# DESIGN REFERENCE GUIDE

## Township

Version 2.0

June 2023

## Contents

## 1. About GreenRE

GreenRE Sdn Bhd is a wholly owned subsidiary of the Real Estate and Housing Development Association (REHDA). The GreenRE rating tool has been developed for the purposes as mentioned herein and may be subject to updating and/or modification in the future.



GreenRE Sdn Bhd
Wisma Rehda,
No.2C, Jalan SS5/6D,
47301 Petaling Jaya,
Selangor, Malaysia

## 2. Introduction

The GreenRE assessment scheme was established in 2013 and is a recognized green building rating system tailored for the tropical climate. GreenRE sets parameters and establishes indicators to guide the design, construction and operation of buildings towards increased energy effectiveness and enhanced environmental performance.

The intent of this Design Reference Guide for Township (referred to as “this Guideline”) is to establish environmentally friendly practices for the planning, design and construction of office interior, which would help to mitigate the environmental impact of building interior for new offices, existing operating offices and existing offices undergoing renovation. This tool is dedicated for township  other than retail and hospitality.

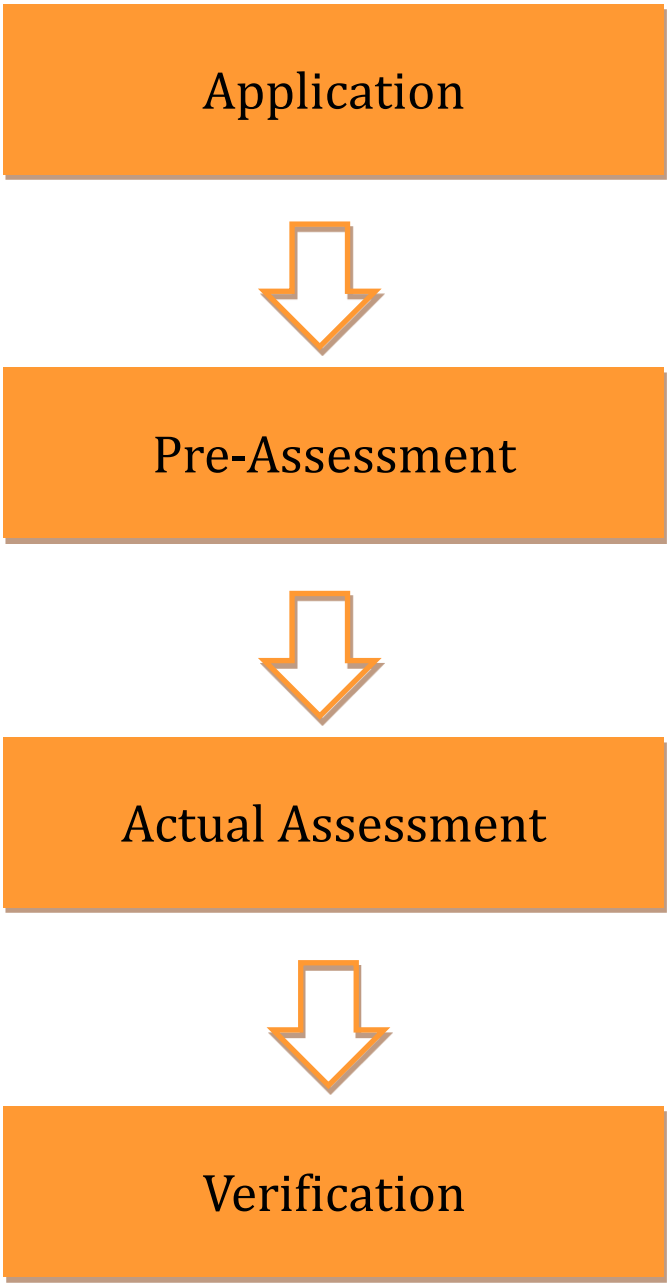
This Guideline is not intended to abridge safety, health, environmental or related requirements contained in other applicable laws, codes or policies administered by relevant authorities. Where there is a conflict between a requirement of this Guideline and such other regulations affecting the design, construction and operation of the project, the building regulations shall take precedence.

## 3. Revision Log

| Revision | Description | Date Effective |
|---|---|---|
| 1.0 | Issued for Implementation | 1st June 2015 |
| 2.0 | Issued for Implementation | June 2023 (Reference Guide) |

## 4. Certification Process

The GreenRE Township Certification process is as follows:




Submittal of application with relevant supporting documents for certification upon finalization of township design

A pre-assessment audit will be conducted to give the project team a better understanding of the criteria and evaluation of the certification level sought.

Actual assessment to be conducted once the design and documentary evidences (e.g., approved plan) are ready. After the actual assessment, our assessors will review the documents submitted and formalize report to management within four weeks.

Assessment process includes design and documentary reviews to verify if the township meets

(i) The intents of the criteria
(ii) The pre-requisite requirement for GreenRE Bronze, Silver, Gold and Platinum rating where applicable.
(iii) Letter of award showing the GreenRE rating will be issued at this stage.

Site verification to be conducted upon project completion.

Refer to page 6 for pre-requisite requirements.

A certificate will be issued at this stage.

## 5. GreenRE Township Rating System

Overview•

The GreenRE Township criteria consist of six (6) environmental impact categories namely:

(a) **Part 1 - Energy Efficiency:** This category focuses on the approach that can be used in the infrastructure and public amenities to optimise the energy efficiency of the township.

(b) **Part 2 - Water Management:** This category focuses on the selection of fittings for public amenities and strategies towards efficient water usage and management.

(c) **Part 3 - Material & Waste Management:** This category focuses on the design, practices and selection of materials and resources that would reduce the environmental impacts and the waste management strategies.

(d) **Part 4 - Environmental Planning:** This category focuses on the design strategies that would enhance the indoor environmental quality which include air quality, thermal comfort, acoustic control, and daylighting.

(e) **Part 5 - Green Buildings and Green Transport:** This category focuses on the public transportation network and availability of green rated buildings within the township.

(f) **Part 6 - Community and Innovation:** This category focuses on the community involvement and innovative features available for the benefit of the community.

These environment impact categories are broadly classified under two main grouping namely (I) Energy Related Requirements and (II) Other Green Requirements. Energy Related Requirements consist of Part 1- Energy Efficiency where credits are allocated for the various energy efficient designs, practices and features used. A minimum of 10 credits must be obtained from this group to be eligible for certification.

Other Green Requirements consist of Part 2 - Water Management; Part 3 – Material & Waste Management; Part 4 - Environmental Planning; Part 5 - Green Buildings and Green Transport, and Part 6 – Community and Innovation. A minimum of 50 credits must be obtained from this grouping to be eligible for certification.

## 7 GreenRE Award Rating

| Score | Rating |
|---|---|
| 101 and above | GreenRE Platinum |
| 91 to ≤ 100 | GreenRE Gold |
| 76 to ≤ 90 | GreenRE Silver |
| 60 to ≤ 75 | GreenRE Bronze |

## 7. GreenRE Assessment Criteria

### 7.1 Framework – GreenRE for Township

To achieve GreenRE Award

Pre-requisite & Mandatory Requirements
All relevant pre-requisite requirements for the specific GreenRE Rating are to be complied with

+

Energy Related Requirements
Minimum 10 credits

Other Green Requirements
Minimum 50 credits

**Part 1 – Energy Efficiency**
TS 1-1 Energy Efficiency for Infrastructure and Public Amenities
TS 1-2 On-site Energy Generation
TS 1-3 Site Planning and Building Orientation
TS 1-4 Energy Management System
TS 1-5 Minimise Energy Consumption during Off-Peak Hours

**Part 2 - Water Management**
TS 2-1 Water Efficient Fittings for Infrastructure and Public Amenities
TS 2-2 Stormwater Management
TS 2-3 Alternative Water Sources
TS 2-4 Water Efficient Landscaping
TS 2-5 Water Efficiency Management

**Part 3 – Material & Waste Management**
TS 3-1 Minimise Cut and Fill in Earthworks
TS 3-2 Sustainable Construction for Infrastructure and Public Amenities
TS 3-3 Sustainable Products for Infrastructure and Public Amenities
TS 3-4 Waste Reduction
TS 3-5 Waste Management and Segregation
TS 3-6 Waste Conveyance
TS 3-7 Waste Reuse and Processing

**Part 4 - Environmental Planning**
TS 4-1 Self Sufficiency and Accessibility within Township
TS 4-2 Green and Blue Spaces for the Public
TS 4-3 Microclimate Optimisation
TS 4-4 Outdoor Thermal Environment
TS 4-5 Site Selection
TS 4-6 Conservation and Integration of Existing Structures and Assets
TS 4-7 Habitat Conservation and Restoration
TS 4-8 Minimise Site Disturbance
TS 4-9 Environmental Management System
TS 4-10 Future Provision and Connections

**Part 5 – Green Buildings and Green Transport**
TS 5-1 Green Building within Township
TS 5-2 Green Urban Design Guidelines
TS 5-3 Green Transportation

**Part 6 – Community and Innovation**
TS 6-1 Stakeholder Engagement, Feedback and Evaluation
TS 6-2 Public Awareness, Education and Community Involvement
TS 6-3 Green Lease
TS 6-4 Intelligent Infrastructure
TS 6-5 Safe Environment
TS 6-6 Light Pollution Reduction
TS 6-7 Other Green Features and Innovation
TS 6-8 Embodied & Operational Carbon Calculation (Pre- Req)

## 7.2 Credit Allocation for Township Criteria

| Category | | Credit Allocation |
|---|---|---|
| **(I) Energy Related Requirements** | | |
| Minimum 10 Credits | **Part 1 – Energy Efficiency** | |
| | TS 1-1 Energy Efficiency for Infrastructure and Public Amenities | 8 |
| | TS 1-2 On-site Energy Generation | 6 |
| | TS 1-3 Site Planning and Building Orientation | 10 |
| | TS 1-4 Energy Management System | 5 |
| | TS 1-5 Minimise Energy Consumption During Off-Peak Hours | 1 |
| | **Category Score for Part 1 – Energy Efficiency** | **30** |
| **(II) Other Green Requirements** | | |
| TS Minimum 50 Credits (Part 2 to 6) | **Part 2 – Water Management** | |
| | TS 2-1 Water Efficient Fittings for Infrastructure and Public Amenities | 4 |
| | TS 2-2 Stormwater Management | 8 |
| | TS 2-3 Alternative Water Sources | 4 |
| | TS 2-4 Water Efficient Landscaping | 2 |
| | TS 2-5 Water Efficiency Management | 3 |
| | **Category Score for Part 2 – Water Management** | **21** |
| | **Part 3 – Material and Waste Management** | |
| | TS 3-1 Minimise Cut and Fill in Earthworks | 3 |
| | TS 3-2 Sustainable Construction for Infrastructure and Public Amenities | 7 |
| | TS 3-3 Sustainable Products for Infrastructure and Public Amenities | 5 |
| | TS 3-4 Waste Reduction | 2 |
| | TS 3-5 Waste Management and Segregation | 4 |
| | TS 3-6 Waste Conveyance | 2 |
| | TS 3-7 Waste Reuse and Processing | 4 |
| | **Category Score for Part 3 – Material and Waste Management** | **27** |
| | **Part 4 – Environmental Planning** | |
| | TS 4-1 Self Sufficiency and Accessibility Within Township | 5 |
| | TS 4-2 Green and Blue Spaces for the Public | 3 |
| | TS 4-3 Microclimate Optimisation | 4 |
| | TS 4-4 Outdoor Thermal Environment | 8 |
| | TS 4-5 Site Selection | 5 |
| | TS 4-6 Conservation and Integration of Existing Structures and Assets | 1 |
| | TS 4-7 Habitat Conservation and Restoration | 7 |
| | TS 4-8 Minimise Site Disturbance | 2 |
| | TS 4-9 Environmental Management System | 6 |
| | TS 4-10 Future Provision and Connections | 2 |
| | **Category Score for Part 4 – Environmental Planning** | **43** |
| | **Part 5 – Green Buildings and Green Transport** | |
| | TS 5-1 Green Buildings Within Township | 20 |
| | TS 5-2 Green Urban Design Guidelines | 4 |
| | TS 5-3 Green Transport Within Township | 11 |
| | **Category Score for Part 5 – Green Buildings and Green Transport** | **35** |
| | **Part 6 – Community and Innovation** | |
| | TS 6-1 Stakeholder Engagement, Feedback and Evaluation | 6 |
| | TS 6-2 Public Awareness, Education and Community Involvement | 7 |
| | TS 6-3 Green Lease | 2 |
| | TS 6-4 Intelligent Infrastructure | 3 |
| | TS 6-5 Safe Environment | 1 |
| | TS 6-6 Light Pollution Reduction | 2 |
| | TS 6-7 Other Green Features and Innovation | 5 |
| | TS 6-8 Operational and Embodied Carbon Calculation | 3 |
| | **Category Score for Part 6 – Community and Innovation** | **29** |
| **GreenRE Township Score** | | **185 (Max)** |

### 7.3 Pre-requisite Requirements for GreenRE Township

**1. Green Building within Township**

At least 10% by GFA of all buildings in the township or 5,000 $m^2$ (whichever is higher) to achieve corresponding GreenRE rating.

| GreenRE Township Rating | At least 10% by GFA of all buildings in township or 5,000$m^2$ (whichever is higher) |
|---|---|
| GreenRE Bronze | GreenRE Bronze |
| GreenRE Silver | GreenRE Silver |
| GreenRE Gold | GreenRE Gold |
| GreenRE Platinum | GreenRE Platinum |

**2. Minimum System Efficiency and Energy Monitoring (if using Township Cooling System)**

i. Where District Cooling System is being utilized in the township, the total system (chilled water plant) efficiency must achieve a minimum of **0.8 kW/RT** for **GreenRE Silver, Gold and Platinum** awards.

ii. Permanent instrumentation for monitoring of the district cooling system efficiency to be provided in accordance with the following requirement:

a. The installed instrumentation shall have the capability to calculate resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.

b. The location and installation of the measuring devices to meet the manufacturer's recommendation.

c. Data acquisition system to have a minimum resolution of 16 bit.

d. All data logging with capability to trend at 1 minute sampling time interval.

e. Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.

f. Temperature sensors with minimum accuracy of ±0.05 ºC at 0 ºC. 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 sides of the temperature sensor for verification of measurement accuracy.

iii. Annual submission of building energy consumption data and operating system efficiency of the district cooling system to GreenRE.

