



BCA GREEN MARK

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# BCA Green Mark for Supermarket

**Point Allocations - BCA Green Mark for Supermarket**

Category		Point Allocations	
<b>(I) Energy Related Requirements</b>			
<b>Minimum 30 Points</b>	<b>Part 1 : Energy Efficiency</b>		
	1-1 Refrigeration System	34	
	1-2 Air-conditioning	14	
	1-3 Artificial Lighting	19	
	1-4 Energy Management Programme	4	
	1-5 Escalators and Travelling Walkways	2	
	1-6 Energy Efficient Features	10	
	<b>Category Score for Part 1 – Energy Efficiency</b>		<b>83</b>
<b>(II) Other Green Requirements</b>			
	<b>Part 2 : Water Efficiency</b>		
	2-1 Water Efficient Fittings	8	
	2-2 Water Usage	2	
	2-3 Water Efficiency Management Plans	2	
	2-4 Water Consumption of Cooling Towers	2	
	<b>Category Score for Part 2 – Water Efficiency</b>		<b>14</b>
	<b>Part 3 : Environmental Protection</b>		
	3-1 Sustainable Base Building	6	
	3-2 Waste Management	9	
	3-3 Sustainable Products	12	
	3-4 Environmental Sustainability Practices	4	
	3-5 Refrigerant Management	8	
	3-6 Green Transport	4	
	<b>Category Score for Part 3 – Environmental Protection</b>		<b>43</b>
	<b>Part 4 : Indoor Environmental Quality</b>		
	4-1 Thermal Comfort	2	
	4-2 Noise Level	2	
	4-3 Indoor Air Pollutants	4	
	4-4 Lighting Quality	2	
	<b>Category Score for Part 4 – Indoor Environmental Quality</b>		<b>10</b>
<b>Part 5 : Other Green Features</b>			
5-1 Green Features & Innovations	8		
<b>Category Score for Part 5 – Other Green Features</b>		<b>8</b>	
<b>Total Points Allocated :</b>		<b>158</b>	

### BCA Green Mark Award Rating

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

**Pre-requisite Requirements**

**For Green Mark Certification:**

Supermarket Air-conditioning System	Energy Efficiency Index (kWh/m <sup>2</sup> /year)
Standalone air-conditioning system	< 1200
Air-conditioning by retail landlord	< 850

**For Green Mark Gold<sup>Plus</sup> and Platinum rating:**

- (1) The refrigeration system efficiency should be optimized by complying with the following requirements:
  - i) The compressor(s) of each refrigeration system to be installed with variable speed drives.
  - ii) Expansion valves of the refrigeration system to be of electronic type to achieve optimal regulation of refrigerant to the evaporator.

(2) ≥ 75% of remote refrigerated display cabinets/ showcases to be fitted with doors.

(3) The store standalone air-conditioning system efficiency should comply with the following requirements:

i) For Stores using Air-Cooled Unitary Systems:

Green Mark Rating	Minimum Air-conditioning System Efficiency (kW/RT)
Gold <sup>Plus</sup>	≤ 0.85
Platinum	≤ 0.78

ii) For Stores using Water-Cooled Chilled-Water Plant:

Green Mark Rating	Minimum Air-conditioning System Efficiency (kW/RT)
Gold <sup>Plus</sup>	≤ 0.70
Platinum	

(4) Energy Management/Monitoring System (EMS) to monitor the following major energy consumption:

- i) Refrigeration
- ii) Lighting
- iii) Receptacle loads
- iv) Air-conditioning\*

\*For supermarket with standalone air-conditioning system

(5)

Supermarket Air-conditioning System	Energy Efficiency Index (kWh/m <sup>2</sup> /year)
	Green Mark Platinum
Standalone air-conditioning system	≤ 950
Air-conditioning by retail landlord	≤ 600

(6) To assign at least one dedicated 'Green' checkout lane to serve only consumers with their own recycle bags; sales of recycle bags can be an alternative to the consumers using the 'Green' lanes.

