BCA GREEN MARK

GM ENRB: 2017

BCA GREEN MARK FOR EXISTING NON-RESIDENTIAL BUILDINGS

Simplified Version

Framework – BCA Green Mark for Existing Non-Residential Buildings 2017 (GM ENRB: 2017)

To achieve Green Mark Award

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

Section 1 – SUSTAINABLE MANAGEMENT

1.1 Environmental Credentials of Facility Managers and Consultants
1.2 Sustainable Policy and Action Plan
1.3 Green Building Committee
1.4 Green Education
1.5 Green Fit-out Guidelines
1.6 Green Lease
1.7 Green-related Activities for Building Occupants
1.8 Greenery
1.9 Refrigerant
1.10 Green Transport
1.11 Sustainable Operation

Section 2 – BUILDING ENERGY PERFORMANCE

2.1 Façade Performance
2.2 Air Conditioning System Operating Efficiency
2.3 Natural / Mechanical Ventilation Performance
2.4 Lighting System Efficiency
2.5 Vertical Transportation System
2.6 Ventilation in Car Park
2.7 Ventilation in Common Areas
2.8 Energy Efficient Practices and Features
2.9 Renewable Energy

Section 3 – RESOURCE STEWARDSHIP

3.1 Water Efficient Fittings
3.2 Landscape Irrigation
3.3 Reduction of Water Consumption of Cooling Towers
3.4 Water Monitoring and Leak Detection
3.5 Water Usage Portal and Dashboard
3.6 Use of Alternative Water Sources
3.7 Green Products and Materials
3.8 Recycling Facilities
3.9 Storage Area for Recyclable Waste
3.10 Promotion of Waste Reduction
3.11 Waste Monitoring

Section 4 – SMART AND HEALTHY BUILDINGS

4.1 Occupant Comfort
4.2 Outdoor Air Control
4.3 Enhanced Filtration Media
4.4 Indoor Contaminants
4.5 Lighting Quality
4.6 Acoustics
4.7 Biophilic Features
4.8 Energy Monitoring
4.9 Demand Control
4.10 Integration and Analytics

Section 5 – ADVANCED GREEN EFFORT

POINT ALLOCATION – BCA Green Mark for Existing Non-Residential Buildings 2017 (GM ENRB: 2017)

GM Criteria		Point Allocations
Section 1 – SUSTAINABLE MANAGEMENT		
1.1	Environmental Credentials of Facility Managers and Consultants	1
1.2	Sustainable Policy and Action Plan	4
1.3	Green Building Committee	2
1.4	Green Education	2
1.5	Green Fit-out Guidelines	1
1.6	Green Lease	2
1.7	Green-related Activities for Building Occupants	3
1.8	Greenery	6
1.9	Refrigerant	4
1.10	Green Transport	4
1.11	Sustainable Operation	6
	Score for Section 1 – Sustainable Management	**35**
Section 2 – BUILDING ENERGY PERFORMANCE		
2.1	Façade Performance	2
2.2	Air Conditioning System Operating Efficiency	16 for AC/ MV;
2.3	Natural / Mechanical Ventilation Performance	17 for NV
2.4	Lighting System Efficiency	6
2.5	Vertical Transportation System	1.5
2.6	Ventilation in Car Park	2
2.7	Ventilation in Common Areas	3
2.8	Energy Efficient Practices and Features	2
2.9	Renewable Energy	6.5
	Score for Section 2 – Building Energy Performance	**40**
Section 3 – RESOURCE STEWARDSHIP		
3.1	Water Efficient Fittings	7
3.2	Landscape Irrigation	1
3.3	Reduction in Water Consumption of Cooling Towers	2.5
3.4	Water Monitoring and Leak Detection	1
3.5	Water Usage Portal and Dashboard	1
3.6	Use of Alternative Water Sources	2
3.7	Green Products and Materials	7
3.8	Recycling Facilities	3.5
3.9	Storage Area for Recyclable Waste	1
3.10	Promotion of Waste Reduction	2
3.11	Waste Monitoring	2
	Score for Section 3 – Resource Stewardship	**30**

POINT ALLOCATION – BCA Green Mark for Existing Non-Residential Buildings 2017 (GM ENRB: 2017)

GM Criteria		Point Allocations
Section 4 – SMART AND HEALTHY BUILDINGS		
4.1	Occupant Comfort	5.5
4.2	Outdoor Air Control	1.5
4.3	Enhanced Filtration Media	2.5
4.4	Indoor Contaminants	2.5
4.5	Lighting Quality	4
4.6	Acoustics	1
4.7	Biophilic Features	2
4.8	Energy Monitoring	11
4.9	Demand Control	5
4.10	Integration and Analytics	5
	Score for Section 4 – Smart and Healthy Buildings	**40**
Section 5 – ADVANCED GREEN EFFORT		
	Advanced Green Effort	20
	Score for Section 5 – Advanced Green Effort	**20**
	Total Green Mark Score available	**165**

Green Mark Award Rating

BCA Green Mark Award Rating and Pre-requisite Requirements

Green Mark Rating	Green Mark Score
Green Mark Platinum	70 and above
Green Mark Gold^{PLUS}	60 to < 70
Green Mark Gold	> 50 to < 60
Green Mark Certified	Compliance with all pre-requisite requirements

Pre-requisite Requirements for Existing Non-residential Building Criteria

1. ENERGY CONSUMPTION MONITORING

To compute and monitor the building's Energy Use Intensity (EUI) for the past 3 years and review its Energy Efficiency Improvement Plan, where necessary

All Ratings

2. AIR CONDITIONING SYSTEM MINIMUM OPERATING EFFICIENCY

All Ratings

(i) For Buildings using Water-cooled Chilled-water Plant

Green Mark Rating	Building Cooling Load (RT)	
	< 500	≥ 500
	Minimum Efficiency (kW/RT)	
Certified	0.8	0.75
Gold	0.75	0.70
Gold^{PLUS}	0.7	0.67
Platinum	0.67	0.65

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

Green Mark Rating	Building Cooling Load (RT)	
	< 500	≥ 500
	Minimum Efficiency (kW/RT)	
Certified	1.1	1.0
Gold	1.0	*N.A
Gold^{PLUS}	0.85	
Platinum	0.78	

*For buildings with cooling load of more than 500 RT, the air-cooled chilled-water plant or unitary air-conditioners will be assessed on a case-by-case basis. It will only be considered when it meets the same efficiency requirement as stipulated in 2(i).

