in cooling towers efficiency • Max 20 points	(a) Water Cooled Chilled-Water Plant Building Cooling Load > 500RT • Min Air-Conditioned System Efficiency ≤ 0.7 kW/RT 15 points for meeting the prescribed chilled-water plant efficiency of 0.70 kW/RT 0.25 point for every percentage improvement in the chilled-water plant efficiency over the baseline Building Cooling Load ≤ 500RT • Min Air Conditioned System Efficiency of 0.8 kW/RT 12 points for meeting the prescribed chilled-water plant efficiency of 0.80 kW/RT 0.45 point for every percentage improvement in the chilled-water plant efficiency over the baseline (Up to 20 point)

Non-Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
NRB 1-2 Air-Conditioning System	Unitary Air-conditioners • 1.5 points for every **%** improvement Max 25 points Air distribution system • 0.5 point for every % improvement • 10% improvement to achieve max 5 points	Air Cooled Chilled-Water Plant/Unitary Air-Conditioners Building Cooling Load > 500RT • Min Air-Conditioned System Efficiency ≤ 0.8 kW/RT 12 points for meeting the prescribed air-conditioning system efficiency of 0.80 kW/RT 1.3 points for every percentage improvement in the air-conditioning system efficiency over the baseline Building Cooling Load ≤ 500RT • Min Air Conditioned System Efficiency of 0.9 kW/RT 10 points for meeting the prescribed air-conditioning system efficiency of 0.90 kW/RT 0.6 point for every percentage improvement in the air-conditioning system efficiency over the baseline (Up to 20 points) Air distribution system • 0.2 point for every % improvement • 30% improvement to achieve max 6 points • More stringent requirement for VAV baseline as stated in SS553

Non-Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
NRB 1-2 Air-Conditioning System		New Items • 1 point - Provision of variable speed control for chiller plant equipment • 1 point – Instrumentation for monitoring water cooled chilled-water plant efficiency – *Prerequisite Requirement* • 1 point – Verification of central chilled-water plant instrumentation : Heat balance to be computed and in accordance with AHRI 550/590
NRB 1-3 Building Envelope – Design / Thermal Parameters	• 24 points for no west facing façade • Better Thermal Transmittance (U value) of roof 2 points for every 0.1 W/m^{2}K reduction	• 30 points for no west facing façade • Better Thermal Transmittance (U value) of roof 1 point for every 0.1 W/m^{2}K reduction
NRB 1-4 Natural Ventilation / Mechanical Ventilation	• Max 8 points for 100% of the buildings achieving good natural ventilation • 5 points for ventilation simulation & implementation of identified effective building design • Max 13 points	• Max 10 points for 100% of the buildings achieving good natural ventilation • 5 points for the use of ventilation simulation & • 5 points for implementation of identified effective building design • Max 20 points New Item • 15 points for 25% improvement in mechanical ventilation system efficiency from the stipulated SS553 baseline
NRB 1-5 Daylighting	-	New Items (a) Use of daylighting and glare simulation analysis to ensure ambient lighting levels in meeting the level stated in SS 531:Part 1:2006 – Code of Practice for Lighting of Work Places. • Extent of coverage: At least 75% of the units with daylighting provisions meet the minimum illuminance level and are within the acceptable

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td>NRB 1-5 Daylighting – cont'd</td><td>-</td><td>glare exposure.

Points awarded based on the extent of perimeter daylight zones (Up to 3 points)
<table><tr><th>Distance from the Façade Perimeters (m)</th><th>Points Allocation</th></tr><tr><td>≥ 3.0</td><td>1</td></tr><tr><td>4.0 – 5.0</td><td>2</td></tr><tr><td>> 5.0</td><td>3</td></tr></table>
(b) Daylighting for common areas such as toilets, staircases, corridors
• 0.5 point each, with at least 80 % of each applicable area for extent of coverage</td></tr>
<tr><td>NRB 1-6 Artificial Lighting</td><td>0.5 point for every percentage improvement in lighting power budget
-</td><td>0.3 point for every percentage improvement in lighting power budget</td></tr>
<tr><td>NRB 1-7 Ventilation in Carparks</td><td>• 5 points for naturally ventilated carparks
• 4 points for Fume extract
• 3 points MV with or without supply</td><td>• 4 points for naturally ventilated
• 2.5 points for Fume extract
• 2 points MV with or without supply</td></tr>
<tr><td>NRB 1-8 Ventilation in Common Areas</td><td>-</td><td>No change</td></tr>
<tr><td>NRB 1-9 Lifts and Escalators</td><td>• 1 point for lifts with the AC variable voltage and variable frequency (VVVF) motor drive and
• 1 point for sleep mode
• 1 point for escalators with energy efficient features such as motion sensors</td><td>Both sleep mode and VVVF motor drive implemented:

• All lifts and escalators - 2 points
• All lifts or escalators - 1 point</td></tr>
</table>

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td><u>NRB 1-10 Energy Efficient Practices & Features</u></td><td>• 3 points for every 1% energy saving over the total building energy consumption (Up to 11 point)</td><td>• 3 points for every 1% energy saving over the total building energy consumption (Up to10 points)

<u>New Items</u>
• Use of vertical greenery system that helps to reduce heat gain to buildings
• Re-generative lifts
• Lifts with gearless drive</td></tr>
<tr><td><u>NRB 1-11 Renewable Energy</u></td><td>5 points for every 1% replacement of electricity (based on the total electricity consumption including tenant’s usage) by renewable energy