### Elective Requirements

Part 1 - Energy Efficiency	Green Mark Points
<p><b><u>1-1 Refrigeration System</u></b></p> <p>Encourage the use of energy efficient refrigeration system.</p> <p>(a) Optimise the efficiency of the refrigeration system condensing units with the following energy efficient design considerations:</p> <p>i) The compressor(s) of each refrigeration system to be installed with variable speed drives</p> <p style="text-align: center;">and</p> <p>ii) Expansion valves of the refrigeration system to be of electronic type to achieve optimal regulation of refrigerant to the evaporator.</p> <p>iii) For water-cooled refrigeration system, the fans of cooling tower to be installed with variable speed drives for water-cooled refrigeration system.</p> <p style="text-align: center;">or</p> <p>For air-cooled refrigeration system, the electronically commutated (EC) fans of the condensing units to be installed with variable speed drives.</p> <p>iv) The refrigerant saturated condensing temperature for water-cooled refrigeration system to be no higher than 36 °C.</p> <p style="text-align: center;">or</p> <p>The refrigerant saturated condensing temperature for air-cooled refrigeration system to be no higher than 40 °C basing on the assumption of 32 °C outdoor ambient air temperature.</p> <p>For other outdoor ambient air temperatures specified, the <math>\Delta T</math> – temperature difference between the condensing temperature and the ambient air is to be <math>\leq 8</math> °C.</p> <p>v) The pressure transducers monitoring the evaporative and condensing temperature to be monitored remotely by the refrigeration system management/ monitoring system.</p> <p>vi) All suction pipes of the refrigeration system are to be insulated with rigid material of U-value <math>\leq 0.48</math> W/m<sup>2</sup>K and clad with galvanized iron sheet.</p>	<p style="text-align: center;">6 points</p> <p style="text-align: center;">2 points</p> <p style="text-align: center;">2 points</p> <p style="text-align: center;">2 points</p> <p style="text-align: center;">2 points</p>

(b) Optimise the efficiency of the refrigeration system evaporators through the following energy efficient design considerations:

- i) Fin spacing of the evaporators in the freezer rooms to be no less than 7 mm.
- ii) Fin spacing of the evaporators in the chiller rooms to be no less than 4 mm.
- iii) All remote refrigerated display cabinets/ showcases to be fitted with anti-sweat controllers.
- iv) High efficient electronically commutated (EC) fans for all remote refrigerated display cabinets/ showcases.
- v) All remote refrigerated display cabinets/ showcases to be certified by independent certification body.
- vi) Remote refrigerated display cabinets/ showcases, to be fitted with doors.

2 points

2 points

2 points

2 points

2 points

Percent of remote refrigerated display cabinets fitted with doors	Points Allocation
≥ 25%	0.5
≥ 50%	2
≥ 75%	3

vii) All remote refrigerated display cabinets/ showcases to be fitted with LED lightings.

2 points

viii) Hot gas defrosting system for low temperatures remote display cabinets/ showcases

2 points

(c) Refrigerated display cabinets to be cooled remotely by central refrigeration plant with condensers installed outside the air-conditioned spaces.

Percent of remote refrigerated display cabinets	Points Allocation
≥ 70 %	0.5
≥ 80%	2
≥ 90%	3

**1-2 Air-Conditioning System**

Encourage the use of high efficiency air-conditioned equipment to minimize the energy consumption.

Supermarket installed with **standalone** air-conditioning system.

(a)(i)

- Water-cooled Central Chilled-Water Plant :
  - Water-Cooled Chiller
  - Chilled-water pump
  - Condenser water pump
  - Cooling tower

<sup>(4)</sup> For central chilled-water plant, the operating efficiency should be based on the most frequent occurring operating part-load condition of the central chilled-water plant full installed capacity (excluding standby).

If there are 2 most frequent occurring load conditions for the defined normal building operation hours, both the operating efficiency for the 2 specified load conditions should be 0.70 kW/ton or less; the points scored will be based on the poorer operating efficiency.