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

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

3. ENERGY IMPROVEMENT ON LIGHTING SYSTEM To demonstrate at least 20% improvement in the lighting power budget for common areas over the baseline stated in annex A	All Ratings
4. WATER CONSUMPTION MONITORING To compute and monitor the building's yearly water consumption (m^3/GFA(m^2)) for the past 3 years and review its Water Efficiency Improvement Plan, where necessary	All Ratings
5. CHILLER PLANT MEASUREMENT AND VERIFICATION (M&V) INSTRUMENTATION To provide permanent measuring instruments for monitoring of chilled water system operating efficiency. The installed instrumentation shall have the capability to calculate the resultant operating system efficiency (i.e. kW/RT) within 5% of its true value and in accordance with SS 591. Each measurement system shall include the sensor(s), any signal conditioning, the data acquisition system and wiring connecting these components. A heat balance substantiating test for water-cooled chilled-water system is to be computed in accordance to SS 591 for verification of the accuracy of the M&V instrumentation. The heat balance shall be computed over the entire normal operating hours with more than 80% of the computed heat balance within ±5% over a 1-week period.	All Ratings
6. INDOOR TEMPERATURE To maintain the indoor dry-bulb temperature at 23 °C and above to prevent overcooling	All Ratings
7. INDOOR AIR QUALITY (IAQ) SURVEILLANCE AUDIT To conduct an IAQ surveillance audit once every 3 years. The audit shall be conducted by an accredited laboratory under Singapore Accreditation Council with respect to the recommended IAQ parameters and acceptable limits stated in Table 1 of *SS 554 : 2016 Code of Practice for Indoor Air Quality for Air-Conditioned Buildings* or in Annex E of NEA's *Guidelines for Good Indoor Air Quality in Office Premises*.	All Ratings
8. TENANT AND OCCUPANT ENGAGEMENT To conduct at least one green activity related in a year involving the building tenants and occupants	Gold, Gold^{PLUS} and Platinum Ratings
9. RECYCLING FACILITIES To provide appropriate recycling facilities for collection and storage of common recyclables such as paper, glass, metal and plastic in commingled or sorted form	Gold, Gold^{PLUS} and Platinum Ratings
10. POST OCCUPANCY EVALUATION (POE) To conduct a POE survey once every 3 years and take corrective actions accordingly.	Gold^{PLUS} and Platinum Ratings
11. DISPLAY OF GREEN MARK PLAQUE/ DECAL To display the Green Mark plaque/ decal at a prominent location (eg. main lobby) in the building.	Platinum Rating

Section 1 – SUSTAINABLE MANAGEMENT	Green Mark Credit Points (35 Points)
1.1 Environmental Credentials of Facility Managers and Consultants To recognise facility managers, consultants with specialised green credentials who can effectively operate and/or guide the maintenance team towards sustainable management of the building. Applicable to in-house building and facility management team or external consultants with the following credentials: a) Certified Green Mark AP (FM)/ GMFM b) Certified Green Mark AAP (FM)/ GMFP c) Singapore Certified Energy Manager (SCEM)	0.5 point for Certified GMAP(FM) 1 point for Certified GMAAP (FP) or SCEM (Up to 1 point)
1.2 Sustainable Policy and Action Plan To recognise management's commitment and leadership towards sustainable operation and maintenance of the building. To establish the following policies and documents, endorsed by the top management, which contain sustainability targets, implementation measures and improvement plans to achieve the target set over the next three years: a) Energy Management Policy and Energy Improvement Plan b) Water Management Policy and Water Improvement Plan c) Waste Management Policy and Waste Recycling Plan d) Valid ISO 14001 or ISO 50001 Certifications	1 point for each item (Up to 4 points)
1.3 Green Building Committee To encourage collaborations between environmentally-conscious owners and tenants to promote sustainability-related initiatives for the building. Members in this Committee includes tenants or building occupants	1 point for involving at least 3 tenants or building occupants; 2 points for involving at least 6 tenants or building occupants; and they represent more than 30% of total lettable area (Up to 2 points)
1.4 Green Education To educate building users and tenants on the green features of the building and how they can contribute towards sustainability. a) Green Building User Guide b) Green Corner	 1 point 1 point

1.5 Green Fit-out Guidelines

To educate tenants on sustainable renovation by providing green fit-out guidelines with details recommending minimum environmental standards to assist the tenants in making sustainable fit-out decisions for their premises. The guidelines are to be disseminated to the relevant tenant management and personnel.

1 point

1.6 Green Lease

To encourage building owners and tenants to go an extra mile towards sustainability by implementing Green Lease.

The green lease, to be incorporated into tenancy agreement, shall establish agreed levels of environmental building performance between landlord and his tenants.

Points will be awarded based on the percentage of net lettable area (NLA) on Green Lease

0.5 point for provision of Green Lease
or
1 point if ≥10% of NLA are on Green lease
or
2 points if ≥40% of NLA are on Green lease
(Up to 2 points)

1.7 Green-related Activities for Building Occupants

To encourage tenant and building occupant engagement through green or occupant well-being related activities. Points can be scored based on the number of activities held in a year.

1 point for each green-related activity in a year
(Up to 3 points)

1.8 Greenery

To provide greenery within the development to reduce urban heat island effect.

Description	GAI
Trees	6
Palms	4
Shrubs	3
Landscape and grass	1

a) Greenery Provision (GnP)

To encourage greater use of greenery within the development. GnP is calculated by considering the 3D volume covered by plants using the Green Area Index (GAI).

GnP	Credit Points
0.5 to < 1.0	1 point
1.0 to < 2.0	1.5 points
2.0 to < 3.0	2 points
≥ 3.0	2.5 points

b) Rooftop Greenery

To encourage rooftop greenery and sky gardens to reduce heat gain into the building. Points will be awarded based on the percentage of green area over the useable roof area

Useable roof area (%)	Credit Points
≥ 20% to < 50%	0.5 point
≥ 50%	1 point

c) Vertical Greenery

To encourage vertical greenery on façade to reduce heat gain into the building. Points will be awarded based on the vertical greenery areas.