**3. Minimum score for GreenRE Gold and Platinum Township rating**

Achieve minimum score for the following criteria:

| Criteria | GreenRE Township Rating | |
|---|---|---|
| | Gold | Platinum |
| TS 3-2 Sustainable Construction for Infrastructure and Public Amenities | ≥ 3 Credits | ≥ 4 Credits |
| TS 3-3 Sustainable Products for Infrastructure and Public Amenities | ≥ 2 Credits | ≥ 3 Credits |
| Part 4 – Environmental Planning | ≥ 15 Credits | ≥ 21 Credits |

4. NRB 6-8(a) & (b) & (c)) calculation of operational and embodied carbon

5. Additional Pre- Requisite for Industrial Park/ Township as follow:

**(i) <u>TS 2-2 - Stormwater Management</u>**
Compliance with DOE requirements for discharge to public drainage to be shown.

**(ii) <u>TS 3-5 – Waste Management & Segregation</u>**
Waste management policy for hazardous and non-hazardous waste to be implemented.

Mandatory Requirements:

All the building in the township boundary certification to show compliance on the UBBL -38A as follow:

**1. Building Envelope – OTTV**

- The OTTV of the building envelope for a commercial building, having a **total air-conditioned area exceeding 4,000 m² and above should not exceed 50 W/m².**

**2. Roof**

- In the **case of an air-conditioned building**, the concept of Roof Thermal Transfer Value (RTTV) is applied if the roof is provided with skylight and the entire enclosure below is fully air-conditioned.

- For roofs with skylight, the maximum recommended RTTV is 25 W/m².

**3. Roof – U-Value**

- **The roof of the building** shall not have a thermal transmittance (U-Value) greater than that tabulated in Table 2-1.

**Table 2-1 Maximum U-Value for Roof (W/m²K)**

| Roof Weight Group | Maximum U-Value (W/m²K) |
|---|---|
| Light (Under 50 kg/m²) | 0.4 |
| Heavy (Above 50 kg/m²) | 0.6 |

## GreenRE Township Criteria

| Part 1 – Energy Efficiency | GreenRE Credits |
|---|---|
| **TS 1-1 Energy Efficiency for Infrastructure and Public Amenities**<br><br>Baseline: Minimum efficiency requirement of mechanical and electrical systems as stated in MS1525:2014 or equivalent local standards, or based on conventional systems, etc.<br><br>Baseline building energy efficiency index (EEI) based on national standard.<br><br>The mechanical and electrical systems to be included in the calculation shall include (but not limited to) the following:<br><br>(a) Street lighting / landscape lighting / carpark lighting / electric signage<br>(b) Water pumps<br>(c) Mechanical fans<br>(d) Lifts / escalators<br><br>***Pre-requisite Requirements***:<br>*Minimum System Efficiency and Energy Monitoring (if using District Cooling System)*<br><br>*(i) Where District Cooling System is being utilised in the township, the total system (chilled water plant) efficiency must achieve a minimum of 0.8 kW/RT for GreenRE Silver, Gold and Platinum awards.*<br><br>*(ii) Permanent instrumentation for monitoring of the township cooling system efficiency to be provided in accordance with the following requirement:*<br><br>*a) The installed instrumentation shall have the capability to calculate resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.*<br><br>*b) The location and installation of the measuring devices to meet the manufacturer's recommendation.*<br><br>*c) Data acquisition system to have a minimum resolution of 16 bit.*<br><br>*d) All data logging with capability to trend at 1 minute sampling time interval.* | 0.15 credits for every percentage of saving over the total energy consumption for infrastructure and public amenities (Excludes energy consumption for those under GreenRE for Buildings)<br><br>Credits awarded = 0.15 x (% improvement)<br><br>(Up to 8 credits) |

| | |
|---|---|
| *e) Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.*<br><br>*f) Temperature sensors with minimum accuracy of ±0.05 ºC at 0 ºC. 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 sides of the temperature sensor for verification of measurement accuracy.*<br><br>*(iii) Annual submission of building energy consumption data and operating system efficiency of the district cooling system to GreenRE.* | |
| **<u>TS 1-2 On-site Energy Generation</u>**<br><br>Encourage the on-site generation of energy for self-supply in the common areas of the township (e.g. street lighting, landscape lighting, etc).<br><br>(a) Energy generation by efficient combined system such as co-generation, tri-generation, etc.<br><br>(b) Generation of renewable energy.<br><br>(c) Energy recovery or regeneration. | Credits scored for every percentage replacement of electricity (based on total annual township energy consumption) by systems:<br><br>10% – 2 credits<br>15% – 4 credits<br>>20% – 6 credits<br><br>[Total 6 credits] |
| **<u>TS 1-3 Site Planning and Building Orientation</u>**<br><br>Minimise the heat gain / loss by use of passive solar strategies to reduce the energy demand.<br><br>(a) 50% or more of the plot have one axis within plus minus 22.5 degree of geographical north / south, and north / south length is at least as long or longer than the east / west length<br><br>OR<br><br>(b) 50% or more of the project building GFA have one axis of each building is at least 1.5 times longer than the other, and the longer axis is within 22.5 degrees of geographical north / south axis<br><br>(c) Reduction of the area of the west facing elevation of buildings, or application of inter-block shading strategies to west / east facing facades | <u>(a) Plot coverage</u><br>0.1 credit for every percentage improvement in the plot coverage<br>Credits awarded = 0.1 x (% improvement)<br><br>OR<br><br><u>(b) GFA coverage</u><br>0.15 credit for every percentage improvement in the GFA coverage<br>Credits awarded = 0.15 x (% improvement)<br>(Up to 4 credits)<br><br>50% - 1credit<br>90% - 2 credits<br>(based on the No. of the public building) |

| | |
|---|---|
| (d) Planning of buildings layout and massing to avoid blocking prevailing wind | 50% - 1credit<br>90% - 2credits<br>(based on the No. of the public building) |
| (e) Natural ventilation and day-lighting for public spaces | 2 credits<br><br>[Total 10 credits] |
| **<u>TS 1-4 Energy Management System</u>**<br><br>Design and incorporate energy monitoring and/or control system to facilitate energy consumption monitoring and management for public facilities | |
| (a) Provide with sub-metering with remote metering capability for subsystems > 15 kW or with electric loads > 100 kVA | 2 credits |
| (b) Provide with township level energy monitoring and automatic control systems for applicable energy consuming systems | 0.5 credit for each control system (minimum of 90% coverage of the system capacity) to public facilities, such as motion or photo sensors for lighting control, etc.<br>(Up to 2 credits) |
| (c) Provide with energy management plan at design stage such as setting targets, developing measures and strategies | 1 credit<br><br>[Total 5 credits] |
| **<u>TS 1-5 Minimise Energy Consumption During Off-Peak Hours</u>**<br><br>Design and incorporate energy optimisation plan (e.g. for night operation and weekends where there is little occupancy) to ensure only the essential energy consuming devices are running e.g. the system configuration optimised for night loads | 1 credit |
| **PART 1 – ENERGY EFFICIENCY**<br><br>**CATEGORY SCORE:** | Sum of GreenRE credits obtained from TS 1-1 to 1-4:<br><br>**30 Credits Maximum**<br><br>[**Minimum 10 credits**] |

<table>
<tr><th>Part 2 – Water Management</th><th>GreenRE Credits</th></tr>
<tr><td><u>TS 2-1 Water Efficient Fittings for Infrastructure and Public Amenities</u><br><br>Encourage the use of water efficient fittings covered SPAN's Water Efficiency Products Labelling Scheme (WEPLS) or equivalent water labelling schemes<br><br>(a) Basin taps and mixers<br>(b) Flushing cisterns<br>(c) Shower taps, mixers or showerheads<br>(d) Sink/ bib taps and mixers<br>(e) Urinals and urinal flush valves</td><td><table><tr><td colspan="3">Rating based on WEPLS</td></tr><tr><td>Efficient</td><td>Highly Efficient</td><td>Most Efficient</td></tr><tr><td>1</td><td>2</td><td>4</td></tr></table><br>Credits awarded based on the number and water efficiency rating of the fitting type used<br><br>OR<br><br>Based on the water saving compared to baseline model (Not rated fitting)<br><br>20% - 1 credit<br>30% - 2 credits<br>40% -3 credits<br>50% - 4 credits<br>[Total 4 credits]</td></tr>
<tr><td><u>TS 2-2 Stormwater Management</u><br><br>Encourage the treatment of stormwater run-off before discharge to public drains<br><br>Provisions of the stormwater management features or design features as recommended in Urban Stormwater Management Manual for Malaysia (MASMA) design guidelines<br><br>Pre-requisite : For Industrial Parks / Townships, compliance with DOE requirements for discharge to public drainage to be shown.</td><td>Credits scored based on the % of runoff from impervious areas within the site<br><br>OPTION A – Applicable only for the whole township including public realm, infrastructure and individual land parcels.<br><br>10-35% = 2 credits<br>35-50% = 5 credits<br>>50% = 8 credits<br><br>OR<br><br>OPTION B – Applicable for the whole township excluding individual land parcels.<br>25-50% = 2 credits<br>50-70% = 5 credits<br>>70% = 8 credits<br><br>[Total 8 credits]</td></tr>
<tr><td><u>TS 2-3 Alternative Water Sources</u><br><br>Collection and use of alternative water sources for non-potable use such as irrigation, washing and water features to reduce use of potable water. Water sources can include rainwater, greywater and recycled water from approved sources.<br><br>Credits will be pro-rated based on the effectiveness of use</td><td>100% of replacement using non-potable water = 4 credits<br><br>75% of replacement using non-potable water = 3 credits<br><br>50% of replacement using non-potable water = 2 credits<br><br>30% of replacement using non-potable water = 1 credits<br><br>[Total 4 credits]</td></tr>
</table>

| | |
|---|---|
| **TS 2-4 Water Efficient Landscaping**<br><br>Reduce the water demand by selecting drought resistant plants in landscaping design | 50% - 1 credit<br>80% - 2 credits<br><br>[Total 2 credits] |
| **TS 2-5 Water Efficiency Management**<br><br>Design and incorporate water efficiency management plans to reduce the demand of water by public facilities and in common areas<br><br>(a) Provide the use of private water meters and leak detection system to monitor the major water usage e.g. irrigation, water features and swimming pools, etc<br><br>(b) Targets to improve public area water performance should be set. To show intent, measures and implementation strategies of water efficiency improvement plans over the next three years | 1 credit for provision of individual sub meters; 2 credits for sub-meters linked to township management system<br><br>1 credit<br><br>[Total 3 credits] |
| **PART 2 – WATER EFFICIENCY**<br><br>**CATEGORY SCORE:** | Sum of GreenRE credits obtained from TS 2-1 to 2-5:<br><br>**21 credits Maximum** |

<table>
<tr><th>Part 3 – Material and Waste Management</th><th>GreenRE Credits</th></tr>
<tr><td><u>TS 3-1 Minimise Cut and Fill in Earthworks</u><br><br>Encourage reduction in the quantity of excavated materials removed or transported into the township by optimising the use of cut and fill material removed during earthworks/ land preparation works for the township<br><br>(a) Reusing of at least 50% of the topsoil<br><br>(b) Reusing of at least 50% cut and fill material</td><td><br><br><br><br><br>1 credit<br><br>2 credits<br><br>[Total 3 credits]</td></tr>
<tr><td><u>TS 3-2 Sustainable Construction for Infrastructure and Public Amenities</u><br><br>Encourage recycling and the adoption of designs, practices and materials that are environmentally friendly and sustainable in the construction of infrastructure and public amenities<br><br>(a) Use of sustainable and recycled materials<br><br>(i) Green Cements with approved industrial by-product (such as Ground Granulated Blast Furnace Slag (GGBS), silica fume, fly ash) to replace ordinary Portland Cement (OPC) by at least 10% by mass for superstructural works.<br><br>(ii) Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS) from approved sources to replace coarse and fine aggregates for concrete production of main building elements<br><br><u>Note</u>: For structural building elements, the use of RCA and WCS shall be limited to maximum 10% replacement by mass of coarse/ fine aggregates respectively or as approved by the relevant authorities.<br><br>(b) Recycle or salvage of non-hazardous construction waste by weight<br><br>Or<br><br>(c) Recycled content in construction materials other than part TS3-2(a) that has been made from pre and/or post-consumer materials<br><br><u>Pre-requisite Requirement</u>:<br>Minimum score under this criterion:<br>GreenRE Gold ≥3 credits<br>GreenRE Platinum ≥4 credits</td><td><br><br><br><br><br>2 credits<br><br><br><br>Extent of Coverage: The total quantity used (in tonnage) for replacement of coarse or fine aggregates must not be less than the minimum usage requirement that is [0.03 x Gross Floor Area (GFA in m2)]<br><br><table><tr><th>Quantity of RCA / WCS</th><th>Credits Allocation</th></tr><tr><td>≥ 0.5 times (0.5X) minimum usage requirement</td><td>1</td></tr><tr><td>≥ 1X minimum usage req.</td><td>2</td></tr><tr><td>≥ 1.5X minimum usage req.</td><td>3</td></tr><tr><td>≥ 2X minimum usage req.</td><td>4</td></tr></table><br>(Up to 4 credits for TS 3-2(a)(i) and (a)(ii))<br><br>1 credit for 10%<br>2 credits for 20%<br>3 credits for 30%<br><br>Or<br><br>2 credits for 10%<br>3 credits for 15%<br><br>(Up to 3 credits)<br><br>[Total 7 Credits]</td></tr>
</table>