OR

3 points for every 1% replacement of electricity (based on the total electricity consumption excluding tenant’s usage) by renewable energy

(Up to 20 Points)</td><td>Point scored based on the expected energy efficiency index (EEI) and % replacement of electricity by renewable energy source (Up to 20 points)

<table>
<tr><th rowspan="2">Expected 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>
<tr><td>≥ 30 kWh/m^2/yr</td><td>5 points</td><td>3 points</td></tr>
<tr><td>< 30 kWh/m^2/yr</td><td>3 points</td><td>1.5 points</td></tr>
</table>
</td></tr>
</table>

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
Part 2 – Water Efficiency		
NRB 2-1 Water Efficient Fittings	• 4 points for "Good" rating fittings • 6 points for "Very Good" rating fittings • 8 points for"Excellent" rating fittings • Up to 8 points	• No point for "Good" rating fittings -MWEL • 8 points for "Very Good" rating fittings • 10 points for "Excellent" rating fittings • Up to 10 Points
NRB 2-2 Water Usage and Leak Detection		No change
NRB 2-3 Irrigation System and Landscaping	-	New Item • 1 point for use of drought tolerant plants or plants that require minimal watering for ≥ 80% of the landscape areas
NRB 2-4 Water Consumption of Cooling Tower	• 1 point- Cooling tower water treatment system which can achieve 6 or better cycles of concentration	• 1 point - Cooling tower water treatment system which can achieve **7** or better cycles of concentration

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td colspan="3">Part 3 - Environmental Protection</td></tr>
<tr><td rowspan="2">NRB 3-1 Sustainable Construction</td><td>Up to 1 point if at least 10% of the fine and/or coarse aggregate used for concrete production of structural application are replaced with recycled products from approved sources. 0.5 point for each recycled product used. Points can only be scored if the extent of implementation covers at least 50% of all concrete structural elements of the superstructures (by volume). (Requirement was previously under other green features)</td><td>• Up to 5 points for the use of Green Cements, Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS)
• 1 point for the use of Green Cements at least 10% by mass for superstructural works.
• 2 points for the use of RCA or WCS above or equal to the minimum usage requirement
• 4 points for the use of RCA or WCS above or equal to the minimum usage requirement</td></tr>
<tr><td>• 0.1 point for every percentage reduction in the prescribed CUI limit
(Up to 4 points)</td><td>• Up to 5 points can be scored for more efficient concrete usage for building components based on CUI
<table><tr><th>Project CUI (m3/m2)</th><th>Points</th></tr><tr><td>≤ 0.70</td><td>1</td></tr><tr><td>≤ 0.60</td><td>2</td></tr><tr><td>≤ 0.50</td><td>3</td></tr><tr><td>≤ 0.40</td><td>4</td></tr><tr><td>≤ 0.35</td><td>5</td></tr></table></td></tr>
<tr><td>NRB 3-2 Sustainable Products</td><td>• SGLS Products - 1 point for high impact item; 0.5 point for low impact item (Cap at 4 points)
• Products with at least 30% recycled content by weight or volume - 1 point for high impact item; 0.5 point for low impact item (Cap at 4 points)</td><td>Up to 8 points for the use of environmental friendly products that are certified by approved local certification body. Higher weightage will be given to products that are classified to be more environmental friendly.
<table><tr><th colspan="3">Weightage based on the extent of environmental friendliness of products</th><th rowspan="2">Points scored based on the weightage and the extent of coverage & impact
1 point for high impact item
0.5 point for low impact item
(Up to 8 points)</th></tr><tr><td>Good</td><td>Very Good</td><td>Excellent</td></tr><tr><td>1</td><td>1.5</td><td>2</td></tr></table></td></tr>
</table>

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Green Mark Version 3.0</th><th>Revised Green Mark Version 4.0</th></tr>
<tr><td>NRB 3-3 Greenery Provision</td><td>
<table>
<tr><th>GnPR</th><th>Points</th></tr>
<tr><td>0.5 to < 1.0</td><td>1</td></tr>
<tr><td>1.0 to < 1.5</td><td>2</td></tr>
<tr><td>1.5 to < 3.0</td><td>3</td></tr>
<tr><td>3.0 to < 3.5</td><td>4</td></tr>
</table>
• Using the Green Area Index (GAI) for computation of Greenery Provision.
</td><td>
<table>
<tr><th>GnPR</th><th>Points</th></tr>
<tr><td>0.5 to < 1.0</td><td>1</td></tr>
<tr><td>1.0 to < 1.5</td><td>2</td></tr>
<tr><td>1.5 to < 3.0</td><td>3</td></tr>
<tr><td>3.0 to < 3.5</td><td>4</td></tr>
<tr><td>3.5 to < 4.0</td><td>5</td></tr>
<tr><td>≥ 4.0</td><td>6</td></tr>
</table>
• Using the Leaf Area Index (LAI) for computation of Green Plot Ratio.
</td></tr>
<tr><td>NRB 3-4 Environmental Management Practice</td><td>
• 1 point for project team comprises certified GMM
• 2 point for project team comprises certified GMP (Up to 3 points)
</td><td>
• 0.5 point for project team comprises certified GMM
• 0.5 point for project team comprises certified GMFM
• 1 point for project team comprises certified GMP (Up to 1 points)