Greenery area (m^2)	Credit Points
≥ 10 to < 50	0.5 point
≥ 50	1 point

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d) Sustainable Landscape Management

To encourage sustainable management of greenery within the development. Points will be awarded for the following:

(i) The building landscape is certified under NParks' Landscape Excellence Assessment Framework (LEAF);

OR

(ii) Adoption of a landscape management plan that covers the following items:

- Use of organic composts from horticultural wastes
- Provision of onsite composting
- Provision of general landscape maintenance and management plan

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1.5 points

OR

0.5 point each
(Up to 1.5 points)

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<u>1.9 Refrigerant</u>

To encourage the responsible use and management of environment-friendly refrigerants and to minimise the impact of refrigerants on the environment.

a) Green Refrigerant

Use of refrigerants with reduced impact to the ozone layer and global warming.

Points will be awarded based on the Ozone Depleting Potential (ODP) and/or Global Warming Potential (GWP).

b) Refrigerant Leak Detection System

An automated refrigerant leak detection system shall be installed with detection points at critical areas in the plant room(s) housing the chillers and/or other equipment that contain refrigerants.

c) Refrigerant Management System

A refrigerant management procedure or strategies are in place on proper handling of refrigerants during storage and top-up, maintaining of the log sheets, tracking and reducing the refrigerant consumption as well as avoiding leakages.

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ODP and GWP of Refrigerant	Points
ODP=0 **or** GWP<100	0.5
ODP=0 **and** GWP<750	1
ODP=0 **and** GWP<10	1.5

(Up to 1.5 points)

1 point

1.5 points

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<u>1.10 Green Transport</u>

To encourage the use of alternative transportation modes such as public transport or cycling.

a) Good access (<500m walking distance) to public transport networks such as MRT/LRT stations and bus stops

b) Provision of covered walkway(s) to the nearest public transport networks

c) Provision of priority parking lots for hybrid and electric vehicle

- At least 1 priority parking lot per 100 lots or at least 10 priority parking lots, whichever is lower

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0.5 point

0.5 point

1 point

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</table>

• At least 1 no. of electric vehicle charging point near the priority parking lots OR Provision of electrical vehicle charging and parking infrastructure for vehicles or to facilitate electric car-sharing service	0.5 point 0.5 point (Up to 1.5 points)
d) Provision of bicycle parking lots, shower and changing facilities • At least 2 bicycle parking lots per 1,500m^2 GFA; or • At least 3 bicycle parking lots per 1,500m^2 GFA; or • At least 50 bicycle parking lots • Provision of shower and changing facilities	0.5 point 1 point 1 point 0.5 point (Up to 1.5 points)
<u>1.11 Sustainable Operation</u> To implement various policies and measures to promote sustainable operations and maintenance within the building. **a) Green Procurement Policy** Adoption and implementation of a Green Procurement Policy, endorsed by the top management, on procuring green products, materials, goods and services from contractors and vendors committed to environmental sustainability. **b) Performance-based Procurement for Retrofitting** Adoption of an Energy Performance Contract (EPC) by EPC firms accredited by Singapore Green Building Council (SGBC) or equivalent for replacement of the following systems to achieve measurable performance outcomes: (i) Centralised chilled-water system with guaranteed efficiency of 0.65 kW/RT or better (ii) Air distribution system with guaranteed efficiency of 0.25 kW/RT or better **c) Performance-based Procurement for Maintenance** To adopt a performance-based maintenance contract of at least 3 years by EPC firms accredited by Singapore Green Building Council (SGBC) or equivalent for the following systems to maintain its operational system efficiency: (i) Centralised chilled-water system with guaranteed efficiency of 0.65 kW/RT or better	1 point 1 point 1 point 1 point

(ii) Air distribution system with guaranteed efficiency of 0.25 kW/RT or better	1 point
d) System Handover and Documentation When a building system (e.g. air-conditioning system, Building Automation System (BAS)) is retrofitted, it shall be properly tested and verified to ensure compliance with the desired efficiency and performance levels. To maintain proper and updated system verification and handover documents of retrofitted building systems, including description of systems' operation and controls, testing and commissioning reports, as-built drawings, technical and training manuals and user guides.	1 point

<table>
<tr><th>Section 2 – BUILDING ENERGY PERFORMANCE</th><th>Green Mark Credit Points (40 Points)</th></tr>
<tr><td><u>2.1 Façade Performance</u>

To enhance the overall thermal performance of the building envelope thus reducing the overall heat gain into the building.</td><td><table><tr><th>Envelope Thermal Transfer Value (ETTV) (W/m^2)</th><th>Points</th></tr><tr><td>45 ≤ ETTV <50</td><td>1</td></tr><tr><td>40 ≤ ETTV <45</td><td>2</td></tr></table></td></tr>
<tr><td><u>2.2 Air Conditioning System Operating Efficiency</u>

To encourage the use of energy efficient and appropriately sized air-conditioning system(s) that can optimise its performance and reduce its environment impact.

a) Water-cooled Chilled-water Plant:
▪ Water-cooled Chiller
▪ Chilled water pump
▪ Condenser water pump
▪ Cooling tower

<table><tr><th rowspan="2">Baseline</th><th colspan="2">Building Cooling Load</th></tr><tr><th>< 500 RT</th><th>≥500 RT</th></tr><tr><td><u>Pre-requisite Requirement</u>
Minimum system efficiency of central water-cooled chilled-water plant</td><td>0.8 kW/RT</td><td>0.75 kW/RT</td></tr></table>
OR

b) Air-cooled Chilled-water Plant / Unitary Air-conditioners:

Air-cooled Chilled-water Plant:
▪ Air-cooled Chiller
▪ Chilled Water Pump

Unitary Air-conditioners:
▪ Variable Refrigerant Flow (VRF) System
▪ Water-cooled Package Unit
▪ Single-spilt Unit
▪ Multi-spilt Unit

<table><tr><th rowspan="2">Baseline</th><th colspan="2">Building Cooling Load</th></tr><tr><th>< 500 RT</th><th>≥500 RT</th></tr><tr><td><u>Pre-requisite Requirement</u>
Minimum system efficiency of air-cooled chilled-water plant or unitary air-conditioners</td><td>1.1 kW/RT</td><td>1.0 kW/RT</td></tr></table>
Note 1: For buildings with different air-conditioning systems, the points awarded will be pro-rated based on the cooling load of each system.