(a)(ii)

- Air-Cooled Central Chilled-Water Plant:
  - Air-Cooled Chiller
  - Chilled-water pump
- Unitary Air-Conditioners:
  - Variable Refrigerant Flow (VRF) system

<sup>(5)</sup> For variable refrigerant flow system (VRF), the efficiency should be based on normal design dry-bulb temperature of  $24 \pm 1$  °C and RH  $\leq$  65%; Outdoor dry-bulb temperature of 35 °C.

The operating efficiency of the VRF system is the COP of the outdoor condensing units (CU) basing on the most frequent occurring operating part-load point of the CU full installed capacity (excluding standby).

**(a)(i) Water-cooled Central Chilled-Water Plant**

**Peak building cooling load  $\geq$  500 tons**

The prescribed baseline chiller plant efficiency is 0.70 kW/ton

0.45 points for every percentage improvement in the chiller plant efficiency<sup>(4)</sup> over the baseline

Points awarded =  $0.45 \times (\% \text{ improvement})$

Baseline: (i) For peak building cooling load equal to or more than 500 tons, the minimum central chilled-water plant efficiency should be 0.70 kW/ton or less.

**Peak building cooling load  $<$  500 tons**

The prescribed baseline chiller plant operating efficiency is 0.80 kW/ton

0.45 points for every percentage improvement in the chiller plant efficiency<sup>(4)</sup> over the baseline

Points awarded =  $0.45 \times (\% \text{ improvement})$

Baseline: (ii) For peak building cooling load of less than 500 tons, the minimum central chilled water plant efficiency should be 0.80 kW/ton or less.

(Up to 8 points)

**(a)(ii) Air-Cooled Central Chilled-Water Plant and Other Unitary Air-Conditioners**

**Peak building cooling load  $\geq$  500 tons**

The prescribed baseline air-conditioning system efficiency is 0.80 kW/ton.

1 point for every percentage improvement in the air-conditioning system efficiency<sup>(5)</sup> over the baseline

Points awarded =  $1 \times (\% \text{ improvement})$

Baseline: The minimum system efficiency of air-cooled chilled-water plant and other unitary air-conditioners should be 0.80 kW/ton or less.

<p>(a)(iii) Air Distribution System :</p> <ul style="list-style-type: none"> <li>• Air Handling Units (AHUs)</li> <li>• Fan Coil Units (FCUs)</li> </ul> <p><u>Baseline</u> : (iii) SS553:2009 Table 2 – Fan power limitation in air-conditioning systems</p> <p>(a)(iv) Sensors or similar automatic control devices are used to regulate outdoor air flow rate to maintain the concentration of carbon dioxide in accordance with Table 1 – Recommended IAQ Parameters of SS 554.</p> <p>Carbon dioxide acceptable range: ≤ 700 ppm above outdoor.</p>	<div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <b>Peak building cooling load &lt; 500 tons</b> </div> <p>The prescribed baseline air-conditioning system efficiency of 0.90 kW/ton.                  0.4 points for every percentage improvement in the air-conditioning system efficiency<sup>(5)</sup> over the baseline</p> <p>Points awarded = 0.4 x (% improvement)</p> <p>Baseline: The minimum system efficiency of air-cooled chilled-water plant and other unitary air-conditioners should be 0.90 kW/ton or less.</p> <p style="text-align: center;">(Up to 8 points)</p> <p><u>(a)(iii) Air Distribution System</u></p> <p>0.2 point for every percentage improvement in the air distribution system efficiency over baseline standard.</p> <p>Points awarded = 0.2 x (% improvement)</p> <p style="text-align: center;">(Up to 4 points)</p> <p style="text-align: center;">2 points</p>
<p><b><u>1-3 Artificial Lighting</u></b></p> <p>Encourage the use of high efficient lighting to minimise energy consumption from lighting usage while maintaining proper lighting level.</p> <p>(a) Lighting power budget</p> <p><u>Baseline</u> = Maximum lighting power budget stated in SS530.</p> <p>Power wattage including general, accent and display lighting.</p>	<p>0.7 point for every percentage improvement above the baseline</p> <p>Points awarded = 0.7 x (% improvement)</p> <p style="text-align: center;">(up to 15 points)</p>