New Item
• 1 point for main contractor with good track records in sustainable, environmental friendly practices such as the Green and Gracious Builder Award
</td></tr>
<tr><td>NRB 3-5 Green Transport</td><td>
• 1 point - Adequate bicycle parking lots
</td><td>
Criterion previously known as Public Transport Accessibility

• Provision of covered/sheltered bicycles parking lots with adequate shower facilities
• 1 point if no. of bicycle lots ≥ 3% of GFA/10
• 1 point if no. of bicycle lots ≥ 1.5% of GFA/10

New Items
• 1 point - provision of covered walkway to facilitate connectivity and use of public transport
• 1 point - provision of hybrid/electric vehicle refueling/ recharge stations and priority parking lots within the development.
</td></tr>
</table>

Non-Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
NRB 3-6 Refrigerants	-	No change
NRB 3-7 Stormwater Management	-	New Item Points awarded based on the the extent of the stormwater treatment. • 3 points for treatment of run-off from more than 35% of total site area or paved area • 2 points for treatment of run-off from 10% to 35% of total site area • 1 point for treatment of run-off from up to 10% of total site area (Up to 3 points)
Part 4 – Indoor Environmental Quality		
NRB 4-1 Thermal Comfort	• 2 points - indoor temperature between 22.5 and 25.5°C; RH < 70%	• 1 point - indoor operative temperature between 24 to 26 °C; Relative Humidity < 65%
NRB 4-2 Noise Level	• 2 points for good ambient sound levels as recommended in CP 13	• 1 point for good ambient sound levels as recommended in SS 553
NRB 4-3 Indoor Air Pollutants	• 1 point for use of adhesives under SGLS for composite wood products	• 1 point for use of environmental friendly adhesives certified by approved local certification body
NRB 4-4 Indoor Air Quality Management	-	New Items • 1 point for provision of filtration media and differential pressure monitoring equipment. • 1 point for implementing effective IAQ management plan to ensure that building ventilation systems are clean and free from debris. Internal surface condition testing for ACMV systems are to be included.

Non-Residential Building Criteria

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
NRB 4-5 High Frequency Ballasts	-	Renumbered from 4-4 to 4-5

Criteria	Current Green Mark Version 3.0	Revised Green Mark Version 4.0
Part 5 – Other Green Features		
NRB 5-1 Green Features and Innovations		**New Items** • Carbon footprint of development) • Conservation of existing building structure such as structural elements or building envelope *(this item was previously under NRB 3-1)* • Buildability Score • Demolition Protocol

Code for Environmental Sustainability of Buildings

Summary of Main Changes

The Code which sets out the minimum environmental sustainability standards and compliance method for buildings is revised to achieve greater energy and resource efficency in building developments. The main changes include the following :

1. Maximum Cap of 50 points no longer applicable

The cap of 50 points for both Energy Related Requirement and other Green Requirement will be removed to encourage design team to explore more energy or resource efficient design options. However, the minimum scoring required for both sections (i.e. Energy Related Requirement – 30 points & Other Green Requirement – 20 points) will still be applicable.

2. Pre-requisite Requirement – Minimum System Efficiency of Air-Conditioning System

Prescribed system efficiency of air–conditioning systems to be as follows:

(i) For Buildings using Water Cooled Chilled-Water Plant:

Minimum Central Chilled Water Plant Efficiency	**Peak Building Cooling Load (RT)**	
	< 500	**≥ 500**
	Efficiency (kW/RT)	
	0.80	0.70

(ii) For Buildings using Air-cooled Chilled-Water Plant or Unitary Air-Conditioners:

Minimum System Efficiency of Air Cooled Chilled-Water Plant or Unitary Air-Conditioners	**Peak Building Cooling Load (RT)**	
	< 500	**≥ 500**
	Efficiency (kW/RT)	
	0.90	0.80

The performance of the overall air-conditioning system for the building can either be based on the efficiency at full installed capacity (exclude standby) of the system or expected operating efficiency of the system at part-load condition during normal building operation hours as defined below:

Office Building: Monday to Friday: 9 am to 6 pm Saturday: 9 am to 11 pm Retail Mall: Monday to Sunday: 10 am to 10 pm Institutional: Monday to Friday: 9 am to 6 pm	Hotel and Hospital: 24-hour Industrial and Other Building Types: To be determined based on the operating hours

3. Pre-requisite Requirement – Instrumentations for monitoring the water cooled chilled- water plant efficiency *(1 point under Criteria 1-2 (d) Air-Conditioning System)*

For buildings that are designed with water cooled chilled-water plants, permanent measuring instruments for monitoring the plant efficiency shall be provided in accordance with the following requirement:

(i) 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.
(ii) The location and installation of the measuring devices to meet the manufacturer's recommendation.
(iii) Data acquisition system to have a minimum resolution of 16 bit.
(iv) All data logging with capability to trend at 1 minute sampling time interval.
(v) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.
(vi) Temperature sensors with minimum accuracy of ± 0.05 °C @ 0°C. All thermo-wells shall be installed in a manner which 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.