Note 2: For building using VRF air-conditioning system, up to 12 points can be scored if permanent M&V is provided. Otherwise, it is capped at 8 points</td><td>Points awarded = 0.6 x (% improvement from baseline)
(Up to 12 points)

Points awarded = 0.3 x (% improvement from baseline)
(Up to 12 points will be awarded if permanent M&V is provided for VRF air-conditioning system. Otherwise, it is capped at 8 points.)</td></tr>
</table>

Note 3: For buildings using district cooling system, the points awarded will be based on the weighted percentage of the point awarded under2.2c) Air Distribution System. **c) Air Distribution System** • Air Handling Units (AHUs) • Fan Coil Units (FCUs) Air distribution operating system efficiency baseline: 0.28 kW/RT *Note 4: In order to score for this criteria, the building's air-conditioning system Energy Use Intensity (EUI) for the past one year shall be calculated and submitted. It shall be calculated based on the following formulae:* *(i) EUI_{AC} = Annual building energy consumption of air-conditioning system (kWh) / GFA(m^2).* *(ii) $EUI_{AC\#}$= Annual building energy consumption of air-conditioning system (kWh) within standard building operating hours defined in the table below / GFA(m^2).* Office Building: Monday to Friday: 9am to 6pm Retail Mall: Monday to Sunday: 10am to 10pm Hotel and Hospital: 24-hour Industrial Building and Other Building Types: To be determined based on its normal operating hours	Point scored = 0.14 x (% improvement from baseline) (Up to 4 points)
2.3 Natural / Mechanical Ventilation Performance Applicable to non air-conditioned buildings, with an aggregate non air-conditioned building area > 10% of the total floor area excluding car parks and common areas. a) **Natural Ventilation** ***(only applicable to occupied areas, excluding circulation, plant rooms and transit areas)*** To encourage building that facilities good natural ventilation. Naturally ventilated areas should be properly designed to utilise prevailing wind condition to achieve adequate cross ventilation, and effectively designed to be thermally comfortable and healthy for the building occupants. **b) Mechanical Ventilation** To encourage the use of energy efficient mechanical ventilation system as the preferred ventilation mode to reduce the use of air-conditioning in buildings. Baseline: Allowable Nameplate Motor Power Constant Volume: 0.47 W/CMH Variable Volume: 0.74 W/CMH *Note : Where there is a combination of naturally ventilated and mechanically ventilated spaces, the points awarded will only be based on the predominant ventilation modes of normally occupied spaces.*	10 points will be awarded for use of natural ventilation 1 point for every 10% of NV areas with window openings facing north and south directions and cross ventilation demonstrated (Up to 17 points) 0.3 point for every 1% improvement from baseline (Up to 16 points)

2.4 Lighting System Efficiency To encourage the use of energy efficient lighting to minimise energy consumption from lighting usage while maintaining proper lighting level. The lighting should be designed in accordance to the recommended lux levels in *SS 531 – 1 : 2006 – Code of Practice for Lighting of Workplaces Part 1 – Indoor Lighting or CP 38 : 1999 Code of Practice for Artificial Lighting in Buildings*. Please refer to Annex A for the baseline of lighting power budget.	Point scored = 0.1 x (% improvement from baseline) (Up to 6 points) 3 points for lighting in lettable/non-common area; 3 points for lighting in common area
2.5 Vertical Transportation System To encourage the use of energy efficient vertical transportation systems within the building. a) Provision of lifts, escalators and travelators equipped with AC variable voltage and variable frequency (VVVF) motor drive and sleep mode features b) Provision of lift with regenerative drive	1 point 0.5 point
2.6 Ventilation in Car Park To encourage the use of natural ventilation or energy efficient design and control of ventilation systems in carparks. a) Mechanically ventilated car parks with carbon monoxide (CO) sensor control b) Carparks with natural ventilation *Note 1: Full points can be awarded in this criteria for buildings with no carpark.* *Note 2: Where there is a combination of different ventilation mode adopted for carpark, the points awarded will be pro-rated accordingly based on area.*	1.5 points 2 points (Up to 2 points)
2.7 Ventilation in Common Areas To encourage the use of energy efficient ventilation systems in common areas as follows: • Toilets • Staircases • Corridors • Lift lobbies • Atrium	Extent of Coverage: At least 90% of each applicable area Points will be awarded based on the mode of ventilation provided in the applicable areas Natural ventilation – 1 point for each applicable area Mechanical ventilation – 0.5 point for each applicable area (Up to 3 points)
2.8 Energy Efficiency Practices And Features To encourage the use of energy efficient practices and features which are innovative and/or have positive environmental impact.	1 point for every 1% energy saving over the annual total building energy consumption (Up to 2 points)

2.9 Renewable Energy

To encourage greater adoption and use of renewable energy.

a) Solar Energy Feasibility Study

The evaluation of a building's potential in harnessing solar energy so as to raise awareness on viable solar opportunities within the development and allow building owners to make an informed decision regarding the adoption of solar photovoltaics.

1 point

The solar energy feasibility report should consists of the following details:

- Roof characteristics and shading considerations
- Solar energy generation potential
- Economics of solar installation
- Roof access and safety requirements
- Recommendations on roof spatial optimisation

b) Solar Ready Roof

To encourage existing buildings to be ready for solar photovoltaic installation and facilitate their deployment should building owners decide to do so in the near future.

The building development shall demonstrate solar readiness for at least 50% of the feasible roof area determined through the feasibility study. Points will be awarded for each of the following:

- **Structural readiness**: Provisions to accommodate optimised structural installation of solar panels on rooftop spaces — 0.5 point
- **Electrical readiness**: Provisions to accommodate optimised electrical installation of solar panels on rooftop spaces — 0.5 point
- **Spatial readiness**: Provisions to optimise the available non-shaded rooftop area for photovoltaic and/or adoption of recommendations for roof spatial optimisation outlined in the solar energy feasibility study. — 0.5 point

c) Adoption of Renewable Energy

To encourage on-site generation of renewable energy to reduce the building's power consumption from the grid and carbon emissions.