<p>(b) Lighting controls</p> <p>Encourage the use of lighting control circuits to minimize energy usage, such as provision of the following strategies:</p> <p>(i) Zoning of lighting for different usage/ location</p> <p>(ii) Use of occupancy sensors to control the lighting in the retail areas i.e. switch off or dim the lights during off-peak hours.</p>	<p>2 points</p> <p>2 points</p>
<p><b><u>1-4 Energy Management Programme</u></b></p> <p>(a) To create, adopt and implement a comprehensive energy management programme which should include the following steps:</p> <ul style="list-style-type: none"> <li>• Step 1 - Make Commitment</li> <li>• Step 2 - Assess Performance</li> <li>• Step 3 - Set Goals</li> <li>• Step 4 - Create Action Plan</li> <li>• Step 5 - Implement Action Plan</li> <li>• Step 6 - Evaluate Progress</li> <li>• Step 4 –Recognize Achievements</li> </ul> <p>(b) Energy Management/Monitoring System (EMS) to monitor the following major energy consumption:</p> <ol style="list-style-type: none"> <li>a) Refrigeration</li> <li>b) Lighting</li> <li>c) Receptacle loads</li> <li>d) Air-conditioning*</li> </ol> <p>*For supermarket with standalone air-conditioning system</p>	<p>2 points</p> <p>2 points</p>
<p><b><u>1-5 Escalators and Travelling Walkways</u></b></p> <p>Encourage the use of energy efficient transportation systems.</p> <p>Escalators and travelling walkways with AC variable voltage and variable frequency (VVVF) motor drive and sleep/ stand-by mode.</p>	<p>2 points</p>

<p><b><u>1-6 Energy Efficient Features</u></b></p> <p>Encourage the use of energy efficient practices and features which are innovative and/or have positive environmental impact.</p> <p>(a) Computation of energy efficiency index (EEI).</p> <p><b><u>Calculation of EEI :</u></b></p> <p><b>EEI ={ [TEC*(112/OH)] + REC}/ GFA</b></p> <p><i>where:</i></p> <p>TEC : Total supermarket store energy consumption excluding refrigeration energy consumption (kWh/year)</p> <p>REC : Refrigeration energy consumption (kWh/year)</p> <p>GFA : Gross floor area (m2)</p> <p>112 : Typical weekly operating hours of supermarket in Singapore (hrs/week)</p> <p>OH : Actual weekly operating hours of the supermarket (hrs/week)</p> <p>(b) Use of energy efficient features :</p> <p>Examples :</p> <ul style="list-style-type: none"> <li>• Motion sensors for back-of-house stores or offices.</li> <li>• Effective daylighting design e.g. skylighting, for the retail spaces; all daylit spaces must be integrated with automatic electric lighting control systems e.g. photo cells.</li> </ul>	<p style="text-align: center;">2 points</p> <p style="text-align: center;">3 points for every 1% energy saving over the total supermarket energy consumption</p> <p style="text-align: center;">(Up to 8 points)</p>
<p><b>PART 1 – ENERGY EFFICIENCY</b></p> <p><b>CATEGORY SCORE :</b></p>	