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<tr>
<td><u>TS 3-3 Sustainable Products for Infrastructure and Public Amenities</u><br><br>Promote use of environmentally friendly products that are certified under by approved local certification body and are applicable to infrastructure works and public amenities (including street furniture)<br><br>Pre-requisite Requirement:<br><br>Minimum score under this criterion:<br>GreenRE Gold ≥2 credits<br>GreenRE Platinum ≥3 credits</td>
<td>
<table>
<tr><td colspan="3">Weightage based on the extent of environmental friendliness of products</td></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>
<br>Credits scored based on the weightage and the extent of coverage and impact<br><br>1 credit for high impact item<br>0.5 credit for low impact item<br><br>[Total 5 credits]
</td>
</tr>
<tr>
<td><u>TS 3-4 Waste Reduction</u><br><br>Minimise waste generation in a sustainable manner, covering all kinds of waste including commercial waste (e.g. paper waste), construction waste, etc</td>
<td>1 credit for each item monitored and reduced (Up to 2 credits)<br><br>[Total 2 credits]</td>
</tr>
<tr>
<td><u>TS 3-5 Waste Management and Segregation</u><br><br>Encourage waste recycling within township to reduce waste going to landfill. Promote proper disposal of waste and provide waste management infrastructures<br><br>(a) Provision of at least one recycling station at the township level dedicated to the separation, collection and storage of recyclable materials such as paper, glass, plastics and metals<br><br>(b) Provision of at least one drop-off point for potentially hazardous waste such as paints, solvents, batteries<br><br>(c) Provision of litter receptacles with integrated recycle containers at public areas (including at public amenities)<br><br>(d) Develop a community waste strategy and education programme e.g. promotional materials such as posters, circulars and provision of recycling bags to promote waste sorting, collecting and recycling of waste<br><br>Pre-requisite : For Industrial Parks / Townships, waste management policy for hazardous and non-hazardous waste to be implemented.</td>
<td>1 credit for every item of requirement that is met<br><br>[Total 4 Credits]</td>
</tr>
<tr>
<td><u>TS 3-6 Waste Conveyance</u><br><br>Reduce the negative impact on environment during waste conveyance, such as use of odourless pneumatic conveyance system, specific waste transport design to minimise the disturbance</td>
<td>1 credit for low impact applications<br>2 credits for high impact applications<br><br>[Total 2 Credits]</td>
</tr>
</table>

| | |
|---|---|
| | |
| **TS 3-7 Waste Reuse and Processing**<br><br>Encourage use of environmentally friendly waste processing system<br><br>(a) Provision of local composting (kitchen and garden wastes) /chipping facilities within the boundary of the development and / or at strategic locations. Compost should be made available to local users (building occupiers, owners, residents, maintenance firms)<br><br>(b) Use of organic waste for energy generation e.g. through bio-methanisation<br><br>(c) Waste water recycling treatment plant | <br><br><br>Up to 2 credits<br><br><br><br>Up to 2 credits<br><br><br>2 credits for high impact applications,<br>1 credit for low impact applications<br><br>[Total 4 Credits] |
| **PART 3 – WASTE EFFICIENCY**<br><br>**CATEGORY SCORE:** | Sum of GreenRE Credits obtained from TS 3-1 to 3-5:<br><br>**27 Credits Maximum** |

| Part 4 – Environmental Planning | GreenRE Credits |
|---|---|
| **<u>TS 4-1 Self-Sufficiency and Accessibility Within Township</u>**<br><br>Ensure that a diverse range of facilities needed to meet daily needs are suitably incorporated in the masterplan and can be accessed suitably to minimise vehicle trips or distance travelled. Increase the accessibility to key facilities by ensuring that they are sited in accordance to the local planning guidelines<br><br>*[In the absence of local planning guidelines, the following standards/ catchment radius shall apply:*<br><br>*I. Basic Retail (e.g. Hawker centres, local shops, markets) 400m*<br>*II. Community & Leisure Facilities (e.g. 3G exercise facilities, hardcourts, swimming pools, children's playground) 400m*<br>*III. Health Facilities (Pharmacy / GP / Polyclinic, Dentist) 400m*<br>*IV. Educational facilities (e.g. Primary Schools, Secondary Schools excluding tertiary institutions) 800m*<br>*V. Communal facilities (e.g. Child care centres/ pre-schools/ kindergartens, elder care centres, community centre, Resident's committee centre, public squares) 800m*<br>*VI. Employment Centres (e.g. mixed rental Offices / Light industry) 800m*<br>*VII. Residential areas (e.g. mixed income housing)*<br>*VIII. Other supporting amenities (Post office, ATM, Postal box) 800m*<br>*IX. Place of worship 1000m]*<br>*X. Hotels (only for commercial townships)* | 1 credit for each facility applicable to the masterplan and easily accessible by public transport<br><br>(Up to 5 credits)<br><br>[Total 5 credits] |
| **<u>TS 4-2 Green and Blue Spaces for the Public</u>**<br><br>Provide sufficient green and blue spaces for residents and occupants<br><br>(a) Parks, green spaces or water body at least 800 $m^2$ within 400m walking distance<br><br>(b) Interconnectivity of green / blue spaces for public and biodiversity<br><br>(c) Adopt native plant strategies in landscape design - must demonstrate that >60 % of the trees and shrubs are native | 1 credit for every item of requirement that is met<br><br>[Total 3 Credits] |

| | |
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| **TS 4-3 Microclimate Optimisation**<br><br>Promote design optimisation, including site planning and building massing, for better micro-climate, such as use of natural planting and water body to optimise microclimate, through modelling and simulation, verifying by field measurements of major climate data before and after the development:<br><br>(a) Solar analysis (sun path OR solar insolation simulation)<br>(b) Ambient temperature simulation<br>(c) Wind Speed<br>(d) Wind Direction | 1 credit each for design optimisation<br><br>1 credit each for field measurement<br><br>[Total 4 Credits] |
| **TS 4-4 Outdoor Thermal Environment**<br><br>Encourage to use any combination of following strategies to improve the outdoor thermal comfort and reduce heat island effect<br><br>(a) Design and simulate to enable air flow through the development (CFD analysis or wind tunnel testing)<br><br>(b) Use of building vegetation, vegetated walls and green roofs (minimum 20% of the plot area)<br><br>(c) Street sidewalks/ pedestrian walkways shaded over 40%<br><br>(d) Provide shade for open structures such as covered walkways, vine pergolas > 50%<br><br>(e) Use of permeable paving materials with Solar Reflectance Index (SRI) > 29 for at least 50% of the hardscape area (Gravel and wood chippings also encouraged to hardscape areas)<br><br>(f) Open grid pavement system (at least 50% pervious) for pedestrian paths at green spaces> 40%<br><br>(g) Provide shading for open air carparks > 50%<br><br>(h) Avoid building heat exhaust to pedestrian walkways - Exhausts if fronting the public realm must be >5m above pedestrian walkways<br><br>(i) Any other suitable strategy | 2 credits for (a)<br><br>1 credit each for (b) to (i)<br><br>(Up to 6 credits) |
| **TS 4-5 Site selection**<br><br>(a) Avoid use of land with high agricultural or ecological value.<br><br>(b) Use of brownfield sites or reclaimed land, reducing the use of greenfield sites<br><br>(c) Proper remediation measures carried out on contaminated land to restore the land for use | 1 credit for (a)<br>(at least 90% of the township area)<br><br>For (b) Area of site which is previously built-on:<br>100% - 1 credit<br>50% - 0.5 credit<br><br>1 credit for (c) |

| | |
|---|---|
| (d) Flood risk assessment – demonstrate that the buildings are located in an area of low probability of flooding OR the development is appropriately flood resilient and resistant including safe access and escape routes<br><br>*Notes:*<br>*1) There must be no vulnerable building uses in the flood plain area such as emergency dispersal depots (police, fire, ambulance), or installations holding, using or containing hazardous substances.*<br><br>*2) Infrastructure and services planning for overall platform levels, roads, drainage and sewerage must be demonstrated.* | 2 credits if 100% of buildings are in an area of low probability of flooding / non-flood plain, OR demonstrates flood mitigation and escape routes<br><br>1 credit for 75% of buildings<br>0.5 credit for 50% of buildings<br><br>[Total 5 Credits] |
| **TS 4-6 Conservation an Integration of Existing Structures and Assets**<br><br>Conservation, preservation or restoration of historic remains, or buildings, or natural spaces or views that characterise and have local or community importance<br><br>*Note: Gazetted buildings will not be included.* | 1 credit<br><br>[Total 1 Credit] |
| **TS 4-7 Habitat Conservation & Restoration**<br><br>Determine the ecological value of the habitats in and around the site in order to conserve and enhance the biodiversity and prevent deforestation<br><br>(a) Conduct an Environmental Impact Assessment or Biodiversity Impact Assessment to identify habitats, migration routes and potential damage from the development, including justification of developmental benefits versus the potential ecological losses and mitigation measures<br><br>(b) Species protection plan or plans to increase the local species diversity<br><br>(c) Prevent the loss of greenery in the township: Greenery area to be calculated on plan before and after project construction. | 2 credits for (a)<br><br>1 credit for (b)<br><br>Part (c)<br>No change – 1 credit<br>5% GnP improvement 2 credits<br>10% GnP improvement 4 credits<br><br>[Total 7 Credits] |
| **TS 4-8 Minimise Site Disturbance**<br><br>Minimise negative impact on the site environment by constraining construction activities.<br><br>Reduce site clearance and deforestation by conserving at least 20% of the mature trees<br>(Transplanting may be considered) | 2 credits<br><br>[Total 2 Credits] |

| | |
|---|---|
| **TS 4-9 Environmental Management System**<br><br>Encourage the planning, design and management integration to adopt an environmentally friendly management system and practices during development<br><br>(a) Conduct site analysis and assessment before township development<br><br>(b) Developer, master planner, and major contractor that are ISO 14000 certified<br><br>(c) Project team comprises one Certified GreenRE Acredited Profesional (GreenREAP)<br><br>(d) Environmental policy with measurable targets & programmes with management review and corrective action records<br><br>(e) For Industrial Parks / Townships, implementation of Pollution Control Plan | 1 credit<br><br>0.5 credit for each party (up to 2 credits)<br><br>1.0 credit for GreenREAP<br><br>1 credit<br><br>1 credit<br><br>[Total 6 Credits] |
| **TS 4-10 Future Provision and Connections**<br><br>To actively encourage the future adaptability and flexibility of the site, including expansion<br>Suitable design features have been specified to allow for future installation including:<br><br>(a) Utilities expansion and distribution upgrades (Gas, electricity, water, cooling)<br><br>(b) Transport and infrastructure expansion plans<br><br>(c) Others | 1 credit for showing potential of expansion for utilities expansion and distribution.<br><br>1 credit for demonstration that other elements have been considered.<br><br>[Total 2 Credits] |
| **PART 4 – ENVIRONMENTAL PROTECTION CATEGORY SCORE:** | Sum of GreenRE Credits obtained from TS 4-1 to 4-10:<br><br>**42 Credits Maximum** |

<table>
<tr><th>Part 5 – Green Buildings and Green Transport</th><th>GreenRE Credits</th></tr>
<tr><td>

**TS 5-1 Green Buildings Within Township**

Encourage the adoption of green building practices in building design, construction and retrofitting within the township (includes buildings assessed under GreenRE for New Developments and GreenRE for Existing Buildings)

Applies to balance of building GFA above pre-requisite.

***Pre-requisite Requirement**:*

*At least 10% by GFA of buildings in the township or 5,000 sqm (whichever is higher) to achieve the corresponding GreenRE rating.*

<table>
<tr><th>GreenRE Township Rating</th><th>Minimum 10% by GFA of buildings in the township or 5,000 sqm (whichever is higher) to achieve corresponding GreenRE rating</th></tr>
<tr><td>GreenRE Bronze</td><td>GreenRE Bronze</td></tr>
<tr><td>GreenRE Silver</td><td>GreenRE Silver</td></tr>
<tr><td>GreenRE Gold</td><td>GreenRE Gold</td></tr>
<tr><td>GreenRE Platinum</td><td>GreenRE Platinum</td></tr>
</table>

</td><td>

GreenRE Building Credits (GRBc)

<table>
<tr><td>GRB Award Level</td><td>Weightage</td><td>GRBC = Weightage*GFA percentage %</td></tr>
<tr><td>Platinum</td><td>0.20</td><td>C1 = 0.20* % GFA of GreenRE Platinum buildings</td></tr>
<tr><td>Gold</td><td>0.15</td><td>C2 = 0.15* % GFA of GreenRE Gold buildings</td></tr>
<tr><td>Silver</td><td>0.10</td><td>C3 = 0.10* % GFA of GreenRE Silver buildings</td></tr>
<tr><td>Total</td><td colspan="2">GRBP = C1 + C2 + C3</td></tr>
</table>

[Total 20 credits]

</td></tr>
<tr><td>

**TS 5-2 Green Urban Design Guidelines**

Formulation of green urban design guidelines to ensure that key green features at the township level are carried through to development at the individual parcel level

(a) For all land parcels in the township

(b) For all land parcels to be sold to other sub-developers

(c) For strategic land parcels to be sold to other sub-developers

</td><td>

4 credits

2 credits

1 credit

[Total 4 Credits]

</td></tr>
<tr><td>

**TS 5-3 Green Transport Within Township**

General:

(a) Conduct Traffic Modelling for the township to assess and make improvements to the township master plan

(b) Compact and walkable township pattern for master plan; major building entrances with good access to nearest LRT or bus stops in accordance to local planning guidelines or within a 500m walking distance, with sheltered and connected linkage.

Public Transport:

(c) Transit options connecting outwards from the main LRT nodes

(d) Provide dedicated shuttle services and facilities to mass transit

Bicycle:

Promote cycling as a real alternative to cars for shorter journeys

</td><td>

2 credits for (a)

Part (b) will be assessed at Masterplan level to determine the overall efficiency of the township, up to 2 credits.

1 Credit for each Item (c) to (l)
(Up to 7 Credits)

[Total 11 Credits]

</td></tr>
</table>

| | |
|---|---|
| (e) Network of bicycle lanes and routes that are safe, well-lit and segregated with direct links to key areas and routes<br>(f) Provision for secure and sheltered bicycle facilities to public amenities<br><br><u>Car Parking:</u><br>(g) Reduce carpark footprint by employing underground or multi-storey carpark etc.<br>(h) > 10% of open-air parking spaces can be designated for flexible use when not being used for parking, e.g. market stalls, play areas<br>(i) Provide hybrid / electric vehicle refuelling / recharge stations<br><br><u>Pedestrian:</u><br>(j) Universal design features (barrier-free accessibility) to improve the accessibility for the physically challenged<br>(k) Way finding strategies<br><br><u>Cargo Delivery Route and Proximity</u><br><br>(l) Accessible from major highway outlets and /or within proximity to major cargo services (i.e airport, seaport, railway station). Project to be within 10km of these facilities | |
| **PART 5 – GREEN BUILDINGS AND GREEN TRANSPORT**<br><br>**CATEGORY SCORE:** | Sum of GreenRE Credits obtained from TS 5-1 to 5-3:<br><br>**36 Credits Maximum** |

| Part 6 – Community and Innovation | GreenRE Credits |
|---|---|
| **TS 6-1 Stakeholder Engagement, Feedback and Evaluation**<br><br>(a) Conduct residents/ building occupants' satisfaction survey or engage in public consultation exercise to solicit feedback to enhance the quality of the living environment in common facilities / public amenities. Alternatively, provide effective feedback channels (e.g. hotlines, emails, etc) for residents to take ownership of the township<br><br>(i) At Design Phase<br>(ii) During construction / Post completion<br><br>(b) Public consultation / feedback sessions to include the following key stakeholders:<br><br>• Public sector / government agencies<br>• Community / residents committee<br>• NGOs<br>• Professional bodies<br>• Trade unions<br><br>(c) Provide a proper evaluation of the feedback / survey<br><br>(d) Release of findings and feedback received from the public consultation exercise or residents/ building occupants survey, including the list of follow-up actions taken | (a) 1 credit for consultation with stakeholders during construction / post completion (based on extent of consultation and community involvement)<br><br>(b) 1 credit for consultation of at least two key stakeholder group<br><br>(c) 1 credit for providing proper evaluation of feedback/ survey findings<br><br>(d) 1 credit for release of findings and feedback received. Additional 2 credits for addressing follow-up actions<br><br>[Total 6 Credits] |
| **TS 6-2 Public Awareness, Education and Community Involvement**<br><br>To encourage and promote sustainable lifestyle and integration within the township through the production of a dedicated outreach or education programme to increase public awareness on environmental sustainability and green features of the township<br><br>(a) User guide brochures, information portals and facilities (such as visitor centres and exhibits) should be provided where appropriate to facilitate public awareness and education.<br>These areas may include:<br>• Online energy efficiency and energy tracker<br>• Refuse collection<br>• Recycling facilities<br>• Water conservation and usage<br>• Environmental technologies and info<br>• Local transport information<br>• Local amenities and local information<br>• Community groups and activities<br>• Religious building locations<br>• Biodiversity of the area | Up to 2 credits can be scored based on extent of outreach or education programmes and contents. |