Points will be awarded based on the building's Energy Use Intensity (EUI) and % replacement of electricity by renewable energy source

Energy Use Intensity (EUI) [kWh/m^2/yr]	Credit Points Awarded for % Replacement of Total Building Electricity Consumption by Renewable Energy
$\geqslant$ 120	1 point for every 0.5%
80 $\leqslant$ EUI < 120	1 point for every 1.0%
50 $\leqslant$ EUI < 80	1 point for every 1.5%
< 50	1 point for every 2.5%

(Up to 4 points)

Section 2 **ENERGY BUILDING PERFORMANCE SCORE:**	$\frac{\text{(2.2 score) X Air-conditioned Building Floor Area}}{\text{Total Floor Area}} + \frac{\text{(2.3 score) X Non Air-Conditioned Building Floor Area}}{\text{Total Floor Area}} +$ (2.1, 2.4 to 2.9 scores) Where 2.2 score = Total Green Mark score obtained under part 2.2 2.3 score = Total Green Mark score obtained under part 2.3 2.1, 2.4 to 2.9 scores = Total Green Mark scores obtained under part 2.1, 2.4 to 2.9

<table>
<tr><th>Section 3 – RESOURCE STEWARDSHIP</th><th>Green Mark Credit Points (30 Points)</th></tr>
<tr><td><u>3.1 Water Efficient Fittings</u>

a) To encourage the use of water efficient fittings under PUB's Water Efficiency Labelling Scheme (WELS) or adoption of equivalent water efficient flow-rate or flush volume for the following water fittings:
• Basin taps and mixers
• Showers
• Sink/Bib taps and mixers
• Urinals and urinal flush valves
• Dual flushing cistern for water closet (WC)

Or

b) Attained PUB Water Efficient Building (WEB) Certificate</td><td><table><tr><td colspan="2">Rating based on PUB's Water Efficiency Labelling Scheme (WELS)</td><td rowspan="4">Points scored based on the number and water efficiency rating of the fitting type used

(Up to 7 points)</td></tr><tr><td>Very Good</td><td>Excellent</td></tr><tr><td colspan="2">Weightage</td></tr><tr><td>5</td><td>7</td></tr></table>
Or

5 points</td></tr>
<tr><td><u>3.2 Landscape Irrigation System</u>
To encourage use of the following for at least 50% of the landscape areas:

a) Water efficient irrigation systems with features such as automatic sub-soil drip irrigation and moisture or rain sensor control
b) Drought tolerant plants</td><td>Extent of Coverage: At least 50% of landscape areas

0.5 point

0.5 point</td></tr>
<tr><td><u>3.3 Reduction in Water Consumption of Cooling Towers</u>

To encourage adoption of the following measures to reduce the consumption of potable water for the cooling towers:

a) Use of a cooling tower water treatment system which can achieve 7 or better cycles of concentration with acceptable water quality
b) Use of NEWater or alternate approved sources of water such as on-site recycled water, rainwater, Air Handling Unit (AHU) condensate, etc.
c) Use of a heat recovery system or equivalent device that helps to reduce heat rejection required through the cooling towers</td><td>1 point

1 point

0.5 point</td></tr>
<tr><td><u>3.4 Water Monitoring and Leak Detection</u>

To encourage the following provisions to monitor the water consumption of the building:
a) Private meters for all major water uses in the building
b) Smart remote metering system with alert features for leak detection and monitoring purposes</td><td>0.5 point

0.5 point</td></tr>
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3.5 Water Usage Portal and Dashboard

To encourage the adoption of water usage portal(s), dashboard(s) or other equivalent forms with the following provisions:

a) Display metered data, trending of water consumption and relevant parameters which facilitate better management of water consumption during building operation — 0.5 point

b) Allow individual tenants to monitor their own water usages and consumption — 0.5 point

3.6 Use of Alternative Water Sources

To encourage use of alternative water sources for applicable non-potable uses, such as irrigation, washing, water features, toilet flushing, etc. (excluding cooling tower make up water) to reduce use of potable water.

Credit points awarded based on % reduction in total annual potable water usage of the applicable uses:

% reduction of potable water	Credit Points
< 10 %	1 point
≥10 % to 50 %	1.5 points
> 50 %	2 points

3.7 Green Products and Materials

a) Green Products

To encourage use of building services and mechanical and electrical (M&E) products certified by an approved local certification body. Structural components are excluded.

Examples of green products include:
- Chillers
- Auto-tube cleansing system
- Pumps
- Transformers

Credit Point Per Green Product			
Good	Very Good	Excellent	Leader
0.25	0.5	0.75	1.0

(Up to 2 points)

b) Green Materials

To encourage the use of non-structural building component products certified by an approved local certification body. Structural and M&E components are excluded.

Points will be awarded based on the weightage and the extent of coverage and impact (i.e. weightage x extent of coverage and impact).

1 point for high impact item and 0.5 point for low impact item, up to maximum 5 points.

Weightage Based on Extent of Environmental Friendliness of Products			
Good	Very Good	Excellent	Leader
0.25	0.5	0.75	1.0

Credit Point Based on Extent of Coverage and Impact of the Products	
High Impact	1 point
Low Impact	0.5 point

(Up to 5 points)

3.8 Recycling Facilities To encourage the provision of facilities or systems to carry out the following: a) Collection and storage of common recyclables such as paper, glass, metal and plastic in commingled or sorted form. b) Recycling of specialised waste stream such as electronic waste, light bulbs, fluorescent tubes, and food waste. c) Consolidation of horticultural waste for recycling The recycling facilities or systems provided should be applicable to the building type and level of occupancy. It should also be placed in a location convenient for building users, or close to the source of waste generation.	1 point 1 point for each specialised waste stream (Up to 2 points) 0.5 point
3.9 Storage Area for Recyclable Wastes To encourage the provision of proper dedicated storage area at a central location for recyclable wastes.	1 point
3.10 Promotion of Waste Reduction To promote and encourage waste reduction and recycling among tenants, building occupants and visitors in a building.	1 point per avenue of promotion (Up to 2 points)
3.11 Waste Monitoring To encourage the following waste collection practices in the building for continuous improvement on waste reduction: a) Quantifying and monitoring of the waste disposed b) Quantifying and monitoring of the waste recycled	1 point 1 point