4. Enhance the scoring and weightage of the following criteria

- Greater emphasis on the use of passive design strategies and more natural ventilated space. Refer NRB 1-3 & NRB 1-4 and RB 1-2 & RB 4-4.
- More weightage on Sustainable Construction to encourage recycling and the adoption of more concrete efficient design. Refer NRB3-1 and RB 3-1.
- Better water efficient fittings. Refer to NRB 2-1 and RB 2-1
- Better scoring for projects with extensive greenery provision. Refer to NRB 3-3 and RB 3-3

5. **Reduce the scoring of the criteria that are now regulated or becoming a standard practice with due consideration of the technology advancement**
    - Artifical lighting
    - Lift and Escalators
    - Ventilation in Carparks
    - Thermal Comfort
    - Noise Level

6. **New Items (where applicable)**
    - Mechanical Ventilation
    - Daylighting Provision
    - Stormwater Management
    - Use of Drought Tolerant Plants
    - Indoor Air Quality Management
    - Carbon Footprint of Development
    - Buildability Score
    - Demolition Protocol

The specific details of the criteria and changes are listed as follows :

Document Ref	Description
Annex B-1	Comparison of Changes between Current Environmental Sustainability Standard and the Revised Standard - For Residential Buildings
Annex B-2	Comparison of Changes between Current Environmental Sustainability Standard and the Revised Standard - For Non-Residential Buildings

Annex B - 1

Residential Building Criteria

Criteria	Current Environmental Sustainability Standard	Revised Standard
Part 1: Energy Efficiency		
RB 1-1 Building Envelope – Thermal Performance		No change

RB 1-2 Natural Ventilation and A/C Design	Dwelling Unit Indoor Comfort
	
	(a) A/C or Natural Ventilation Design
	• Up to 12 points for A/C certified under Singapore Energy Labelling Scheme
	  • 2 points for A/C with 2-ticks
	  • 6 points for A/C with 3-ticks
	  • 12 points for A/C with 4-ticks
	
	OR
	
	• Up to 12 points for building layout and units designed for natural ventilation (application to development where A/C are not provided)
	
	(b) 4 points for using ventilation simulation to ensure good natural ventilation design
	
	Natural Ventilation in Common Areas
	• 1 point for lift lobbies and corridors
	• 1 point for staircases
	(Extent of coverage: all applicable areas)
		Naturally Ventilated Design and Air-Conditioning System
		
		Option 1 – Ventilation Simulation Analysis
		• 0.2 point for every % of typical units with good natural ventilation
		• Up to 20 points
		
		Option 2 – Ventilation Design and Efficient use of Air-conditioning system
		• Up to 8 points for building layout and units designed for natural ventilation
		• Up to 8 points for A/C certified under Singapore Energy Labelling Scheme
		  • 4 points for A/C with 3-ticks
		  • 8 points for A/C with 4-ticks
		
		Natural Ventilation in Common Areas
		• 1 point for lift lobbies and corridors
		• 1 point for staircases
		(Extent of coverage: at least 80% of applicable areas)

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td>RB 1-3 Daylighting</td><td>Daylighting in the following common areas
• 1 point for lift lobbies and corridors
• 1 point for staircases
• 1 point for carparks
• (Extent of coverage : all applicable areas)</td><td>New Item
(a) Use of daylighting and glare simulation analysis to ensure ambient lighting levels in meeting the level stated in CP38 and SS531.
• Extent of coverage: At least 80% of the units with daylighting provisions meet the minimum illuminance level and are within the acceptable glare exposure.

Points awarded based on the extent of perimeter daylight zones (Up to 3 points)
<table><tr><th>Distance from the Façade Perimeters (m)</th><th>Points Allocation</th></tr><tr><td>≥ 3.0</td><td>1</td></tr><tr><td>4.0 – 5.0</td><td>2</td></tr><tr><td>> 5.0</td><td>3</td></tr></table>
• Daylighting in the following common areas
• 1 point for lift lobbies and corridors
• 1 point for staircases
• 1 point for carparks
(Extent of coverage : At least 80% of the applicable areas)</td></tr>
<tr><td>RB 1-4 Artificial Lighting</td><td>• 0.3 point for every % improvement in the lighting power budget (Up to 12 points)</td><td>0.25 point for every % improvement in the lighting power budget (Up to 10 points)</td></tr>
<tr><td>RB 1-5 Ventilation in Carparks</td><td>• 8 points for naturally ventilated carparks
• 6 points for using CO sensors to regulate MV carparks with fume extract design
• 4 points for using CO sensors to regulated MV carparks with or without supply</td><td>• 6 points for naturally ventilated carparks
• 4 points for using CO sensors to regulate MV carparks with fume extract design
• 3 points for using CO sensors to regulated MV carparks with or without supply</td></tr>
</table>

Criteria	Current Environmental Sustainability Standard	Revised Standard
RB 1-6 Lifts	• 1 point for lifts with AC VVVF motor drive or equivalent • 1 point for lifts with sleep mode	• 1 point for lifts with AC VVVF motor drive or equivalent and energy efficient features such as sleep mode features or equivalent
RB 1-7 Energy Efficient Features		New Item • Provision of vertical greenery system that helps to reduce heat gain to the building • Lifts with gearless drive • Re-generative lifts
RB 1-8 Renewable Energy	• 1 point for every 3 KWp of solar energy Up to 20 points	• 3 points for every 1% replacement of electricity (exclude household's usage) by renewable energy Up to 20 points
Part 2- Water Efficiency		

RB 2-1 Water Efficient Fittings	• For each categories of water efficient fittings with Water Efficiency Labelling Scheme
	  • 0.5 points for good rating
	  • 1 point for very good rating
	  • 2 points for excellent rating
	(Extent of coverage: at least 90% of the type of fittings used)
	• Up to 10 points
		• No point for "Good" rating fittings -MWEL
		• 8 points for "Very Good" rating fittings
		• 10 points for "Excellent" rating fittings
		• Up to 10 points