| | |
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| (b) Encourage residents/ building occupants to participate in green activities | 2 credits for at least 1 activity per year<br><br>Additional 1 credit for each additional green activity organised per year<br>(Up to 3 credits)<br><br>[Total 7 Credits] |
| **TS 6-3 Green Lease**<br><br>Master developer to encourage green lease as an alternative to regular economic rental models within the township. | 2 credits<br><br>[Total 2 Credits] |
| **TS 6-4 Intelligent Infrastructure**<br><br>(a) Provide easy access to high-speed communications infrastructure (digital, fibre optic, etc) and provisions to allow for future growth and maintenance<br><br>(b) Provision of public access to intelligent transport information, including transit routes and schedules, carparking lot availability, amenities nearby, etc. so as to reduce the transport demand | 2 credits<br><br>1 credit<br><br>[Total 3 Credits] |
| **TS 6-5 Safe Environment**<br><br>Design for good natural surveillance of public spaces | 1 credit<br><br>[Total 1 Credit] |
| **TS 6-6 Light Pollution Reduction**<br><br>Minimise light trespass from site, only light areas as required for safety and comfort | 2 credits<br><br>[Total 2 Credits] |
| **TS 6-7 Other Green Features and Innovation**<br><br>Encourage the use of other green features which are innovative and have positive environmental Impact<br><br>Examples:<br>• Dedicated bus and tram lanes on public roads<br>• Car-free township<br>• Use of pre-cast / pre-fabricated construction materials for infrastructure and public amenities<br>• Common services tunnel<br>• Adoption of local labour to ensure economic sustainability | 2 credits for each high impact item<br>1 credit for each low impact item<br><br>(Up to 5 credits)<br><br>[Total 5 Credits] |
| **TS 6-8 Operational & Embodied Carbon Calculation**<br><br>a) Recognise the carbon emission based on operational carbon footprint computation of the building comprising energy [B6] and water consumption [B7]. | 1 credit |

| | |
|---|---|
| b) Calculation of product stage embodied carbon based on following building materials [A1-A3]:<br><br>• concrete<br>• steel<br>• bricks<br>• cement<br>• steel and metal | 0.5 credit |
| c) Calculation of construction stage embodied carbon [A4-A5] | 0.5 credit |
| d) Reduction from reference embodied carbon (for Ready Mix Concrete, Cement, Steel Reinforcement, Bricks, Steel & Metal) | >10% 0.5 credit<br>>30% 1 credit<br><br>(Up to 3 credits) |
| **PART 6 – COMMUNITY AND INNOVATION**<br><br>**CATEGORY SCORE:** | Sum of GreenRE Credits obtained from TS 6-1 to 6-8:<br><br>**29 Credits Maximum** |

| | |
|---|---|
| Part 1- Energy Efficiency | TS 1-1 Energy Efficiency for Infrastructure and Public Amenities<br>TS 1-2 On-site Energy Generation<br>TS 1-3 Site Planning and Building Orientation<br>TS 1-4 Energy Management System<br>TS 1-5 Minimise Energy Consumption during Off-Peak Hours |

## TS 1-1 ENERGY EFFICIENCY FOR INFRASTRUCTURE AND PUBLIC AMENITIES

| | |
|---|---|
| **Objectives** | Site wide energy modelling or calculation to include energy demand and operating carbon emission of project baseline and proposed design |
| **Applicability** | Applicable to all infrastructure and public amenities in the township manage by the management (exclude authority scope). The mechanical and electrical system to be included (but not limited to) the following:<br><br>a) Street lighting / landscape lighting / carpark lighting /electric signage<br>b) Water pumps<br>c) Mechanical Fans<br>d) Lifts / Escalators<br><br>All public amenities and infrastructure to exclude authority scope. |
| **Baseline Standard** | As specified in the MS1525: 2019 |
| **Requirements** | a) 0.15 credits for every percentage of saving over the total energy consumption for infrastructure and public amenities (Excludes energy consumption for those under GreenRE for Buildings)<br><br>Credits awarded = 0.15 x (% improvement)<br><br>(Up to 8 credits) |
| **Prerequisite Requirements** | • Minimum System Efficiency and Energy Monitoring (if using District Cooling System)<br><br>• Where District Cooling System is being utilised in the township, the total system (chilled water plant) efficiency must achieve a minimum of 0.8 kW/RT for GreenRE Silver, Gold and Platinum awards.<br><br>• Permanent instrumentation for monitoring of the township cooling system efficiency to be provided in accordance with the following requirement:<br><br>• The installed instrumentation shall have the capability to calculate resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.<br><br>• The location and installation of the measuring devices to meet the manufacturer's recommendation.<br><br>• Data acquisition system to have a minimum resolution of 16 bit.<br><br>• All data logging with capability to trend at 1 minute sampling time interval.<br><br>• Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent.<br><br>• Temperature sensors with minimum accuracy of ±0.05 ºC at 0 ºC. 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 sides of the temperature sensor for verification of measurement accuracy.<br><br>• Annual submission of building energy consumption data and operating system efficiency of the district cooling system to GreenRE. |

<table>
<tr><td>Documentary Evidences</td><td><u>Energy Improvement</u><ul><li>Extracts of tender specification showing provision of related mechanical & electrical features, relevant chiller system & its permanent monitoring instrumentation.</li><li>Detailed calculations of the overall improvement in equipment/system efficiency of the air-conditioning plants, street lighting/landscape lighting, water pumps, mechanical fans and lift / escalator.</li><li>All related layout and schematic drawings for airconditioned system, lighting, water pumps, mechanical fans and lift / escalator.</li><li>Calculation of the Energy Efficiency Index (EEI) using the pre-determined daily usage pattern and in the prescribed tabulated format.</li><li>Detail calculation including operation hours for the estimated energy load for each component in the building etc.: lighting, air conditioning system, pump, receptacle load.</li><li>Technical product information on the energy efficient features.</li></ul></td></tr>
<tr><td>References</td><td><ul><li>MS1525: 2019 - Energy Efficiency and Use of Renewable Energy for Non-Residential building – Code of Practice</li><li>Local Planning guideline</li></ul></td></tr>
<tr><td>Work Examples</td><td>Background Info:<br>Table TS 1-1.1: Total Township Electricity Consumption per year<table><tr><th>System/Equipment</th><th>Total Design Annual Township Electricity Consumption (kWh)/year</th><th>Total Baseline Annual Township Electricity Consumption (kWh)/year</th></tr><tr><td>Lighting (Public Spaces)</td><td>3,094,380</td><td>5,341,392</td></tr><tr><td>Lighting (Street lighting)</td><td>236,321</td><td>314,822</td></tr><tr><td>Exterior Lighting</td><td>405,800</td><td>560,713</td></tr><tr><td>Air-conditioned Plant</td><td>7,924,425</td><td>8,990,361</td></tr><tr><td>Air System Fans</td><td>632,293</td><td>735,980</td></tr><tr><td>Mechanical Ventilation Fans</td><td>207,571</td><td>220,173</td></tr><tr><td>Lifts</td><td>792,966</td><td>801,368</td></tr><tr><td>Escalators</td><td>45,865</td><td>46,117</td></tr><tr><td>Receptacle Equipment *(16W/m²)</td><td>3,936,517</td><td>3,936,517</td></tr><tr><td>Domestic Water Pump Systems</td><td>226,088</td><td>248,932</td></tr><tr><td>Hot Water Systems</td><td>93,789</td><td>102,810</td></tr><tr><td>Others</td><td>-</td><td>-</td></tr><tr><td>Total:</td><td>17,596,015</td><td>21,299,185</td></tr></table></td></tr>
</table>

**TS 1-2 ON-SITE ENERGY GENERATION**

<table>
<tr><td>Objectives</td><td>Encourage the onsite generation of energy for self-supply in the common area of the township</td></tr>
<tr><td>Applicability</td><td>Applicable to common area or public infrastructure</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>Up to 6 credits scored for replacement of electricity (based on total annual township energy consumption) by systems:<br><br>a) Energy generation by efficient combined system such as co-generation, tri generation and etc<br>b) Generation of renewable energy<br>c) Energy recovery or regeneration<br><br>
<table>
<tr><th>% Replacement of electricity (based on total annual township energy consumption)</th><th>Credits</th></tr>
<tr><td>10%</td><td>2</td></tr>
<tr><td>15%</td><td>4</td></tr>
<tr><td>>20%</td><td>6</td></tr>
</table>
</td></tr>
<tr><td>Prerequisite Requirements</td><td>-</td></tr>
<tr><td>Documentary Evidences</td><td>
<ul>
<li>Summary brief on the target on-site energy generation for the approved Masterplan.</li>
<li>Calculation of percentage replacement of electricity (based on total annual township energy consumption) by systems.</li>
<li>Architectural plan showing location of on-site generation / renewable energy system & extend of its implementation on Approved Masterplan.</li>
<li>Technical product information of on-site generation / renewable energy system if applicable.</li>
</ul>
</td></tr>
<tr><td>References</td><td>-</td></tr>
<tr><td>Worked Examples</td><td>Background info:<br><br>The township providing solar panel as on-site energy generation. Solar specific yield is 1316.9 kWh/kWp/yr based on solar simulation result.<br>Total township energy consumption:<br>Table TS 1-2.1: Total Township Electricity Consumption per year
<table>
<tr><th>System/Equipment</th><th>Total Annual Township Electricity Consumption (kWh)/year</th><th>Baseline</th></tr>
<tr><td>Lighting (Public Spaces)</td><td>3,094,380</td><td>5,341,392</td></tr>
<tr><td>Lighting (Street lighting)</td><td>236,321</td><td>314,822</td></tr>
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<tr><td>Air System Fans</td><td>632,293</td><td>735,980</td></tr>
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<tr><td>Lifts</td><td>792,966</td><td>801,368</td></tr>
<tr><td>Escalators</td><td>45,865</td><td>46,117</td></tr>
</table>
</td></tr>
</table>

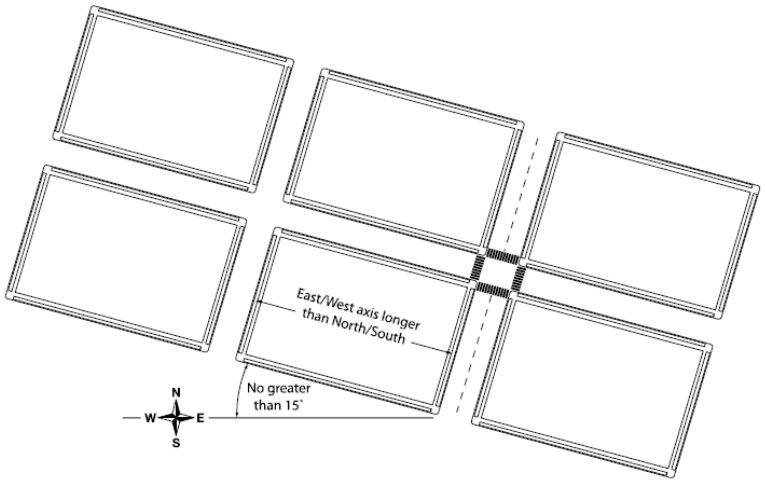
| | | |
|---|---|---|
| Receptacle Equipment *(16W/m²) | 3,936,517 | 3,936,517 |
| Domestic Water Pump Systems | 226,088 | 248,932 |
| Hot Water Systems | 93,789 | 102,810 |
| Others | - | - |
| **Total:** | 17,596,015 | 21,299,185 |

**Table TS 1-2.2: Percentage Replacement of Electricity (based on total annual township energy consumption):**

| | | |
|---|---|---|
| **PV capacity specified** | 1750.00 | kWp |
| **Annual specific yield** | 1316.9 | kWh/kWp/yr |
| **Annual renewable energy generated** | 405605.2 | kWh/yr |
| **Percentage energy replacement** | 13 | % |

Credit claimed: 2 credits

**TS 1-3 SITE PLANNING AND BUILDING ORIENTATION**

| | |
|---|---|
| **Objectives** | Minimise the heat gain/loss by use of passive solar strategies to reduce the energy demand |
| **Applicability** | Applicable to the whole building in the township |
| **Baseline Standard** | - |
| **Requirements** | (a) 50% or more of the plot have one axis within plus minus 22.5 degree of geographical north / south, and north / south length is at least as long or longer than the east / west length<br><br>(a) Plot coverage<br>0.1 credit for every percentage improvement in the plot coverage<br>Credits awarded = 0.1 x (% improvement)<br><br>  <br><br>**Figure 1.** Solar-oriented plot with east-west lengths equal to or greater than north-south lengths, and east-west axis within 15 degrees of geographic east-west<br><br>Or<br><br>(b) 50% or more of the project building GFA have one axis of each building is at least 1.5 times longer than the other, and the longer axis is within 22.5 degrees of geographical north / south axis<br><br>(b) GFA coverage<br>0.15 credit for every percentage improvement in the GFA coverage<br>Credits awarded = 0.15 x (% improvement)<br>(Up to 4 credits) |

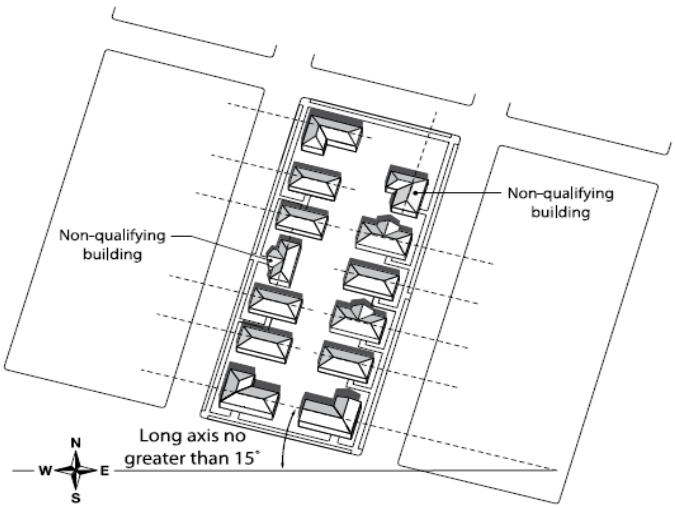



**Figure 2.** Solar-oriented building plot with east-west lengths equal to or greater than north-south lengths, and east-west axis within 15 degrees of geographic east-west

(c) 2 credits for reduction of the window area of the west facing elevation of buildings, or application of inter block shading strategies to west / east facing facades by at least 50%

The building must comply with the Window Wall Ratio less than 0.5 at the East and West Façade or minimise west facing façade by having inter block strategies for East and West facing facade. Where, the design of building not there, to incorporate in the Urban Design Guideline (UDG)

The requirement calculated by the % of number of the building in the township

50% - 1credit
90% - 2credits

(d) 2 credits for proper planning of buildings layout and massing to avoid blocking prevailing wind

Proof with the wind simulation study before and after the development and incorporate in the UDG with recommended building characteristic to minimize disruption to prevailing wind

The requirement calculated by the % of number of the building in the township.