Section 4 – SMART AND HEALTHY BUILDING	Green Mark Credit Points (40 Points)
4.1 Occupant Comfort To encourage the following which contribute towards ensuring occupant comfort: **a) Thermal Comfort** Maintain the indoor dry-bulb temperature within 23°C to 25 °C and the relative humidity <70% for consistent indoor conditions and comfort air-conditioning. **b) Temperature Control** Occupants are able to control the indoor temperature by zones according to their preference. The thermostat set point should not go below 23 ºC. **c) Post Occupancy Evaluation (POE)** A POE survey is conducted and corrective actions are taken accordingly to promote occupant satisfaction. The POE sample size should be at least 10% of the occupant population in the building, or at least 100 for more than 1,000 occupants or 10 for less than 100 occupants in the building. The standardised POE survey questionnaire is available at https://www.bca.gov.sg/GreenMark/others/POE_survey_template.xlsx **d) Indoor Air Quality (IAQ) Management** Adoption of IAQ management practices stated in *Workplace Safety and Health Guidelines – Management of Indoor Air Quality in Air-Conditioned Workplaces*. The appointed in-house IAQ manager should attend relevant IAQ courses and educate the facility management staff accordingly. The IAQ management framework flowchart in the Guidelines should also be used.	 1 point 0.5 point 2 points 2 points
4.2 Outdoor Air Control To encourage the use of the following to ensure sufficient and effective ventilation to a building's air-conditioned spaces and prevent contaminant build-up: **a) Dedicated Outdoor Air System** Provision of a dedicated outdoor air system, such as precool units, to encourage effective treatment of the outdoor air for cooling and dehumidification. **b) Demand Control Ventilation** Use of demand control ventilation strategies, such as provision of carbon dioxide (CO_2) sensors or equivalent devices, to regulate the quantity of fresh air supplied to the building's air-conditioned spaces.	 1 point 0.5 point

4.3 Enhanced Filtration Media To encourage the following for effective removal of harmful pollutants from the building's ventilation system: a) Provision of at least Minimum Efficiency Rating Value (MERV) 6 or equivalent filters for outdoor air filtration all the time, and at least MERV 14 or equivalent filters when the outdoor pollution level is in the unhealthy range in accordance with Ministry of Health's guidelines. OR b) Permanent provision of MERV 14 or equivalent filters to all pre-cool units (e.g. pre-cooled AHUs (PAHUs)) c) Permanent provision of MERV 14 or equivalent filters to all pre-cooled units and >90% coverage of AHUs (by nos.)	0.5 point 1 point 1.5 points
4.4 Indoor Contaminants To encourage the adoption of indoor contaminant pollution control measures and air treatment strategies that can safeguard the health of building occupants. **a) Ultraviolet Germicidal Irradiation (UVGI) System or Equivalent Airborne Disinfection Technologies** Provision of an UVGI system or equivalent in AHUs to help eliminate airborne infectious micro-organisms. The UV wavelength should be of 254nm and a safety interlock for maintenance access should be provided. **b) IAQ Display** Provision of display panels at each floor or tenancy indicating the following information to raise awareness among the tenants, building occupants and visitors on the building's indoor air conditions: • Temperature • Relative humidity • CO_2 concentration	Extent of Coverage (by nos.) of a building's AHUs: 30% to 50% 0.5point >50% 1 point (Up to 1 point) 0.5 point for each parameter (Up to 1.5 points)
4.5 Lighting Quality To encourage the following which contribute towards ensuring well-lit and comfortable spaces and minimising physiological discomfort for the building occupants and users: **a) Lighting Level** The measured indoor lighting levels should comply with the recommended illuminance (average lux level) stated in *SS 531 : 2006 Code of Practice for Lighting of Work Places Part 1 – Indoor Lighting* or *CP 38 : 1999 Code of Practice for Artificial Lighting in Buildings*	Extent of coverage: at least 90% of the occupied areas 1 point

b) Task Lights Provision of task lights for the building occupants and users at workstations to achieve task-appropriate illumination and flexibility for user adjustment and control	1 point
c) Flicker-free Light Fittings Provision of fluorescent luminaires and LED lightings that avoid flicker and stroboscopic effects: • High frequency ballasts (frequency >20kHz) for fluorescent luminaries • LED lighting with <30% flicker	1 point
d) Colour Rendering Index (CRI) Lighting should meet the minimum colour rendering index (Ra or CRI) stated in Clause 5 of *SS 531: 2006 Code of Practice for Lighting of Work Places*	1 point
4.6 Acoustics To ensure a basic level of acoustic comfort for occupant health and well-being by minimising noise and vibration from mechanical and electrical equipment. The measured indoor sound levels should comply with the recommended ambient sound levels in *SS 553 : 2009 Code of Practice for Air-Conditioning and Mechanical Ventilation in Buildings* or *CP 13 : 1999 Code of Practice for Air-Conditioning and Mechanical Ventilation in Buildings*.	1 point
4.7 Biophilic Features To encourage the provision of biophilic features in the building that improves the building occupant and users' physical and mental well-being through the following: a) Direct experience of nature (e.g. access to plants, air (sky garden), water(aquarium), etc.) b) Indirect experience of nature (e.g. images of nature, natural materials, texture, geometry, etc.)	1 point 1 point
4.8 Energy Monitoring **a) Electrical Sub-metering** To encourage the provision of electrical sub-meter to monitor and trend log major energy use systems in the building: • Air distribution equipment, such as AHUs and/or FCUs, to be displayed in kWh and kW/RT • Lighting for common areas • Lighting for non-common areas • Lift system • Escalator system • Carpark mechanical ventilation system • Any other major energy sub-systems	2 points for Air Distribution System 1 point each major energy use system (Up to 4 points)

b) Energy Portal and Dashboard To encourage the provision of an energy portal and/or dashboard, which presents the building's energy use data in a relevant manner, to the following groups: • Internal building and facility management team, in the form of a digital display or web-based and mobile applications • Building occupants and visitors, in the form of digital displays in common areas • Tenants, showing the total energy consumption of the building and the individual tenant consumption	 1 point 1 point 1 point
c) Building Management System (BMS) and Controllers with Open Protocol To encourage the use of BACnet, Modbus or any other non-proprietary protocol as the network of the building management system (BMS). The BMS shall be able to provide scheduled export of a set of any chosen data points with time stamp to commonly used file formats such as .csv or .xls.	 1 point
d) Connection to BCA Smart Chiller Portal To connect/provide the building chiller plant performance data to the BCA Smart Chiller Portal. The sampled data of 1-minute interval shall be grouped and transmitted automatically, at least once a day, to the portal using the REST API interface defined in Annex C.	 1 point
4.9 Demand Control To encourage the use of occupancy-based controls to monitor and regulate the temperature, airflow, or lighting brightness of the following spaces in the building to optimise the building's energy consumption for air-conditioning, mechanical ventilation (ACMV) and lighting. a) Common areas such as: • Toilets • Staircases • Corridors • Lift lobbies • Atriums b) Tenanted/ Normally occupied areas	 0.5 point for at least 50% coverage by each common area type (Up to 2 points) 1 point for every 25% coverage of occupied area (by area), such as offices, retail shops or hotel guest rooms (Up to 3 points)