RB 2-2 Water Usage Monitoring		No change
RB 2-3 Irrigation System & Landscaping		New Item • 1 point for use of drought tolerant plants or plants that require minimal watering for ≥ 80% of the landscape areas

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td colspan="3">Part 3- Environmental Protection</td></tr>
<tr><td rowspan="2">RB 3-1 Sustainable Construction</td><td>Up to 1 point if at least 10% of the fine and/or coarse aggregate used for concrete production of structural application are replaced with recycled products from approved sources. 0.5 point for each recycled product used. Points can only be scored if the extent of implementation covers at least 50% of all concrete structural elements of the superstructures (by volume). (Requirement was previously under other green features)</td><td>• Up to 5 points for the use of Green Cements, Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS)
• 1 point for the use of Green Cements at least 10% by mass for superstructural works.
• 2 points for the use of RCA or WCS above or equal to the minimum usage requirement
4 points for the use of RCA or WCS above or equal to the minimum usage requirement</td></tr>
<tr><td>• 0.1 point for every percentage reduction in the prescribed CUI limit (Up to 4 points)</td><td>• Up to 5 points can be scored for more efficient concrete usage for building components based on CUI
<table>
<tr><th>Project CUI (m3/m2)</th><th>Points</th></tr>
<tr><td>≤ 0.70</td><td>1</td></tr>
<tr><td>≤ 0.60</td><td>2</td></tr>
<tr><td>≤ 0.50</td><td>3</td></tr>
<tr><td>≤ 0.40</td><td>4</td></tr>
<tr><td>≤ 0.35</td><td>5</td></tr>
</table></td></tr>
<tr><td>RB 3-2 Sustainable Products</td><td>• SGLS Products - 1 point for high impact item; 0.5 point for low impact item (Cap at 3 points)
• Products with at least 30% recycled content by weight or volume - 1 point for high impact item; 0.5 point for low impact item (Cap at 3 points)</td><td>Up to 8 points for the use of environmental friendly products that are certified by approved local certification body. Higher weightage will be given to products that are classified to be more environmental friendly.
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1 point for high impact item
0.5 point for low impact item
(Up to 8 points)</th></tr>
<tr><td>Good</td><td>Very Good</td><td>Excellent</td></tr>
<tr><td>1</td><td>1.5</td><td>2</td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td>RB 3-3 Greenery Provision</td><td>• Using Green Area Index (GAI) for computation of Greenery Provision (GnP)

<table><tr><th>GnP</th><th>Points</th></tr><tr><td>2 to < 3.0</td><td>1</td></tr><tr><td>3.0 to < 3.5</td><td>2</td></tr><tr><td>3.5 to < 4.0</td><td>3</td></tr><tr><td>≥4.0</td><td>4</td></tr></table></td><td>• Using Leaf Area Index (LAI) for computation of Green Plot Ratio (GnPR)

<table><tr><th>GnPR</th><th>Points</th></tr><tr><td>1.0 to < 2.0</td><td>1</td></tr><tr><td>2.0 to < 3.0</td><td>2</td></tr><tr><td>3.0 to < 4.0</td><td>3</td></tr><tr><td>4.0 to < 5.0</td><td>4</td></tr><tr><td>5.0 to < 6.0</td><td>5</td></tr><tr><td>≥ 6.0</td><td>6</td></tr></table></td></tr>
<tr><td>RB 3-4 Environmental Management Practice</td><td>• 1 point for project team comprises of GMM
• 2 points for project team comprises of GMP (Up to 3 points)
• 1 point for provision of facilities or recycling bins for collection and storage of different recyclable waste such as paper, glass, plastics etc</td><td>• 0.5 point for project team comprises of GMM
• 0.5 point for project team comprises of GMFM
• 1 point for project team comprises of GMP (Up to 1 point)
• 1 point for provision of recycling bins at each block of development for collection and storage of different recyclable waste such as paper, glass, plastics etc

New Item
1 point for main contractor with good track records in sustainable, environmentally friendly practices during the construction such as the Green and Gracious Builder Award.</td></tr>
<tr><td>RB 3-5 Green Transport</td><td>• 1 point for provision of adequate bicycles parking lots</td><td>• Provision of covered/sheltered bicycles parking lots
  • 0.5 point - at least 5% of no. of dwelling units
  • 1 point - at least 10% of dwelling units</td></tr>
</table>

Criteria	Current Environmental Sustainability Standard	Revised Standard
RB 3-6 Stormwater Management	-	New Item Points awarded based on the the extent of the stormwater treatment. • 3 points for treatment of run-off from more than 35% of total site area or paved area • 2 points for treatment of run-off from 10% to 35% of total site area • 1 point for treatment of run-off from up to 10% of total site area (Up to 3 points)
Part 4- Indoor Environmental Quality		
RB 4-1 Noise Level		No change
RB 4-2 Indoor Air Pollutants	• 2 points for use of low-VOC paints certified under the Singapore Green Labelling Scheme	• 1 point for use of low-VOC paints certified under approved local or overseas certification body
RB 4-3 Waste Disposal		No change
RB 4-4 Indoor Air Quality in Wet Areas	• 1 point for provision of natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets	Provision of natural ventilation and daylighting in wet areas such as kitchens, bathrooms and toilets • 1 point for 50%-90% of all applicable areas • 2 points for more than 90% of all applicable areas