50% - 1 credit
90% - 2 credit

(e) 2 credits for provision of natural ventilation and day-lighting for common area in the public building. At least more than 80% of applicable space.

| | |
|---|---|
| **Prerequisite Requirements** | - |

| | |
|---|---|
| **Documentary Evidences** | • Architectural plan detailing plot or building orientation to required axis, supported by calculation on potential percentage improvement.<br>• All elevation drawing showing area of façade, supported by calculation detailing percentage of reduction in west facing façade.<br>• Report or any documentation which includes proposed planning, strategy and implementation of building layout and massing to avoid blocking prevailing wind.<br>• Architectural plan showing location of natural ventilation & day lighting for public spaces supported by calculation on its extent of coverage. |
| **References** | • GreenRE Ventilation Simulation Methodology and Requirements |
| **Worked Examples** | - |

## TS 1-4 ENERGY MANAGEMENT SYSTEM

<table>
<tr><td>Objectives</td><td>Design and incorporate energy monitoring and/or control system to facilitate energy consumption monitoring and management for public facilities.</td></tr>
<tr><td>Applicability</td><td>All public amenities and infrastructure.</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>(a) 2 credits for provision of sub-metering with remote metering capability for subsystems > 15 kW or with electric loads > 100 kVA<br><br>(b) Up to 2 credits can be scored for provision of the energy level monitoring and automatic control system for applicable energy consuming system. 0.5 credit for each control with at least 90% coverage of the system capacity<br><br>(c) 1 credit can be scored with provision with energy management plan at design stage such as setting target, developing measures and strategies</td></tr>
<tr><td>Prerequisite Requirements</td><td>-</td></tr>
<tr><td>Documentary Evidences</td><td>• Extract of tender specification plan showing location & area of coverage of sub meter/ automatic control system.<br>• Schematic drawing showing the provision of the submeter comply to the requirement<br>• All related drawings showing the compliance to energy management system.<br>• Technical product information on sub meter, remote metering system, automatic control system and all applicable features.<br>• Calculation on the extent of coverage for each control system.<br>• Provision of energy management plan at design stage.</td></tr>
<tr><td>References</td><td>-</td></tr>
<tr><td>Worked Examples</td><td>(b) Table TS 1-4.1: Provision of the Monitoring and Control System Coverage
<table>
<tr><th>Type of energy monitoring and automatic control system</th><th>Function</th><th>Coverage area (%)</th><th>Credit score</th></tr>
<tr><td>Energy Management and Control System (EMCS)</td><td>Metering, monitoring, and interactive control</td><td>All street lighting, public spaces, clubhouse, guardhouse</td><td>0.5</td></tr>
<tr><td>Digital power meter with timer</td><td>Metering and control</td><td>All landscape lighting</td><td>0.5</td></tr>
<tr><td colspan="3">Total Credit</td><td>1</td></tr>
</table></td></tr>
</table>

## TS 1-5 MINIMISE ENERGY CONSUMPTION DURING OFF-PEAK HOURS

<table>
<tr><td>Objectives</td><td>Design and incorporate energy optimisation plan to ensure only the essential energy consuming devices are running.</td></tr>
<tr><td>Applicability</td><td>All public amenities and infrastructure.</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>1 credit can be scored with the provision of the energy optimisation plan to ensure only the essential energy consuming device are running such as scheduled sensor on the street lighting</td></tr>
<tr><td>Prerequisite Requirements</td><td>-</td></tr>
<tr><td>Documentary Evidences</td><td>• Provision for energy optimization plan detailing strategy and its implementation.<br>• Calculation on potential saving from baseline on said energy optimization plan.<br>• Proof of evidence showing the optimisation plan been implemented during actual operation of the township.</td></tr>
<tr><td>References</td><td>-</td></tr>
<tr><td>Worked Examples</td><td>Sample Calculation on potential saving based on the energy optimization plan in township:<br><br>Table TS 1-5.1: Calculation of potential saving<br><table><tr><td>Type of energy optimization</td><td>Total energy consumption without the system (kWh/year)</td><td>Total energy consumption with the system (kWh/year)</td><td>% of savings</td></tr><tr><td>Occupancy sensor</td><td>477,411.46</td><td>405,800</td><td>15%</td></tr></table></td></tr>
</table>

| | |
|---|---|
| Part 2 – Water Management | TS 2-1 Water Efficient Fittings for Infrastructure and Public Amenities<br>TS 2-2 Stormwater Management<br>TS 2-3 Alternative Water Sources<br>TS 2-4 Water Efficient Landscaping<br>TS 2-5 Water Efficiency Management |

## TS 2-1 WATER EFFICIENT FITTINGS FOR INFRASTRUCTURE AND PUBLIC AMENITIES

<table>
<tr><td>Objectives</td><td>Reduce to use of potable water by using water efficient fittings covered under the Water Efficiency Products Labelling Scheme (WEPLS) or Water Efficiency Labelling Scheme (WELS).</td></tr>
<tr><td>Applicability</td><td>Within Township and Public Amenities such as follows and not limited to:<ul><li>Public toilets in garden/landscape/recreational park area</li><li>Guardhouses</li><li>Clubhouse</li><li>Sales Gallery</li><li>Recreational Park etc</li></ul></td></tr>
<tr><td>Baseline Standard</td><td>As specified under Water Efficiency Products Labelling Scheme (WEPLS)</td></tr>
<tr><td>Requirements</td><td>(a) Up to 4 credits can be scored based on the number and water efficiency rating of the fitting type used;<br><br><table><tr><td colspan="3">Rating based on WELS / WEPLS</td></tr><tr><td>Efficient</td><td>Highly Efficient</td><td>Most Efficient</td></tr><tr><td>1</td><td>2</td><td>4</td></tr></table><br>or<br><br>(b) Up to 4 credits can be scored based on the water saving compared to baseline model (not rated fitting)<br><br>20% - 1 credit<br>30% - 2 credits<br>40% -3 credits<br>50% - 4 credits<br><br>Baseline flow rate for the fittings as follow:<br><br><table><tr><th></th><th>Fittings Type</th><th>Flowrate</th></tr><tr><td>1</td><td>Water Closet</td><td>6 litre/ flush</td></tr><tr><td>2</td><td>Urinal</td><td>6 litre / flush</td></tr><tr><td>3</td><td>Sink / Basin Tap</td><td>8 litre / minute</td></tr><tr><td>4</td><td>Bib Tap</td><td>8 litre/ minute</td></tr><tr><td>5</td><td>Shower Tap</td><td>10 litre / minute</td></tr><tr><td>6</td><td>Kitchen Sink</td><td>8.33 litre / minute</td></tr><tr><td>7</td><td>Ablution Tap</td><td>8.00 litre / minute</td></tr></table></td></tr>
<tr><td>Prerequisite Requirements</td><td>Not Applicable</td></tr>
<tr><td>Documentary Evidences</td><td><ul><li>Extracts of the tender specification showing all the water fitting provisions for the development.</li><li>Water fitting schedules showing the numbers, types and the approved rating of the proposed fittings in the prescribed tabulated format shown in the Table TS 2.1-1.</li><li>Schematic drawing of cold water and sanitary plumbing.</li><li>WEPLS product specification or certificate. In the event no product recognition from WEPLS, product catalogue and test report from local or international body that equivalent to the SIRIM standard of testing is required.</li><li>Water saving calculation based on comparison with not rated water fittings using the GreenRE Water Calculator</li></ul></td></tr>
</table>

**References**

2. For more information about WEPLS, refer to http://www.span.gov.my/index.php?option=com_content&view=article&id=580%3Aabout-us1&catid=175%3Awepls&Itemid=457&lang=en

**Worked Examples**

Example of a water fitting schedule showing the numbers, types and the approve rating of the proposed fitting for township development.

**Table TS 2-1.1: Computation of the percentage of water fittings for clubhouse**

| Ref. | Water Fitting Type | WEPLS rating | | | Not Rated | Total |
|---|---|---|---|---|---|---|
| | | Efficient | Highly Efficient | Most Efficient | | |
| 1 | Shower taps and mixers | 0 | 45 | 0 | 0 | 45 |
| 2 | Basin taps and mixers | 0 | 0 | 55 | 0 | 55 |
| 3 | Sink/bib taps and mixers | 0 | 70 | 0 | 0 | 70 |
| 4 | Flushing cisterns | 0 | 0 | 50 | 0 | 50 |
| 5 | Others - Urinals | 0 | 0 | 0 | 5 | 5 |
| Total no. based on rating (A) | | 0 | 115 | 105 | 5 | **∑A = 225** |
| Weightage (B) | | 1 | 2 | 4 | 0 | |
| Total (AxB) | | 0 | 230 | 420 | 0 | **∑(AxB) = 650** |

Credits scored = ∑ (A x B) / ∑A
= 650 / 225
= 2.89 credits

## TS 2-2 STORMWATER MANAGEMENT

| | |
|---|---|
| **Objectives** | Encourage the treatment of stormwater runoff through provision of infiltration or design features before discharge to public drains |
| **Applicability** | Generally applicable for whole plot/phases in the township |
| **Baseline Standard** | Urban Storm Water Management (MSMA) or/and Department of Environment (DOE) requirement |
| **Requirements** | Up to 8 credits scored based on the % of runoff from impervious areas within the site<br><br>**OPTION A** – Applicable only for the whole township including public realm, infrastructure and individual land parcels.<br><br>10 - 35% = 2 credits<br>35 - 50% = 5 credits<br>>50% = 8 credits<br><br>**OR**<br><br>**OPTION B** – Applicable for the whole township excluding individual land parcels.<br>25 - 50% = 2 credits<br>50 - 70% = 5 credits<br>>70% = 8 credits<br><br>**Note**:<br>1) The treatment of stormwater runoff shall be through provision of infiltration or design features as recommended in Urban Storm Water Management (MSMA).<br>2) For Industrial Park , to show the requirement of the water discharge to the public drain comply with DOE requirement . |
| **Prerequisite Requirements** | Not applicable |
| **Documentary Evidences** | • Urban Storm Water Management (MSMA) report showing reduction of post development stormwater peak discharge rate and quantity from exceeding pre-development peak discharge rate and quantity.<br>• Drainage plan, schematic plan, location plan and details of water features such as the specification of filtration layer, transition layer and drainage layer, sub-soil drainage system, overflow arrangement, plant list etc. |
| **References** | MSMA – Urban Storm Water Management |
| **Worked Examples** | - |

## TS 2-3 ALTERNATIVE WATER SOURCES

<table>
<tr><td>Objectives</td><td>Reduce potable water consumption by provision of suitable systems that utilities rainwater or recycled water for landscape irrigation, general cleaning, flushing toilets and water features.</td></tr>
<tr><td>Applicability</td><td>Applicable within township development and Public Amenities such as follows:<ul><li>Public toilets in garden/landscape/recreational park area</li><li>Guardhouses</li><li>Clubhouse</li><li>Sales Gallery</li><li>Recreational Park</li></ul></td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>Up to 4 credits will be awarded based on the % reduction in total potable water usage of the applicable uses as follows:<table><tr><th>% of replacement</th><th>Credits</th></tr><tr><td>100%</td><td>4 credits</td></tr><tr><td>≥ 75%</td><td>3 credits</td></tr><tr><td>≥ 50%</td><td>2 credits</td></tr><tr><td>≥ 30%</td><td>1 credit</td></tr></table>Replacement water sources can include rainwater, grey water, ponds within the township boundary and recycled water from approved sources<br><br>For rainwater harvesting tank provision, RWHT to be sized in accordance to Guideline for Rainwater Harvesting and Utilisation System (SPAH) and MSMA guidelines. The rainwater tanks are to be optimally sized to cater for outdoor water use only</td></tr>
<tr><td>Prerequisite Requirements</td><td>Not applicable</td></tr>
<tr><td>Documentary Evidences</td><td><ul><li>Extracts of the tender specification showing how the non-potable water source will be provided.</li><li>Relevant drawings showing the location and design of non-potable water source.</li><li>Calculation showing the percentage of potable water saved for irrigation system.</li><li>Details of the recycled water system.</li><li>Schematic system showing the recycling system</li></ul>Note: Water calculation template can be download in GreenRE website</td></tr>
<tr><td>References</td><td>1. Manual Saliran Mesra Alam Malaysia (MSMA) (2000), Ministry of Natural Resources and Environment<br>2. “Rainwater – Guideline for Installing a Rainwater Collection and Utilization System”,KPKT (1999)<br>3. “Rainwater Harvesting – Guidebook Planning and Design” Department of Irrigation and Drainage, Ministry of Natural Resources and Environment</td></tr>
</table>

**Table TS 2-3.1: Calculation Rain Water Harvesting System as Alternative Water Source**

| Roof Catchment | | |
|---|---|---|
| Type | $m^2$ | Run-off coefficient |
| Pitched Tile | | 0.8 |
| Steel Roof | 1239 | 0.9 |
| RC Roof | 1110 | 0.5 |
| Block Pavement | | 0.7 |
| Gravel Roadway | | 0.3 |

| | |
|---|---|
| Total Catchment Area ($m^2$) | 2349 |
| Catchment Area x Run -off coefficient | 1670.1 |

| **Type Of System** | First Flush System |
|---|---|
| **Equation** | Collectible Rainwater = Rainfall x Catchment Area x Run Off Coefficient - (Total Catchment Area x First Flush Diversion) |
| **First Flush Diversion (L/sqm)** | 1 |
| **Tank Size (L)** | 160,000.00 |
| **Total Annual Collected Rain Water (L)** | 3,880,633.50 |
| **Average Daily Collected Rain Water (L)** | 10,631.87 |
| **Non-Portable Water Consumption (L/Day)** | 30,000.00 |
| **Percentage of Reduction (%)** | **35.44** |