<b>Part 2 – Water Efficiency</b>	<b>Green Mark Points</b>
<p><b><u>2-1 Water Efficient Fittings</u></b></p> <p>Encourage the use of water efficient fittings covered under the Water Efficiency Labelling Scheme (WELS) or adopt equivalent water efficient flow rates for water fittings</p> <p>(a) Basin Taps and Mixers                      (b) Flushing Cistern                      (c) Showers                      (d) Sink/Bib Taps and Mixers                      (e) Urinals                      (f) All other water fittings</p> <p>Note:                      A PUB Water Efficient Building would be entitled to 4 points.</p> <p>Use of Water Efficient Equipment such as:-</p> <ul style="list-style-type: none"> <li>• Pre-rinse spray valve (&lt; 6 L/ min)</li> <li>• Air-cooled ice-making machine</li> </ul>	<p>Rating based on Water Efficiency Labelling Scheme (WELS)</p> <p>Very Good – 1.5 point                      Excellent – 3 point</p> <p>Points awarded based on the number and water efficiency rating of the fitting type used</p> <p>1 point</p> <p>1 point</p> <p>(Up to 5 points)</p>
<p><b><u>2-2 Water Usage</u></b></p> <p>Provide the use of private-metering and leak detection system for better control and monitoring.</p> <p>Provision of private meters and keep track of major water uses (e.g. pre-rinse spray valve, kitchen/preparation area and toilets)</p>	<p>2 point</p>
<p><b><u>2-3 Water Efficiency Management Plans</u></b></p> <p>Encourage the adoption of PUB’s Water Efficiency Management Plan to better manage and improve the supermarket’s efficiency in water consumption and help reduce cost.</p> <p>Complete and submit Water Efficient Management Plan to PUB. The plan shall include targets to improve outlet’s water performance baseline, a breakdown of the current water use, list of water saving measures and an implementation timeline for the measures over the next 3 years.</p>	<p>2 point</p>

<p><b><u>2-4 Water Consumption of Cooling Towers</u></b></p> <p>Reduce potable water use for cooling and/or refrigeration purposes.</p> <p>(a) Use of cooling tower water treatment system which can achieve at least 7 cycles of concentration at acceptable water quality.</p> <p>(b) Use of NEWater or on-site recycled water from approved sources.</p>	<p>1 point</p> <p>1 point</p>
<p style="text-align: center;"><b>PART 2 – WATER EFFICIENCY</b></p> <p style="text-align: center;"><b>CATEGORY SCORE :</b></p>	

Part 3 – Environmental Protection	Green Mark Points
<p><b>3-1 Sustainable Base Building</b></p> <p>Enhance the supermarket’s green operation through high energy efficient and sustainable BCA Green Mark certified base building.</p> <p>Encourage supermarket to select buildings that employ best practices systems and employ strategies e.g. select a BCA Green Mark certified building.</p>	<p>Green Mark Gold – 1 point</p> <p>Green Mark Gold<sup>PLUS</sup> – 4 points</p> <p>Green Mark Platinum – 6 points</p> <p>(up to 6 points)</p>
<p><b>3-2 Waste Management</b></p> <p>To recognize and encourage the provision of dedicated storage facilities for a supermarket’s operational related recyclable waste streams, so that such waste is diverted from landfill or incineration.</p> <p>(a) A dedicated storage space to cater for the volume of recyclables materials generated by supermarket operator during operation.</p> <p>The dedicated space must cater for separation and storage of minimum of 3 different types of recyclable material, these may include:</p> <ol style="list-style-type: none"> <li>1) Cardboards</li> <li>2) Food/ products donation</li> <li>3) Glass waste</li> <li>4) Plastic bottles</li> <li>5) Printer Cartridge</li> <li>6) Waste paper</li> <li>7) Others</li> </ol> <p>*Refer to the following website for the list of collectors and/or traders for common recyclables:  <a href="http://app2.nea.gov.sg/topics_collecttrade.aspx">http://app2.nea.gov.sg/topics_collecttrade.aspx</a></p> <p>(b) Provision of organic waste composting system to facilitate the reduction in volume of compostable organic waste going directly to landfill.</p>	<p>(up to 6 points)</p> <p>3 points</p>
<p><b>3-3 Sustainable Products</b></p> <p>Promote the use of environmentally friendly products certified by approved local certification body in the interior fit-out of the supermarket.</p>	<p>2 points for high impact item</p> <p>1 point for medium impact item</p> <p>0.5 point for low impact item</p> <p>(Up to 12 points)</p>