Criteria	Current Environmental Sustainability Standard	Revised Standard
Part 5- Other Green Features		
RB 5-1 Green Features and Innovations	-	New Items • Carbon footprint of development • Conservation of existing building structure such as structural elements or building envelope *(this item previously under RB3-1)* • Buildability Score • Demolition Protocol • Water efficient washing machines with Good rating and above.etc

Annex B - 2

(A) Prerequisite Requirement – Minimum System Efficiency of Air-Conditioning System

(Refer to Criteria 1-2 (a) & (b) under Air-Conditioning System)

Prescribed system efficiency of air–conditioning system to be as follows:

For Buildings using Water Cooled Chilled-Water Plant:

Minimum Central Chilled Water Plant Efficiency	Peak Building Cooling Load (RT)	
	< 500	≥ 500
	Efficiency (kW/RT)	
	0.80	0.70

For Buildings using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners

Minimum System Efficiency of Air Cooled Chilled-Water Plant or Unitary Air-Conditioners	Peak Building Cooling Load (ton)	
	< 500	≥ 500
	Efficiency (kW/ton)	
	0.90	0.80

(B) Prerequisite Requirements – Instrumentations for monitoring the water cooled chilled-water plant efficiency

(Refer to Criteria 1-2 (d) under Air-Conditioning System)

For buildings that are designed with Water Cooled Chilled-Water Plant, provision of permanent measuring instruments for monitoring the plant efficiency shall be provided in accordance with the following requirement:

(i) 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.
(ii) The location and installation of the measuring devices to meet the manufacturer's recommendation.
(iii) Data acquisition system to have a minimum resolution of 16 bit.
(iv) All data logging with capability to trend at 1 minute sampling time interval.
(v) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.
(vi) Temperature sensors with minimum accuracy of ± 0.05 °C @ 0°C. All thermo-wells shall be installed in a manner which 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.

Criteria	Current Environmental Sustainability Standard	Revised Standard
Part 1 – Energy Efficiency		
NRB 1-1 ETTV	• 2 points for every reduction of 1 W/m^2 in ETTV from the baseline • 42.5 W/m^2 to achieve max 15 points	• 1.2 points for every reduction of 1 W/m^2 in ETTV from the baseline • 40 W/m^2 to achieve max 12 points
NRB 1-2 Air-Conditioning System	Air- Conditioned Plant • 1.45 points for every % improvement in chiller, chilled-water pump and condenser water pump • 0.05 point for every % improvement in cooling towers efficiency • Max 20 points	(a) Water Cooled Chilled-Water Plant Building Cooling Load > 500RT • Min Air-Conditioned System Efficiency ≤ 0.7 kW/RT 15 points for meeting the prescribed chilled-water plant efficiency of 0.70 kW/RT 0.25 point for every percentage improvement in the chilled-water plant efficiency over the baseline Building Cooling Load ≤ 500RT • Min Air Conditioned System Efficiency of 0.8 kW/RT 12 points for meeting the prescribed chilled-water plant efficiency of 0.80 kW/RT 0.45 point for every percentage improvement in the chilled-water plant efficiency over the baseline (Up to 20 point)

Non-Residential Building Criteria

Criteria	Current Environmental Sustainability Standard	Revised Standard
NRB 1-2 Air-Conditioning System	Unitary Air-conditioners • 1.5 points for every **%** improvement Max 25 points Air distribution system • 0.5 point for every % improvement • 10% improvement to achieve max 5 points	Air Cooled Chilled-Water Plant/Unitary Air-Conditioners Building Cooling Load > 500RT • Min Air-Conditioned System Efficiency ≤ 0.8 kW/RT 12 points for meeting the prescribed air-conditioning system efficiency of 0.80 kW/RT 1.3 points for every percentage improvement in the air-conditioning system efficiency over the baseline Building Cooling Load ≤ 500RT • Min Air Conditioned System Efficiency of 0.9 kW/RT 10 points for meeting the prescribed air-conditioning system efficiency of 0.90 kW/RT 0.6 point for every percentage improvement in the air-conditioning system efficiency over the baseline (Up to 20 points) Air distribution system • 0.2 point for every % improvement • 30% improvement to achieve max 6 points • More stringent requirement for VAV baseline as stated in SS553

Non-Residential Building Criteria

Criteria	Current Environmental Sustainability Standard	Revised Standard
NRB 1-2 Air-Conditioning System		New Items • 1 point - Provision of variable speed control for chiller plant equipment • 1 point – Instrumentation for monitoring water cooled chilled-water plant efficiency – *Pre-requisite Requirement* • 1 point – Verification of central chilled-water plant instrumentation : Heat balance to be computed and in accordance with AHRI 550/590
NRB 1-3 Building Envelope – Design / Thermal Parameters	• 24 points for no west facing façade • Better Thermal Transmittance (U value) of roof 2 points for every 0.1 W/m^2k reduction	• 30 points for no west facing façade • Better Thermal Transmittance (U value) of roof 1 point for every 0.1 W/m^2k reduction
NRB 1-4 Natural Ventilation / Mechanical Ventilation	• Max 8 points for 100% of the buildings achieving good natural ventilation • 5 points for ventilation simulation & implementation of identified effective building design • Max 13 points	• Max 10 points for 100% of the buildings achieving good natural ventilation • 5 points for the use of ventilation simulation & • 5 points for implementation of identified effective building design • Max 20 points New Item • 15 points for 25% improvement in mechanical ventilation system efficiency from the stipulated SS553 baseline
NRB 1-5 Daylighting	-	New Items (a) Use of daylighting and glare simulation analysis to ensure ambient lighting levels in meeting the level stated in SS 531:Part 1:2006 – Code of Practice for Lighting of Work Places.