*Water calculation template can be download in GreenRE website*

## TS 2-4 WATER EFFICIENT LANDSCAPING

| | |
|---|---|
| **Objectives** | Reduce the water demand by selecting native plants in landscaping design and recreational park |
| **Applicability** | Applicable to township development with landscaping and recreational park provision |
| **Baseline Standard** | Not applicable |
| **Requirements** | 1 credit can be scored at least 50% of the landscape areas consist of native plant or plants that require minimal irrigation<br><br>Up to 2 credits if 80% of the landscape areas consist of plants or plants that require minimal irrigation |
| **Prerequisite Requirements** | Not applicable |
| **Documentary Evidences** | • Relevant layout plans showing the overall landscape areas and the areas that use native plants or plants that require minimal irrigation.<br>• Calculation showing the percentage of the landscape areas that use native plants or plants that require minimal irrigation<br>• Plant species showing the minimum water requirement |
| **References** | 1. Manual Saliran Mesra Alam Malaysia (MSMA) (2000), Ministry of Natural Resources and Environment<br>2. “Rainwater – Guideline for Installing a Rainwater Collection and Utilization System”, KPKT (1999)<br>3. “Rainwater Harvesting – Guidebook Planning and Design” Department of Irrigation and Drainage, Ministry of Natural Resources and Environment.<br>4. The list of drought tolerant or resistant plant species may be obtained from the online website: http://florafaunaweb.nparks.gov.sg/ |
| **Worked Examples** | - |

## TS 2-5 WATER EFFICIENCY MANAGEMENT

| | |
|---|---|
| **Objectives** | Reduce the demand of water by public facilities and in common areas through design and incorporation of water efficiency management plans |
| **Applicability** | Applicable to sub-metering provisions for major water uses to the township management and plan to improve water performance in public amenities |
| **Baseline Standard** | |
| **Requirements** | (a) Up to 2 credits for the provision the use of private water meters and leak detection system to monitor the major water usage:<br><br>(j) 1 credit can be scored for the provision of private-meters for major water uses (e.g., water features, irrigation, public toilets)<br><br>(iii) 2 credits can be scored for the linkage of the submeter to the township management system (TMS) for monitoring and leak detection.<br><br>(b) 1 credit can be scored for the provision of the 3 yeas water efficiency management plans and commitment for water savings accrued from proposed measures. |
| **Prerequisite Requirements** | Not applicable |
| **Documentary Evidences** | <u>For 2-1 a(i)</u><br>• Schematic drawings of infrastructure/cold-water distribution system showing the location of the sub meters provided.<br>• List of sub metering and its location.<br><u>For 2-6 a(ii)</u><br>• Schematic drawing and networked planning showing the location of sub-metering and its linkage to the Township Management System (TMS).<br>• List of input and output point of the TMS with highlighted the sub-meter point.<br>• Data logged for smart metering real-time digital display<br><u>For 2-6 (b)</u><br>• Improvement plans showing the calculation of water saving that can be achieved. Water efficiency management plan report inclusive the intent, reduction setting target, measures and implementation strategies of water efficiency improvement plans over the next three years |
| **References** | MS ISO 37122:2019 – Sustainable Cities and Communities *Indicators for Smart Cities* |
| **Worked Examples** | - |

| | |
|---|---|
| Part 3 – Materials and Waste Management | TS 3-1 Minimise Cut and Fill in Earthworks<br>TS 3-2 Sustainable Construction for Infrastructure and Public Amenities<br>TS 3-3 Sustainable Products for Infrastructure and Public Amenities<br>TS 3-4 Waste Reduction<br>TS 3-5 Waste Management and Segregation<br>TS 3-6 Waste Conveyance<br>TS 3-7 Waste Reuse and Processing |

## TS 3-1 MINIMISE CUT AND FILL IN EARTHWORKS

| | |
|---|---|
| **Objectives** | Encourage reduction in the quantity of excavated materials removed or transported into the township by optimising the use of cut and fill material removed during earthworks/ land preparation works for the township |
| **Applicability** | Excess cut and fills and its monitoring during earthworks and on-site conservation of natural resources such as topsoil. |
| **Baseline Standard** | - |
| **Requirements** | Up to 3 credits for optimising the cut and fill materials during earthworks activities<br><br>(a) 1 credit for reusing of at least 50% of the topsoil<br><br>(b) 2 credits for reusing of at least 50% cut and fill material |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 3-1(a)<br>• Earthworks drawings/contour drawings showing the location of excavated topsoil and location reusing the topsoil<br>• Soil management plan extract from Environmental Impact Assessment (EIA) report<br>• Land use strategy<br>• Calculation by determine the volume over the total site of the township for topsoil usage<br><br>For part 3-1(b)<br>• Earthworks drawings/contour drawings showing the location of cut, fills<br>• Earthwork plan showing temporary embankment for the excavation soil<br>• Soil management/excavation plan which specify the depth of the soil and topographical<br>• survey at ground level to the design level<br>• Earthwork activities should be recorded with no import and export of soil to the project site<br>• Calculation of the volume for cut and fill<br>• Mass Haul Diagram (MHD) indicating the breakdown of cut and fill volume, cut and fills to be moved, balanced and earth soil have to be borrowed |
| **References** | 1. Guideline for Slope Design –Jabatan Kerja Raya Malaysia<br>2. Akta Penyiasatan Kajibumi 1974<br>3. Environmental Quality Act (EQA)<br>4. EIA Order 1987 |
| **Worked Examples** | - |

## TS 3-2 SUSTAINABLE CONSTRUCTION FOR INFRASTRUCTURE AND PUBLIC AMENITIES

<table>
<tr><td>Objectives</td><td>Encourage recycling and the adoption of designs, practices and materials that are environmentally friendly and sustainable in the construction of infrastructure and public amenities.</td></tr>
<tr><td>Applicability</td><td>Applicable for infrastructure and public amenities concrete and cement usage</td></tr>
<tr><td>Baseline Standard</td><td></td></tr>
<tr><td>Requirements</td><td>
(a) Up to 4 credits for the Use of sustainable and recycled materials<br><br>
• 2 credits for Green Cements with approved industrial by-product (such as Ground Granulated Blast Furnace Slag (GGBS), silica fume, fly ash -PFA) to replace ordinary Portland Cement (OPC) by at least 10% by mass for superstructural works of infrastructure and public building.<br><br>
• Up to 4 credits for Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS) from approved sources to replace coarse and/or fine aggregates for concrete production of main building elements<br><br>
Extent of Coverage: The total quantity used (in tonnage) for replacement of coarse or fine aggregates must not be less than the minimum usage requirement that is:<br><br>
[0.03 x Gross Floor Area (GFA in $m^2$)]<br><br>
<table>
<tr><th>Quantity of RCA / WCS</th><th>Credits Allocation</th></tr>
<tr><td>≥ 0.5 times (0.5X) minimum usage requirement</td><td>1</td></tr>
<tr><td>≥ 1X minimum usage req.</td><td>2</td></tr>
<tr><td>≥ 1.5X minimum usage req.</td><td>3</td></tr>
<tr><td>≥ 2X minimum usage req.</td><td>4</td></tr>
</table>
<br>
(b) Up to 3 credits for the provision of:<br><br>
(i) Recycle or salvage of non-hazardous construction waste by weight as follow:<br><br>
1 credit for 10%<br>
2 credits for 20%<br>
3 credits for 30%<br><br>
Or<br><br>
(ii) Recycled content in construction materials other than part TS3-2(a) that has been made from pre and/or post-consumer materials by weight as follow:<br><br>
2 credits for 10%<br>
3 credits for 15%
</td></tr>
<tr><td>Prerequisite Requirements</td><td>Minimum score under this criterion:<br>GreenRE Gold ≥ 3 credits<br>GreenRE Platinum ≥ 4 credits</td></tr>
</table>

| | |
|---|---|
| **Documentary Evidences** | For TS 3-2 (a)<br>• Extract of tender specification showing the requirement to use green cement/concrete to be procured<br>• Construction materials with Life Cycle Analysis (LCA) on product carbon footprint showing the ISO 14040 certification or Green Label<br>• Concrete Mix Design showing the percentage of the recycled content composition<br>• Calculation of estimated quantity for replacement by mass of green cement/concrete<br>• To compute extent of coverage for RCA or WCS replacement<br>• Infrastructure and public amenities structural plan showing the dimension, elevations and sizes of each structure components<br><br>For TS 3-2(b)(i)<br>• Extract of tender specification showing the requirement to recycled non-hazardous construction waste<br>• Waste Management Plan approved by authorised party<br>• Bills of Materials<br>• Identification and making list of construction non-hazardous waste that can be recycled or conserved<br>• Disposal Waste Inventory and records<br><br>For TS 3-2(b)(ii)<br>• Extracts from the tender specification and drawings showing the requirements to incorporate the environmentally friendly products that are certified and approved by local/international certification body.<br>• Certification details from approved local/international certification body such as the material certification standards and rating within validity period.<br>• Technical product information on the sustainable products<br>• Calculation of products and extent of coverage.<br>• Declaration of percentage recycled content in the construction materials |
| **References** | 1. Policy Guidance on Resource Efficiency – Organization for Economic Co-operation and Development (OECD)<br>2. MS 14040:2006 Environmental Management - Life Cycle Assessment, Principles and Formworked<br>3. MS 2673: Construction Solid Waste Management<br>4. Environmental Quality (Scheduled Waste) 2017<br>5. Solid Waste and Public Cleansing Management Act 2018 (Act 672)- Scheme for Commercial, Industrial and Institutional Solid Waste<br>6. JKR/SIRIM 3: 2020 Standard – Environmental Protection and Enhancement Works for Projects<br>7. Environmental Sustainability in Malaysia 2020-2030 under Kementerian Alam Sekitar dan Air (KASA)- *Revised February 2022* |
| **Worked Examples** | **TS 3-1(a)(i)**<br>Proposed development will used Grade 35, 40, 70 and 80 concrete.<br><br>From the concrete design mix the percentage of replacement of OPC by the green cements as follow:<br>Grade 35 = 15.52 %<br>Grade 40 = 63%<br>Grade 70 = 59 %<br>Grade 80 = 58 % |

| No | Concrete Grade | Quantity ($m^3$) | Percentage of Green Cement (%) | Green Cement Quantity in ($m^3$) |
|---|---|---|---|---|
| 1 | Grade 35 | 27,381 | 15.52 | 4250 |
| 2 | Grade 40 | 448 | 63 | 282 |
| 3 | Grade 70 | 12,141 | 59 | 7163 |
| 4 | Grade 80 | 12,155 | 58 | 7,050 |
| | Total | 52,155 | | 18,745 |

Overall % Green Cement replacement = 18,745/52,155 = 35.96%

## TS 3-3 SUSTAINABLE PRODUCTS FOR INFRASTRUCTURE AND PUBLIC AMENITIES

<table>
<tr><td>Objectives</td><td>Encourage the use of products that are environmentally friendly and sustainable which certified under approved certification body</td></tr>
<tr><td>Applicability</td><td>Applicable to infrastructure works and public amenities (including street furniture)</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>
Up to 5 credits are allocated to encourage the use of environmentally friendly products that are certified by approved local/international certification body. The criterion is only applicable for infrastructure works and public amenities. Credits scored will be based on the extent of use of environmentally friendly product.<br><br>
The environmentally friendly product proposed must be approved by a valid international or local certification body and is subject to GreenRE evaluation.<br><br>
Table 3-3-1: Weightage for credits allocation
<table>
<tr><th>Extent of use of environmentally friendly product</th><th>Weightage for Credits Allocation</th></tr>
<tr><td>Low impact</td><td>0.5</td></tr>
<tr><td>Medium impact</td><td>1</td></tr>
<tr><td>High Impact</td><td>2</td></tr>
</table>
The use of environmentally friendly products or recycled materials used for infrastructure elements of the development will be considered as <u>high impact</u> (2 credits) on condition that quantities used by percentage are more than 50% (i.e. extent of coverage as compared to total quantities used for same intended purpose. If not met, it will be classified as <u>medium impact</u> (1 credit).<br><br>
Items that are used for all public amenities, common area, external works and communal facilities are considered as <u>medium impact</u> (1 credit) if quantities used by percentage are more than 80% (i.e. extent of coverage as compared to total quantities used for same intended purpose in common areas. If not met, it will be classified as <u>low impact</u> (0.5 credit)<br><br>
Notes:<br>
1) The impact categories listed above generally apply to main infrastructure element – e.g. internal / external wall, floor, ceiling, roof, doors, etc. Singular products – e.g. termite treatment system, playground equipment, gym flooring etc will be classed as <u>low impact.</u> All applications will be subject to GreenRE's evaluation. Same type of the product not allowed to be double claimed for different area of application
</td></tr>
<tr><td>Prerequisite Requirements</td><td><u>Minimum score under this criterion:</u><br>GreenRE Gold ≥ 2 credits<br>GreenRE Platinum ≥ 3 credits</td></tr>
</table>

| | |
|---|---|
| **Documentary Evidences** | • Extracts from the tender specification and drawings showing the requirements to incorporate the environmentally friendly products that are certified and approved by local/international certification body.<br>• Certification details from approved local/international certification body such as the material certification standards and rating within validity period.<br>• Technical product information on the sustainable products<br>• Schedule of materials<br>• Calculation of products and extent of coverage |
| **References** | 1. MyHijau, SIRIM, SGLS, SGBC<br>2. Malaysian Timber Certification Council (MTCC)<br>3. Forest Stewardship Council (FSC)<br>4. Global Eco labelling Network (GEN) http://www.globalecolabelling.net<br>5. Roadmap Environmental Sustainability in Malaysia 2020-2030 under Kementerian Alam Sekitar dan Air (KASA)- *Revised February 2022* |
| **Worked Examples** | Determine if the environmentally friendly products selected are certified with approved local/international certification body. Check if the products used are meant for main building elements, functional spaces or infrastructure and can be considered high impact or medium impact.<br><br>Products that are meant for common areas and external works such as toilets, public amenities, lobbies and landscaping areas are considered as medium impact or low impact.<br><br>High impact to be grant only for infrastructure works such as street furniture road kerbs, and pre-cast drainage box culvert etc.<br><br>Note:<br>Certain products can have more environmentally friendly features than others. Other than recycled materials, they may have features like low VOC assembly or manufactured with resource efficient processes, durability etc that will render the products more environmentally friendly than others. If the certified products selected are more environmentally friendly and are given a better rating by the approved local/international certification body, a higher weightage can be considered in credit scoring.<br><br>Example of a proposed development with the following provisions:<br><br>(a) Use of carpets for management office spaces. Product is not certified.<br><br>(b) Use of panel boards as internal partitions for more than 50% of the office spaces and the product is rated by an approved certification body.<br><br>(c) Precast concrete road kerbs for whole road networks. Product is rated by approved local certification body. – (Singular product)<br><br>(d) Use of roof waterproofing coating for clubhouse. Product is rated by approved local certification body.<br><br>(e) Use of wooden doors for management office. Product is rated by approved local certification body. |

| Products and Extent of coverage | | With approved certification | Extent of use category | Credits scored |
|---|---|---|---|---|
| (a) | Carpets for all management office spaces | No | N/A | 0.0 |
| (b) | Panel boards as internal partition for more than 50% of office spaces | Yes | Medium | 1.0 |
| (c) | Precast road kerbs (road networks) | Yes | High | 2.0 |
| (d) | Roof waterproofing | Yes | Medium | 1.0 |
| (e) | Wooden doors for all areas in the management office | Yes | Medium | 1.0 |