4.10 Integration and Analytics To encourage the integrative use of data to optimise workflow or sustain high performance and energy efficiency in a building. **a) Basic Integration and Analytics** • Use adaptive control algorithms to improve equipment efficiency (e.g. adjust Cooling Tower approach based on outdoor Wet Bulb Temperature) • Identify systems (e.g. chiller plant, AHU) that deviate from statistically expected performance (e.g. raise an alert when the measured kW/RT efficiency of a chiller plant deviates beyond 10%) • Detect equipment that run beyond intended operating hours or routine settings (e.g. an AHU that runs past regular office hours) • Monitor equipment condition for preventive maintenance (e.g. monitoring of embedded sensors in chiller or VRF CU to predict mechanical wear and failure) • Detect fault and deviation from norms to find failed or improperly operating sensors or actuators (e.g. compare set points to actual parameters to find leaking valves or stuck dampers) **b) Advanced Integration and Analytics** • Whole system optimisation using a network of HVAC equipment (e.g. drive the pumps minimally to satisfy "thirstiest" valve) • Integration of sub-systems to optimise resource use or improve user experience (e.g. integration of ID card access system to a hot-desk scheme to compact space and energy use) • Use of Building Information Modelling (BIM) or similar applications that provide location-based visualisation of multiple sensors (e.g. energy & water use, spatial condition e.g. temperature, RH) • Participate in a Demand Response programme (e.g. to reduce energy use of HVAC equipment)	0.5 point each for basic feature (Up to 2 points) 1 point each for advanced feature (Up to 3 points)

Section 5 – ADVANCED GREEN EFFORT	Green Mark Credit Points (20 Points)
5.1 Accredited Green Facility Management Companies To encourage the engagement of Green Facility Management (FM) companies, accredited by the Singapore Green Building Council (SGBC) or equivalent, in the sustainable operation and maintenance of the building.	1 point
5.2 ETTV < 40W/m^2 To encourage good thermal performance of a building envelope to minimise heat gain into the building.	1 point
5.3 Demonstration of Better Air Distribution System Efficiency To encourage better air distribution system efficiency of less than 0.2 kW/RT (Baseline = 0.28 kW/RT). The efficiency should be demonstrated via an energy audit.	0.14 point for every percentage improvement from baseline Points awarded = 0.14 x (% improvement) - 4 (Up to 2 points)
5.4 Renewable Energy a) Further Electricity Replacement By On-site Renewable Energy b) Purchase of Renewable Energy From Licenced Electricity Retailers Minimum 5% of total building energy to be purchased from renewable energy sources and a minimum contract period of 3 years) c) Roof leasing for Photovoltaic installation	Additional 6 points beyond the point cap under part 2.9c for further percentage electricity replacement by renewable energy, based on the building's EUI 1 point 1.5 point
5.5 Thermal Comfort with Elevated Air Speed Use of innovative solutions, such as high temperature cooling with increased air speed, to achieve thermal comfort conditions while reducing energy consumption: • Demonstrate compliance with thermal comfort criteria (-0.5 < PMV < 0.5 and/or PPD < 10%) through ASHRAE 55, ISO 7730 or EN15251 methodologies, and energy savings through actual metering • Indoor temperature maintained at 26^{o}C and above	2 points
5.6 IAQ Surveillance Audit IAQ surveillance audit is conducted once every 3 years by an accredited laboratory under Singapore Accreditation Council with respect to the recommended IAQ parameters and acceptable limits stated in Table 1 of SS554: 2016 based on the reference methods.	2 points

<table>
<tr>
<td><u>5.7 Outdoor Airflow Monitoring System</u>

To measure and monitor the outdoor airflow volume in the following by permanent devices to ensure provision of sufficient ventilation for various spaces, in accordance with desired ventilation rates.

a) All precool units (e.g. PAHUs)

b) > 90% coverage (by nos.) of a building's all AHUs and/or FCUs</td>
<td>1 point

1 point</td>
</tr>
<tr>
<td><u>5.8 SGBC or equivalent Certified Air Filters</u>

Use of SGBC or equivalent certified air filters at all AHUs including PAHUs.</td>
<td>
<table>
<tr><th colspan="4">Credit Points</th></tr>
<tr><th>Good (1tick)</th><th>Very Good (2 ticks)</th><th>Excellent (3 ticks)</th><th>Leader (4 ticks)</th></tr>
<tr><td>0.25</td><td>0.5</td><td>0.75</td><td>1.0</td></tr>
</table>
</td>
</tr>
<tr>
<td><u>5.9 Indoor Air Quality Trending and Monitoring</u>

To provide permanent trend logging and monitoring of the following parameters, with at least 1 measuring point per floor and linked to a centralised system.

a) Temperature and relative humidity

b) At least one common indoor air pollutant such as formaldehyde, Total Volatile Organic Compounds (TVOC) or particulate matters</td>
<td>1 point

1 point for each parameter
(up to 3 points)</td>
</tr>
<tr>
<td><u>5.10 Local Exhaust and Air Purging System</u>

a) Local isolation and exhaust systems to remove the pollutants at source, e.g. photocopier room with exhaust system

b) Air purging system to replace contaminated indoor air with outdoor fresh air</td>
<td>0.5 point

0.5 point</td>
</tr>
<tr>
<td><u>5.11 Permanent M&V for Variable Refrigerant Flow</u> (<u>VRF) system</u>

a) Power meters installed for all condensing units of the VRF system

b) Provision of permanent measuring instruments for monitoring of the energy efficiency performance of the VRF condensing units and air distribution sub-system.

The installed instrumentation shall have the capability to calculate resultant system efficiency (i.e. KW/RT or Coefficient of Performance (COP)) within ±10% uncertainty. Each measurement system shall include the sensor, any signal conditioning, the data acquisition system and wiring connecting them.