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td>NRB 1-5 Daylighting – cont'd</td><td></td><td>• Extent of coverage: At least 75% of the units with daylighting provisions meet the minimum illuminance level and are within the acceptable glare exposure.

Points awarded based on the extent of perimeter daylight zones (Up to 3 points)
<table><tr><th>Distance from the Façade Perimeters (m)</th><th>Points Allocation</th></tr><tr><td>≥ 3.0</td><td>1</td></tr><tr><td>4.0 – 5.0</td><td>2</td></tr><tr><td>> 5.0</td><td>3</td></tr></table>
(b) Daylighting for common areas such as toilets, staircases, corridors
• 0.5 point each, with at least 80 % of each applicable area for extent of coverage</td></tr>
<tr><td>NRB 1-6 Artificial Lighting</td><td>0.5 point for every percentage improvement in lighting power budget
-</td><td>0.3 point for every percentage improvement in lighting power budget</td></tr>
<tr><td>NRB 1-7 Ventilation in Carparks</td><td>• 5 points for naturally ventilated carparks
• 4 points for Fume extract
• 3 points MV with or without supply</td><td>• 4 points for naturally ventilated
• 2.5 points for Fume extract
• 2 points MV with or without supply</td></tr>
<tr><td>NRB 1-8 Ventilation in Common Areas</td><td>-</td><td>No change</td></tr>
<tr><td>NRB 1-9 Lifts and Escalators</td><td>• 1 point for lifts with the AC variable voltage and variable frequency (VVVF) motor drive and
• 1 point for sleep mode
• 1 point for escalators with energy efficient features such as motion sensors</td><td>Both sleep mode and VVVF motor drive implemented:

• All lifts and escalators - 2 points
• All lifts or escalators - 1 point</td></tr>
</table>

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td>NRB 1-10 Energy Efficient Practices & Features</td><td>• 3 points for every 1% energy saving over the total building energy consumption (Up to 11 point)</td><td>• 3 points for every 1% energy saving over the total building energy consumption (Up to 10 points)

New Items
• Use of vertical greenery system that helps to reduce heat gain to buildings
• Re-generative lifts
• Lifts with gearless drive</td></tr>
<tr><td>NRB 1-11 Renewable Energy</td><td>5 points for every 1% replacement of electricity (based on the total electricity consumption including tenant's usage) by renewable energy

OR

3 points for every 1% replacement of electricity (based on the total electricity consumption excluding tenant's usage) by renewable energy

(Up to 20 Points)</td><td>Point scored based on the expected energy efficiency index (EEI) and % replacement of electricity by renewable energy source (Up to 20 points)

<table>
<tr><th rowspan="2">Expected Energy Efficiency Index (EEI)</th><td colspan="2">Every 1 % replacement of electricity (based on total electricity consumption) by renewable energy source</td></tr>
<tr><th>Include tenant's usage</th><th>Exclude tenant's usage</th></tr>
<tr><td>≥ 30 kWh/m^2/yr</td><td>5 points</td><td>3 points</td></tr>
<tr><td>< 30 kWh/m^2/yr</td><td>3 points</td><td>1.5 points</td></tr>
</table>
</td></tr>
</table>

Non-Residential Building Criteria

Criteria	Current Environmental Sustainability Standard	Revised Standard
Part 2 – Water Efficiency		
NRB 2-1 Water Efficient Fittings	• 4 points for "Good" rating fittings • 6 points for "Very Good" rating fittings • 8 points for"Excellent" rating fittings • Up to 8 points	• No point for "Good" rating fittings -MWEL • 8 points for "Very Good" rating fittings • 10 points for "Excellent" rating fittings • Up to 10 Points
NRB 2-2 Water Usage and Leak Detection		No change
NRB 2-3 Irrigation System and Landscaping	-	New Item • 1 point for use of drought tolerant plants or plants that require minimal watering for ≥ 80% of the landscape areas
NRB 2-4 Water Consumption of Cooling Tower	• 1 point- Cooling tower water treatment system which can achieve 6 or better cycles of concentration	• 1 point - Cooling tower water treatment system which can achieve **7** or better cycles of concentration