Therefore, credits scored for TS3-3 = 1.0 + 2.0 + 1.0 + 1.0 = **5.0 credits**

**TS 3-4 WASTE REDUCTION**

| | |
|---|---|
| **Objectives** | Minimise waste generation in a sustainable manner covering all kinds of wastes |
| **Applicability** | Applicable for each plot in the township |
| **Baseline Standard** | |
| **Requirements** | Up to 2 credits to minimise waste generation in township level<br><br>1 credit for each item monitored and reduced for following items:<br>• commercial waste (e.g.: paper, plastic, aluminium)<br>• construction waste (woods/timbers, glass, aluminium) |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Identification of the type of waste materials consumption that can be reused, reduced and recycled<br>• Calculation with comparative study on types of materials to be used as the replacement<br>• Waste Management Report<br>• Inventory or quantity of materials used<br>• To prescribe the requirement in the Universal Design Guideline (UDG)<br>• Proof that will be responsibility to minimize the waste will be taken by local authority and commitment for waste record sharing. |
| **References** | 1. MS ISO 37122:2019 – Sustainable Cities and Communities *Indicators for Smart Cities*<br>2. MS 2673: Construction Solid Waste Management<br>3. Solid Waste and Public Cleansing Management Act 2018 (Act 672)- Scheme for Commercial, Industrial and Institutional Solid Waste<br>4. Roadmap Environmental Sustainability in Malaysia 2020-2030 under Kementerian Alam Sekitar dan Air (KASA)- *Revised February 2022* |
| **Worked Examples** | - |

**TS 3-5 WASTE MANAGEMENT AND SEGREGATION**

| | |
|---|---|
| **Objectives** | Encourage waste recycling within township to reduce waste going to landfill. Promote proper disposal of waste and provide waste management infrastructures |
| **Applicability** | Generally applicable to the whole township |
| **Baseline Standard** | |
| **Requirements** | (a) 1 credit for provision of at least one recycling station at the township level dedicated to the separation, collection and storage of recyclable materials such as paper, glass, plastics and metals<br><br>(b) 1 credit for provision of at least one drop-off point for potentially hazardous waste such as paints, solvents, batteries<br><br>(c) 1 credit for provision of litter receptacles with integrated recycle containers at scattered public areas and accessible by the public (including at public amenities)<br><br>(d) 1 credit for developing a community waste strategy and education programme e.g. promotional materials such as posters, circulars and provision of recycling bags to promote waste sorting, collecting and recycling of waste<br><br>Note :For Industrial Park, to implement the waste management policy for hazardous and non-hazardous waste. |
| **Prerequisite Requirements** | |
| **Documentary Evidences** | For TS 3-5 (a), (b) and (c)<br>• Extracts of the tender specification and drawing showing the location of recycling station, hazardous waste disposal point and litter receptacles with integrated containers at public areas.<br>• Technical product information of recycling station, hazardous waste disposal points and litter receptacles with integrated containers.<br>• Site layout plan showing the location of recycling station, hazardous waste disposal points and litter receptacles with integrated containers at public areas.<br><br>For TS 3-5 (d)<br>• Community waste strategy to support with timeframe and projection of activity undertake with the list of education program<br>• Pursue partnership with NGO or government agencies that can influence community to be more mindful of its responsibilities<br>• Monitor waste activities in community through providing any waste records for data collection such as inventory form and checklist<br>• To provide sample of poster, signage or any communication media for the said activities |
| **References** | 1. Guidelines for Source Separation of Municipal Solid Wastes Malaysia; Kementerian Perumahan dan Kerajaan Tempatan (KPKT)-July 2006<br>2. MS ISO 37122:2019 – Sustainable Cities and Communities *Indicators for Smart Cities*<br>3. Roadmap Environmental Sustainability in Malaysia 2020-2030 under Kementerian Alam Sekitar dan Air (KASA)- *Revised February 2022* |

| | |
|---|---|
| **Worked Examples** | List of education program for waste recycling within township<br>• 3Rs program in school (reduce, reuse and recycle)<br>• No plastic campaign month<br>• DIY Decorative Planting workshop using wastes (bottles or glass)<br>• Hazardous waste collection day (batteries, oil filter, aerosol tins, neon bulb)<br><br><u>Enhance of Institution to strengthen Government Policies on Waste Minimisation</u><br><br>To set target of recycling rate for the township aligned with government target (30% in year 2023 by KASA):<br><br>Recycling Rate (%) = Total <u>Quantity of Recyclables Collected (TRC) x 100%</u><br>TRC + Quantity of Waste Disposed + Others |

**TS 3-6 WASTE CONVEYANCE**

| | |
|---|---|
| **Objectives** | Reduce the negative impact on environment during waste conveyance |
| **Applicability** | Applicable to all plot in the township |
| **Baseline Standard** | - |
| **Requirements** | Provision of the odourless pneumatic conveyance system or any specific waste transport design to minimise disturbance. Credit will be given base on impact of application.<br>• 1 credit for low impact applications:<br>Loads station or place of generation (landed properties, apartment blocks, commercial facilities, etc.) equipped with pneumatic conveyance system collected by the specific waste transport within the plot<br>• 2 credits for high impact applications:<br>Integrated pneumatic conveyance system from loads station (indoor domestic waste and outdoor recycling items) through underground vacuum network to the central waste handling facilities for all plots |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Schematic diagram showing the location of vacuum network/pipeline of collecting domestic waste and recycle item to the conveyance transport system/sealed container<br>• Location of central waste handling facilities<br>• Vacuum pipeline network showing the air-intake, discharge valve, inspection chamber and connection from other plots to the central waste handling facilities<br>• Sealed container showing the mixed waste and recyclable waste and its capacity |
| **References** | - |
| **Worked Examples** | - |

**TS 3-7 WASTE REUSE AND PROCESSING**

| | |
|---|---|
| **Objectives** | Encourage use of environmentally friendly waste processing system and way for a township to achieve a level of energy independence |
| **Applicability** | Applicable to all plots |
| **Baseline Standard** | - |
| **Requirements** | (a) Up to 2 credits for provision of local composting station or provision of compost bin (kitchen and garden wastes) /chipping facilities within the boundary of the development and / or at strategic locations. The Compost should be made available to local users (building occupiers, owners, residents, maintenance firms) and able to meet at least 30% of landscape fertilizer needs.<br><br>(b) Up to 2 credits for usage of organic waste (municipal bio-waste, sewage sludge, agricultural residues) for energy generation e.g. through bio-methanisation process<br><br>1 credit for high impact: e.g. As fuel for vehicle used/heavy-duty transport<br>2 credits for low impact: e.g. As fuel for industrial and commercial used<br><br>Noted: Energy generated from the waste treatment plant shall be expressed in GJ per year |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | <u>For 3-7 (a)</u><br>• Extract of tender specification and drawings showing provisional of local composting system.<br>• Technical product information of local composting system.<br>• Methodology, calculation and specification of composting system for local users.<br>• Drawing showing the location of the compost bins within the township<br><br><u>For 3-7 (b)</u><br>• Extract of tender specification showing provision of organic waste for energy generation and its methodology.<br>• Sources of organic waste and application of the energy use<br>• Process flow path from waste to energy plant (WTE) to energy generation |
| **References** | MS ISO 37122:2019 – Sustainable Cities and Communities *Indicators for Smart Cities* |
| **Worked Examples** | - |

| | | |
|---|---|---|
| Part 4 – Environmental Planning | TS 4-1 | Self Sufficiency and Accessibility within Township |
| | TS 4-2 | Green and Blue Spaces for the Public |
| | TS 4-3 | Microclimate Optimisation |
| | TS 4-4 | Outdoor Thermal Environment |
| | TS 4-5 | Site Selection |
| | TS 4-6 | Conservation and Integration of Existing Structures and Assets |
| | TS 4-7 | Habitat Conservation and Restoration |
| | TS 4-8 | Minimise Site Disturbance |
| | TS 4-9 | Environmental Management System |
| | TS 4-10 | Future Provision and Connections |

## TS 4-1 SELF-SUFFICIENCY AND ACCESSIBILITY WITHIN TOWNSHIP

| | |
|---|---|
| **Objectives** | Ensure that a diverse range of facilities needed to meet daily needs are suitably incorporated in the masterplan and can be accessed suitably to minimise vehicle trips or distance travelled. Increase the accessibility to key facilities by ensuring that they are sited in accordance to the local planning guidelines |
| **Applicability** | Applicable to township's boundary |
| **Baseline Standard** | Local planning guideline |
| **Requirements** | Up to 5 credits [In the absence of local planning guidelines, the following standards/ catchment radius shall apply from the entrance of plot.:<br><br>i. Basic Retail (e.g. Hawker centres, local shops, markets) 400m<br>ii. Community & Leisure Facilities (e.g. 3G exercise facilities, hardcourts, swimming pools, children's playground) 400m<br>iii. Health Facilities (Pharmacy / GP / Polyclinic, Dentist) 400m<br>iv. Educational facilities (e.g. Primary Schools, Secondary Schools excluding tertiary institutions) 800m<br>v. Communal facilities (e.g. Child care centres/ pre-schools/ kindergartens, elder care centres, community centre, Resident's committee centre, public squares) 800m<br>vi. Employment Centres (e.g. mixed rental Offices / Light industry) 800m<br>vii. Residential areas (e.g. mixed income housing)<br>viii. Other supporting amenities (Post office, ATM, Postal box) 800m<br>ix. Place of worship 1000m<br>x. Hotels (only for commercial townships)<br><br>1 credit for each facility applicable to the masterplan and easily accessible by public transport<br><br>Radius will be from the entrance of each plot and more than 50% of the plot comply with the distance in radius. |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | Township masterplan showing the location of the facilities with easily accessible by public transport. |
| **References** | 1. Transit Oriented Development (TOD), Malaysia<br>2. Sustainable Development Goal (SDG) 2015-2030- Goal 11 *Sustainable Cities and Communities* |
| **Worked Examples** | - |

## TS 4-2 GREEN AND BLUE SPACES FOR THE PUBLIC

| | |
|---|---|
| **Objectives** | Provide sufficient green and blue spaces for residents and occupants |
| **Applicability** | Applicable to all plot in the township |
| **Baseline Standard** | - |
| **Requirements** | 1 credit for every item of requirement that is met:<br><br>(a) Parks, green spaces or water body at least 800m$^2$ within 400m walking distance from every entrance of the plot available in the township.<br><br>(b) Interconnectivity of green / blue spaces for public and biodiversity<br><br>(c) Adopt native plant strategies in landscape design - must demonstrate that >60 % of the trees and shrubs are native |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 4-2(a)<br>• Layout plan showing area of parks, green space or water body within township and demarcation of distance to show compliance to the requirement.<br><br>For 4-2(b)<br>• Layout plan showing interconnectivity between green/blue spaces for public and biodiversity.<br>• Extract of Environmental Impact Assessment (EIA) report indicating the biodiversity survey and the area showing the interconnectivity between green/blue spaces for public<br>• Biodiversity Action Plan<br><br>For 4-2(c)<br>• Extract of tender specification and drawings showing provision of at least 60% of trees and shrubs are native.<br>• Calculation showing the 60% quantity of native plant<br>• Information of plant specification.<br>• Site Management Plan (SMP) for maintenance of the native plan |
| **References** | 1. Environmental Quality Act (EQA), 1974<br>2. Dasar Alam Sekitar Negara (DASN)- *National Policy on the Environment*, Department of Environment, Kementerian Alam Sekitar dan Air (KASA) 2002<br>3. Sustainable Development Goal (SDG) 2015-2030- Goal 15 *Life of Land* |
| **Worked Examples** | - |

## TS 4-3 MICROCLIMATE OPTIMISATION

| | |
|---|---|
| **Objectives** | Promote design optimisation, including site planning and building massing, for better micro-climate, such as use of natural planting and water body to optimise microclimate, through modelling and simulation, verifying by field measurements of major climate data before and after the development |
| **Applicability** | Applicable to all plots in the township |
| **Baseline Standard** | - |
| **Requirements** | Up to 4 credits for design optimisation or field measurement.<br><br>(a) 1 credit each for design microclimate optimisation as follows:<br>• Solar analysis (sun path or solar insolation simulation)<br>• Ambient Temperature Simulation<br>• Wind Speed Simulation<br>• Wind direction Simulation<br><br>(b) 1 credit each for field measurement:<br>• Ambient Temperature<br>• Humidity<br>• Wind Speed<br>• Wind Direction |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 4-3(a)<br>• Microclimate optimisation plan detailing strategies for site planning & building massing for better micro climate based on solar analysis or ambient temperature simulation.<br>• Solar analysis report for sun path or solar insolation simulation before development.<br>• Site Planning analysis report<br>• SRI value >29 for hardscape area at public area and roadway within the township<br>• Building massive planning simulation report showing the orientation of the building and the shape<br>• Extract from EIA report indicating the water bodies and green space area<br>• Sea Level Rise report<br><br>For 4-3(b)<br>• Measurement report before and after the development.<br>• Extract data logger for physical on-site measurement |
| **References** | 1. Environmental Quality Act (EQA), 1974<br>2. Sustainable Development Goal (SDG) 2015-2030-- Goal 13 *Climate Action*<br>3. Roadmap Environmental Sustainability in Malaysia 2020-2030 under Kementerian Alam Sekitar dan Air (KASA)- *Revised February 2022*<br>4. Low Carbon Cities Framework (LCCF), Kementerian Alam Sekitar dan Air (KASA)<br>5. National Climate Change Policy – NRE |
| **Worked Examples** | |