<p><b><u>3-4 Environmental Sustainability Practices</u></b></p> <p>Encourage and promote the adoption of environmental sustainability practices through green awareness programme.</p> <ul style="list-style-type: none"> <li>a) Dedicated checkout lane for customers who bring their own shopping bags</li> <li>b) Reward customers who bring their own shopping bags with discount on purchases.</li> </ul>	<p>2 points</p> <p>2 points</p>
<p><b><u>3-5 Refrigerant Management</u></b></p> <p>Reduce the contribution of commercial refrigeration &amp; air-conditioning to global warming and ozone depletion.</p> <ul style="list-style-type: none"> <li>(a) Use of environmentally neutral refrigerant e.g. carbon dioxide (R7-44) for refrigeration system.</li> <li>(b) Use of refrigerant with ozone depletion potential (ODP) of zero or global warming potential (GWP) of less than 100 in air-conditioning and refrigeration systems.</li> <li>(c) Use of low-charge refrigeration system e.g. complete secondary loop multiplex system</li> </ul> <p>Refrigerating machinery room shall contain a detector, located in an area where refrigerant from a leak will concentrate, that actuates an alarm and mechanical ventilation.</p>	<p>2 points</p> <p>2 points</p> <p>2 points</p> <p>2 points</p>
<p><b><u>3-6 Green Transport</u></b></p> <p>Promote environmental friendly transport options and facilities to reduce pollution from individual car use.</p> <ul style="list-style-type: none"> <li>(a) Good access to nearest MRT/LRT or bus stops.</li> <li>(b) Provision of adequate bicycles parking lots.</li> </ul>	<p>2 points</p> <p>2 points</p>
<p style="text-align: center;"><b>PART 3 – ENVIRONMENTAL PROTECTION</b></p> <p style="text-align: center;"><b>CATEGORY SCORE :</b></p>	

<b>Part 4 – Indoor Environmental Quality</b>	<b>Green Mark Points</b>
<p><b><u>4-1 Thermal Comfort</u></b></p> <p>Indoor Thermal Environment and Outdoor Air Supply Requirements for comfort air-conditioning to comply with SS 553: 2009.</p>	<p>2 point</p>
<p><b><u>4-2 Noise Level</u></b></p> <p>Occupied spaces in buildings are designed with good ambient sound levels as recommended in SS 553 Table 8 – Recommended ambient sound level.</p>	<p>2 point</p>
<p><b><u>4-3 Indoor Air Pollutants</u></b></p> <p>To reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well being of installers, staffs and shoppers.</p> <p>(a) Use of low volatile organic compounds (VOC) paints/ surface coating certified by approved local certification body.</p> <p>(b) Use of adhesives/ sealants certified by local certification body.</p>	<p>2 points</p> <p>2 points</p>
<p><b><u>4-4 Lighting Quality</u></b></p> <p>Improve workplace lighting quality by avoiding low frequency flicker associated with fluorescent lighting with the use of high frequency ballasts in fluorescent luminaries or equivalent.</p>	<p>2 points</p>
<p><b>PART 4 – INDOOR ENVIRONMENTAL QUALITY</b></p> <p><b>CATEGORY SCORE :</b></p>	

Part 5 – Other Green Features	Green Mark Points
<p><b><u>5-1 Green Features and Innovations</u></b></p> <p>Encourage the use of other green features which are innovative and/or have positive environmental impact.</p> <p>Examples :</p> <ul style="list-style-type: none"> <li>● Educational Corners e.g. promoting 3R (Reduce, Reuse and Recycle)</li> <li>● Use of evaporative-cooled condensers</li> <li>● Etc</li> </ul>	<p>2 points for high impact item</p> <p>1 point for medium impact item</p> <p>0.5 point for low impact item</p> <p>(Up to 8 points)</p>
<p style="text-align: center;"><b>PART 5 – OTHER GREEN FEATURES CATEGORY SCORE :</b></p>	

### Green Mark Score

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