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td colspan="3">Part 3 - Environmental Protection</td></tr>
<tr><td rowspan="2">NRB 3-1 Sustainable Construction</td><td>Up to 1 point if at least 10% of the fine and/or coarse aggregate used for concrete production of structural application are replaced with recycled products from approved sources. 0.5 point for each recycled product used. Points can only be scored if the extent of implementation covers at least 50% of all concrete structural elements of the superstructures (by volume). (Requirement was previously under other green features)</td><td>• Up to 5 points for the use of Green Cements, Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS)
• 1 point for the use of Green Cements at least 10% by mass for superstructure applications.
• 2 points for the use of RCA or WCS above or equal to the minimum usage requirement
• 4 points for the use of RCA or WCS above or equal to the minimum usage requirement</td></tr>
<tr><td>• 0.1 point for every percentage reduction in the prescribed CUI limit
(Up to 4 points)</td><td>• Up to 5 points can be scored for more efficient concrete usage for building components based on CUI
<table><tr><th>Project CUI (m3/m2)</th><th>Points</th></tr><tr><td>≤ 0.70</td><td>1</td></tr><tr><td>≤ 0.60</td><td>2</td></tr><tr><td>≤ 0.50</td><td>3</td></tr><tr><td>≤ 0.40</td><td>4</td></tr><tr><td>≤ 0.35</td><td>5</td></tr></table></td></tr>
<tr><td>NRB 3-2 Sustainable Products</td><td>• SGLS Products - 1 point for high impact item; 0.5 point for low impact item (Cap at 4 points)
• Products with at least 30% recycled content by weight or volume - 1 point for high impact item; 0.5 point for low impact item (Cap at 4 points)</td><td>Up to 8 points for the use of environmental friendly products that are certified by approved local certification body. Higher weightage will be given to products that are classified to be more environmental friendly.
<table><tr><th colspan="3">Weightage based on the extent of environmental friendliness of products</th><th rowspan="2">Points scored based on the weightage and the extent of coverage & impact
1 point for high impact item
0.5 point for low impact item
(Up to 8 points)</th></tr><tr><th>Good</th><th>Very Good</th><th>Excellent</th></tr><tr><td>1</td><td>1.5</td><td>2</td></tr></table></td></tr>
</table>

Non-Residential Building Criteria

<table>
<tr><th>Criteria</th><th>Current Environmental Sustainability Standard</th><th>Revised Standard</th></tr>
<tr><td>NRB 3-3 Greenery Provision</td><td>
<table>
<tr><th>GnPR</th><th>Points</th></tr>
<tr><td>0.5 to < 1.0</td><td>1</td></tr>
<tr><td>1.0 to < 1.5</td><td>2</td></tr>
<tr><td>1.5 to < 3.0</td><td>3</td></tr>
<tr><td>3.0 to < 3.5</td><td>4</td></tr>
</table>
• Using the Green Area Index (GAI) for computation of Greenery Provision.
</td><td>
<table>
<tr><th>GnPR</th><th>Points</th></tr>
<tr><td>0.5 to < 1.0</td><td>1</td></tr>
<tr><td>1.0 to < 1.5</td><td>2</td></tr>
<tr><td>1.5 to < 3.0</td><td>3</td></tr>
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<tr><td>3.5 to < 4.0</td><td>5</td></tr>
<tr><td>≥ 4.0</td><td>6</td></tr>
</table>
• Using the Leaf Area Index (LAI) for computation of Green Plot Ratio.
</td></tr>
<tr><td>NRB 3-4 Environmental Management Practice</td><td>
• 1 point for project team comprises certified GMM
• 2 point for project team comprises certified GMP (Up to 3 points)
</td><td>
• 0.5 point for project team comprises certified GMM
• 0.5 point for project team comprises certified GMFM
• 1 point for project team comprises certified GMP (Up to 1 points)

New Item
• 1 point for main contractor with good track records in sustainable, environmental friendly practices such as the Green and Gracious Builder Award
</td></tr>
<tr><td>NRB 3-5 Green Transport</td><td>
• 1 point - Adequate bicycle parking lots
</td><td>
Criterion previously known as Public Transport Accessibility

• Provision of covered/sheltered bicycles parking lots with adequate shower facilities
• 1 point if no. of bicycle lots ≥ 3% of GFA/10
• 1 point if no. of bicycle lots ≥ 1.5% of GFA/10

New Items
• 1 point - provision of covered walkway to facilitate connectivity and use of public transport
• 1 point - provision of hybrid/electric vehicle refueling/ recharge stations and priority parking lots within the development.
</td></tr>
</table>

Non-Residential Building Criteria

Criteria	Current Environmental Sustainability Standard	Revised Standard
NRB 3-6 Refrigerants	-	No change
NRB 3-7 Stormwater Management	-	New Item Points awarded based on the the extent of the stormwater treatment. • 3 points for treatment of run-off from more than 35% of total site area or paved area • 2 points for treatment of run-off from 10% to 35% of total site area • 1 point for treatment of run-off from up to 10% of total site area (Up to 3 points)
Part 4 – Indoor Environmental Quality		
NRB 4-1 Thermal Comfort	• 2 points - indoor temperature between 22.5 and 25.5; RH < 70%	• 1 point - indoor operative temperature between 24 to 26 °C; Relative Humidity < 65%
NRB 4-2 Noise Level	• 2 points for good ambient sound levels as recommended in CP 13	• 1 point for good ambient sound levels as recommended in SS 553
NRB 4-3 Indoor Air Pollutants	• 1 point for use of adhesives under SGLS for composite wood products	• 1 point for use of environmental friendly adhesives certified by approved local certification body
NRB 4-4 Indoor Air Quality Management	-	**New Items** • 1 point for provision of filtration media and differential pressure monitoring equipment. • 1 point for implementing effective IAQ management plan to ensure that building ventilation systems are clean and free from debris. Internal surface condition testing for ACMV systems are to be included.
NRB 4-5 High Frequency Ballasts	-	Renumbered from 4-4 to 4-5

Non-Residential Building Criteria

Criteria	Current Environmental Sustainability Standard	Revised Standard
Part 5 – Other Green Features		
NRB 5-1 Green Features and Innovations		**New Items** • Carbon footprint of development) • Conservation of existing building structure such as structural elements or building envelope *(this item was previously under NRB 3-1)* • Buildability Score • Demolition Protocol