All data are to be logged at 5-minute sampling time interval, recorded to at least 1 decimal point, and available for extraction for verification purposes.</td>
<td>1 point

2 points</td>
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<td><u>5.12 Complementary Certifications</u>

To encourage tenants in a building to take up certification of their tenanted areas or premises under the BCA Green Mark occupant-centric schemes
a) At least 1 tenant certified under a Green Mark occupant-centric scheme
b) The building achieves the BCA Green Mark Pearl Award
c) The building achieves the BCA Green Mark Pearl Prestige Award</td>
<td>

0.5 point
1 point
2 points</td>
</tr>
<tr>
<td><u>5.13 Display of BCA Green Mark Plaque and Decal</u>

To encourage display of the BCA Green Mark Plaque or Decal at a prominent location in the building, such as the foyer or main lobby.</td>
<td>

1 point</td>
</tr>
<tr>
<td><u>5.14 Efficient Hot Water System</u>

To encourage the best practice for hot water system operation, points will be awarded to buildings' Hot Water System Ratio (HWSR) is better than baseline. To drive the industry forward in monitoring the hot water system performance, points will be awarded for hot water system M&V.

Additional 2 points are available for Hot Water System Ratio (HWSR) better than baseline; another 0.5 point for Hot Water System M&V; 0.5 point for measuring heat loss.</td>
<td>
<table>
<tr><th>5.15</th><th>Description of criterion</th><th>Credit Points</th></tr>
<tr><td>a)</td><td>Hot Water System Ratio (HWSR) baseline is 1.45
1 Point for achieving HWSR of 1.45;
0.02 point for every percentage improvement in the HWSR better than 1.45
Point scored = 0.02 x (HWSR – 1.45)/1.45 X 100</td><td>1

1</td></tr>
<tr><td>b)</td><td>Provision of permanent measuring instruments for monitoring of Hot Water System Ratio</td><td>0.5</td></tr>
<tr><td>c)</td><td>Measure Heat loss from Hot Water system, can be from third party energy audit or permanent M&V</td><td>0.5</td></tr>
</table>
</td>
</tr>
<tr>
<td><u>5.15 Persistent Bio-Cumulative and Toxic (PBT) Free Lighting</u>

Provision of Persistent Bio-cumulative and Toxic (PBT) free lighting</td>
<td>

0.5 point for ≥ 90% of lighting fittings in the project</td>
</tr>
</table>

5.16 Adoption of Smart Facilities Management (FM)

To encourage the adoption of Smart FM in area such as M&E services, security, environmental services etc to improve workflow processes, increase productivity and enhance service delivery for sustainable operation and maintenance of the building.

a) Conduct a feasibility study using the 5-step SMART process template including cost benefit analysis (refer to "Technical Guide on Smart FM")

0.5 point

b) Implementation of smart technology solutions such as:
   - Usage of robotics for feedback and optimisation of processes (e.g. cleaning, security)
   - Usage of video monitoring coupled with facial recognition for incident detection in security function
   - Workflow automation to streamline FM services with feedback loop
   - Use of digital twin to monitor assets and enable predictive maintenance

Points Based on Impact of Smart Solutions (Up to 2.5 points)	
High Impact	1 point
Low Impact	0.5 point

5.17 Other Advanced Green Efforts

Buildings which demonstrate substantial and exemplary performance to a specific sustainability indicator or outcome addressed within Green Mark beyond what is specified in the criteria, assessed on a case-by-case basis.

Coverage	Impact	Credit Points
≥10% and < 30% of the project	Low	0.5 point per item
≥30% and <60% of the project	Medium	1 point per item
≥60% of the project	High	2 points per item

Annex A: Maximum Lighting Power Budget (including ballast loss)

Type of Usage	Maximum Lighting Power Budget (W/m^2)
Offices	15
Classrooms	15
Hotel guest room	15
Lecture theatres	15
Auditoriums / Concert halls	10
Shops / Supermarkets / Departmental stores (including general, accent & display lighting)	25
Restaurants	15
Lobbies / Atriums / Concourse	10
Stairs	6
Corridors	10
Toilets	15
Car parks	5
Electronic manufacturing and fine detail / Assembly industries	20
Medium and heavy industries	15
Warehouses / Storage areas	10

Annex B: REST API to Import Chiller Data (DRAFT)

Title	*REST API to insert chiller plant raw data*
URL	*e.g. https://bca_cesp.portal.com/api/ImportRawData*
Method	*The request type* **POST**
URL Params	*Not Required*
Data Params	*[* *{* *"BuildingId": "buildinga",* *"ObjectId": "CH",* *"ObjectNo": "1",* *"DataFieldId": "KW",* *"Value": "110",* *"Timestamp": "2016-01-16 02:15:01",* *"Key": "secretkey"* *},* *{* *"BuildingId": "uwctamp",* *"ObjectId": "* CHWP*",* *"ObjectNo": "1",* *"DataFieldId": "* CWST*",* *"Value": "11.40",* *"Timestamp": "2016-01-16 02:15:01",* *"Key": "secretkey* *"},* *]*
Success Response	**Example:** **Code:** 200
Error Response	***Code:** 400, if buildingId not valid* ***Code:** 402, if building object datafield mapping not valid* ***Code:** 403, if secrectkey for that building is not correct* ***Code:** 404, Other problem*
Notes	

Building Object Naming Dictionary (DRAFT)

Item	Type	Input	Remarks	Constraints
BuildingId	String	BuildingA	Building ID	1 to 50 character
ObjectId	string	CH	Chiller	1 to 50 character
		CHWP	Chiller Water Pump	1 to 50 character
		CWP	Condenser Water Pump	1 to 50 character
		CHWH	Chilled Water Header	1 to 50 character
		CWH	Condenser Water Header	1 to 50 character
		CT	Cooling Tower	1 to 50 character
		AIR	Air Distribution System	1 to 50 character
ObjectNo	numeric	1..10	Instance number	1 to 10
DataFieldId	String	CHWST	Chilled Water Supply Temperature	1 to 50 character
		CHWRT	Chilled Water Return Temperature	1 to 50 character
		CWST	Condenser Water Supply Temperature	
		CWRT	Condenser Water Return Temperature	
		CWF	Condenser Water Flow	
		CHWF	Chilled Water Flow	1 to 50 character
		KW	Power	1 to 50 character
Value	numeric	1..999999	Value of that point	decimal value
Timestamp	Cal + time	2016-01-16 02:15:01	Datetime format	yyyy-mm-dd hh:mm:ss
Unit	String			
Remarks	String			
Key	String	Secret key	Building secret key provided by Vendor	1 to 10 character