## TS 4-4 OUTDOOR THERMAL ENVIRONMENT

| | |
|---|---|
| **Objectives** | Encourage to use any combination of following strategies to improve the outdoor thermal comfort and reduce heat island effect |
| **Applicability** | Applicable to all plots |
| **Baseline Standard** | - |
| **Requirements** | Up to 6 credits for the implementation of the strategies to reduce the heat island effect:<br>a. Design and simulate to enable air flow through the development (CFD analysis or wind tunnel testing) – 2 credits<br>b. Use of building vegetation, vegetated walls and green roofs (minimum 20% of the plot area) – 1 credit<br>c. Street sidewalks/ pedestrian walkways shaded over 40% - 1 credit<br>d. Provide shade for open structures such as covered walkways, vine pergolas > 50% - 1 credit<br>e. Use of permeable paving materials with Solar Reflectance Index (SRI) > 29 (Gravel and wood chippings also encouraged to hardscape areas) at least 50% of the hardscape area- 1 credit<br>f. Open grid pavement system (at least 50% pervious) for pedestrian paths at green spaces> 40% -1 credit<br>g. Provide shading for open air carparks > 50% - 1 credit<br>h. Avoid building heat exhaust to pedestrian walkways - Exhausts if fronting the public realm must be >5m above pedestrian walkways - 1 credit<br>i. Any other suitable strategy (1 credit for each) |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Ventilation simulation or wind tunnel testing reports summarising the analysis and modelling results for township as well as the recommendations for design.<br>• Extracts of the tender specification showing the design requirement to improve the outdoor thermal comfort and reduce heat island effect.<br>• Architectural plan showing the design which provide better outdoor thermal comfort and/or reduction of head island effect.<br>• Technical product information of products if applicable.<br>• Relevant drawing indicating the applicable area and its coverage |
| **References** | 1. Sustainable Development Goal (SDG) 2015-2030-- Goal 13 *Climate Action* |
| **Worked Examples** | - |

**TS 4-5 SITE SELECTION**

| | |
|---|---|
| **Objectives** | Encourage land use efficiency measures and their feasibility for suitability of development for space optimisation and reduce pressure on undeveloped land |
| **Applicability** | Applicable to all landform within the township |
| **Baseline Standard** | - |
| **Requirements** | (a) Avoid use of land with high agricultural or ecological value for at least 90% of the land area – 1 credit<br><br>(b) Use of brownfield sites or reclaimed land, reducing the use of greenfield sites<br><br>Area of site which is previously built-on:<br><br>100% - 1.0 credit<br>50% - 0.5 credit<br><br>(c) Up to 1 credit for proper remediation measures carried out on contaminated land to restore the land for use – 1 credit<br><br>(d) Up to for 2 credits for conducting flood risk assessment – demonstrate that the buildings are located in an area of low probability of flooding OR the development is appropriately flood resilient and resistant including safe access and escape routes<br><br>• credits if 100% of buildings are in an area of low probability of flooding / non-flood plain, OR demonstrates flood mitigation and escape routes<br><br>• 1 credit for 75% of buildings are in an area of low probability of flooding / non-flood plain, OR demonstrates flood mitigation and escape routes<br><br>• 0.5 credit for 50% of buildings are in an area of low probability of flooding / non-flood plain, OR demonstrates flood mitigation and escape routes<br><br>Note (d):<br><br>*1) There must be no vulnerable building uses in the flood plain area such as emergency dispersal depots (police, fire, ambulance), or installations holding, using or containing hazardous substances.*<br><br>*2) Infrastructure and services planning for overall platform levels, roads, drainage and sewerage must be demonstrated.* |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | <u>For 4-5 (a)</u><br>• Site plan showing township is not located near agricultural or ecological valued site<br>• Environmental Screening Report showing the physical environment and ecological aspects<br>• Social Screening Report showing the sociological and economic impact<br>• Soil Investigation Report<br>• Geological Report<br>• Extract of Environmental Impact Assessment (EIA) report on the land details |

| | |
|---|---|
| | For 4-5 (b)<br>• Relevant documents indicated township site is brownfield or reclaimed land.<br>• Extract of Environmental Impact Assessment (EIA) report on the land details.<br>• Official Geographic Information System (GIS) data from JUPEM indicating historical of used land<br><br>For 4-5 (c)<br>• Extract of tender specification showing remediation measures for restoration of land.<br>• Site Screening Level (SSL) for contaminated land<br>• Qualitative Risk Assessment (QRA) report<br>• Contamination mitigation plan/action plan<br><br>For 4-5 (d)<br>• Extract of tender specification showing provision of flood risk assessment.<br>• Flood risk assessment report and recommended contingency plan. |
| **References** | 1. Guidelines for Site Investigation Works (JKR)<br>2. Geographic Information System (GIS), Department of Survey and Mapping Malaysia-JUPEM<br>3. Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land, DOE Malaysia<br>4. Environmental Quality Act (EQA), 1974<br>5. ISO 31000 Risk Management Principle and Guideline, 2009<br>6. Flood Risk Assessment and Mapping Guideline, National Disaster Management Agency (NADMA), Malaysia |
| **Worked Examples** | - |

## TS 4-6 CONSERVATION AN INTEGRATION OF EXISTING STRUCTURES AND ASSETS

| | |
|---|---|
| **Objectives** | Conservation, preservation or restoration of historic remains, or buildings, or natural spaces or views that characterise and have local or community importance |
| **Applicability** | Applicable to all plot within the township/reclaimed land |
| **Baseline Standard** | - |
| **Requirements** | Up to 1 credit for conservation, preservation or restoration of historic remains, or buildings (not including the gazetted building), or natural spaces or views that characterise and have local or community importance (cultural heritage)<br><br>• Historical building e.g. building structures (facades), monuments<br>• Natural spaces or views e.g. wetlands, submerge-landscape, limestone caves<br>• Cultural heritage e.g. place of worship, archaeological sites-fossil<br>• Underwater cultural heritage e.g. shipwreck, coral reef, underwater cities<br><br>Note: Heritage assets within the project site shall be retained and restored, to be integrated as part of the project. |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Relevant documents showing conservation existing structures and assets, including information on specific items, photographic evidence and methodology of conservation<br>• Heritage Impact Assessment Report showing the historical buildings and/or cultural landscape |
| **References** | 1. Akta Warisan Kebangsaan 2005 *(www.heritage.gov.my)*<br>2. Heritage Impact Assessment Development - Town and Country Planning Act 1976 (Act 172)<br>3. Low Carbon Cities Framework (LCCF), Kementerian Alam Sekitar dan Air (KASA)<br>4. UNESCO Convention on the Protection of the Underwater Cultural Heritage, 2001<br>5. MS ISO 37122:2019 – Sustainable Cities and Communities *Indicators for Smart Cities*<br>6. Garis Panduan Perancangan Pemuliharaan dan Pembangunan Kawasan Sensitif Alam Sekitar, Warisan Kebudayaaan dan Warisan Semulajadi 2017 *(www.townplan.gov.my)* GP007-A (12) |
| **Worked Examples** | - |

## TS 4-7 HABITAT CONSERVATION & RESTORATION

| | |
|---|---|
| **Objectives** | Determine the ecological value of the habitats in and around the site in order to conserve and enhance the biodiversity and prevent deforestation |
| **Applicability** | Applicable to all plot within the township |
| **Baseline Standard** | - |
| **Requirements** | Up to 7 credits for below requirement:<br><br>(a) 2 credits for conduct an Environmental Impact Assessment or Biodiversity Impact Assessment to identify habitats, migration routes and potential damage from the development, including justification of developmental benefits versus the potential ecological losses and mitigation measures<br><br>(b) 1 credit for provision species protection plan or plans to increase the local species diversity<br><br>(c) Prevent the loss of greenery in the township: Greenery area to be calculated on plan before and after project construction.<br><br>No change – 1 credit<br>5% GnP improvement 2 credits<br>10% GnP improvement 4 credits<br><br>Note:<br>Biodiversity refers to a variety of plant and animal life in a particular habitat |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 4-7(a)<br>• Extract of Environmental Impact Assessment (EIA) including justification of development benefit versus potential ecological losses and mitigation measures<br>• Commitment from developer to implement the mitigation plan<br><br>For 4-7(b)<br>• Biodiversity Action Plan or<br>• Wildlife Management Plan e.g. wildlife tunnel provision, wetlands conservation or<br>• Habitat Conservation Plan including native plants and endangered species<br><br>For 4-7(c)<br>• Calculation showing the extent of the greenery provision within township before development.<br>• Design drawing showing the greenery area before and after construction |
| **References** | 1. Low Carbon Cities Framework (LCCF), Kementerian Alam Sekitar dan Air (KASA)<br>2. MS ISO 37122:2019 – Sustainable Cities and Communities *Indicators for Smart Cities*<br>3. Environmental Quality Act (EQA), 1974<br>4. Wildlife Conservation Enactment 1997<br>5. National Policy on Biodiversity by Ministry of Natural Resources and Environment, Malaysia 2016-2026<br>6. United Nations Convention on Biological Diversity (CBD)<br>7. High Conservation Value Forests (HCVF) Toolkit for Malaysia, World Wide Funds (WWF) Malaysia<br>8. Sustainable Development Goal (SDG) 2015-2030-- Goal 15 *Life of Land* |
| **Worked Examples** | - |

**TS 4-8 MINIMISE SITE DISTURBANCE**

| | |
|---|---|
| **Objectives** | Minimise negative impact on the site environment by constraining construction activities |
| **Applicability** | Applicable within the township |
| **Baseline Standard** | - |
| **Requirements** | 2 credits for reducing site clearance and deforestation by conserving at least 20% of the mature trees (with a trunk diameter larger than 28 cm (11 inches)<br><br>Transplanting can be considered to achieve the objective of this criteria<br><br>Preserve the following trees that are also identified as in good or excellent condition:<br>• all heritage or champion trees and trees whose dbh exceeds 50% of the state champion dbh for the species;<br>• a minimum of 75% of all non-invasive trees (including the above) larger than 18 inches (45 centimetres) dbh; and<br>• a minimum of 25% of all non-invasive trees (including the above) larger than 12 inches (30 centimetres) dbh if deciduous and 6 inches (15 centimetres) dbh if coniferous |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Relevant documents showing constraining construction activities which include reducing site clearance and conservation of mature trees OR<br>• Site Inventory Analysis on Greenery report conducted by ISA Certified Arborist or local professional specialist |
| **References** | 1. High Conservation Value Forests (HCVF) Toolkit for Malaysia, World Wide Funds (WWF) Malaysia<br>2. International Society of Arboriculture (ISA)<br>3. MyCREST Design & Construction Stage v 2.0- Section 2.1 Carbon Sequestration Conservation of Trees with a Minimum Diameter of 28 cm (11 inches)<br>4. LEED v4 for Neighbourhood Development- Section Minimize Site Disturbance |
| **Worked Examples** | - |

**TS 4-9 ENVIRONMENTAL MANAGEMENT SYSTEM**

| | |
|---|---|
| **Objectives** | Encourage the planning, design and management integration to adopt an environmentally friendly management system and practices during development |
| **Applicability** | Applicable for project team of the township |
| **Baseline Standard** | - |
| **Requirements** | Up to 5 credits for the adoption of the following strategies:<br><br>(a) Conduct site analysis and assessment before township development- 1 credit<br><br>(b) Developer, master planner, and major contractor that are ISO 14000 certified - 0.5 credit for each party (Up to 1.50 credits)<br><br>(c) Project team comprises one Certified GreenRE Accredited Professional (GreenRE AP) – 1 credit<br><br>(d) Environmental policy with measurable targets & programmes with management review and corrective action records - 1 credit<br><br>(e ) For Industrial Park to implement the Pollution Control Plan |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 4-9(a)<br>• Environmental site analysis and assessment for the purpose of planning, design and management integration to adopt an environmentally friendly management system and practice during development.<br><br>For 4-9(b)<br>• A certified true copy of the ISO 14000 certificate of developer, master planner and major contractor where applicable.<br><br>For 4-9(c)<br>• A certified true copy of the certificate of GreenRE Accredited Professional (GreenREAP) where applicable and a confirmation of their involvement performance.<br><br>For 4-9(d)<br>• Provision of intent, measures and implementation strategies of environmental policy with measurable targets & programmes with management review and corrective action records.<br><br>For 4-9(e)<br>• Pollution Control Plan consist of on measurable target and corrective action records. |
| **References** | 1. ISO 14001 standards and Scope<br>2. Sustainable Development Goal (SDG) 2015-2030- Goal 11 *Sustainable Cities and Communities* |
| **Worked Examples** | - |

## TS 4-10 FUTURE PROVISION AND CONNECTIONS

| | |
|---|---|
| **Objectives** | To actively encourage the future adaptability and flexibility of the site, including expansion |
| **Applicability** | Generally applicable to all plots |
| **Baseline Standard** | - |
| **Requirements** | Up to 2 credits for the implementation suitable design features to allow for future installation including:<br>(a) Utilities expansion and distribution upgrades (Gas, electricity, water, cooling)<br>(b) Transport and infrastructure expansion plans<br>(c) Others<br>1 credit for showing potential of expansion for utilities expansion and distribution.<br>1 credit for demonstration that other elements have been considered. |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Report on design features for the purpose of future utilities expansion and distribution upgrades. Includes drawings & design brief.<br>• Report on design features for the purpose of future transport and infrastructure expansion plans. Includes drawings & design brief.<br>• Report on design features for the purpose of other expansion plans. Includes drawings & design brief. |
| **References** | - |
| **Worked Examples** | - |

| | |
|---|---|
| Part 5 – Green Building and Green Transport | TS 5-1 Green Building within Township<br>TS 5-2 Green Urban Design Guidelines<br>TS 5-3 Green Transport Within Township |

## TS 5-1 GREEN BUILDINGS WITHIN TOWNSHIP

<table>
<tr><td>Objectives</td><td>Encourage the adoption of green building practices in building design, construction and retrofitting within the township (includes buildings assessed under GreenRE for New Developments and GreenRE for Existing Buildings)</td></tr>
<tr><td>Applicability</td><td>Applicable to the Phase 1 of the township</td></tr>
<tr><td>Baseline Standard</td><td>GreenRE NRB, RES, ENRB</td></tr>
<tr><td>Requirements</td><td>GreenRE Building Credits (GRBc)<br><br>
<table>
<tr><td>GRB Award Level</td><td>Weightage</td><td>GRBC = Weightage*GFA percentage %</td></tr>
<tr><td>Platinum</td><td>0.20</td><td>C1 = 0.20* % GFA of GreenRE Platinum buildings</td></tr>
<tr><td>Gold</td><td>0.15</td><td>C2 = 0.15* % GFA of GreenRE Gold buildings</td></tr>
<tr><td>Silver</td><td>0.10</td><td>C3 = 0.10* % GFA of GreenRE Silver buildings</td></tr>
<tr><td>Total</td><td colspan="2">GRBP = C1 + C2 + C3</td></tr>
</table>
<br>GFA certified building ($m^2$) / Total building GFA in the township ($m^2$)</td></tr>
<tr><td>Prerequisite Requirements</td><td>At least 10% of the GFA or 5,000 sqm (whichever is higher) at Phase 1 to achieve the corresponding GreenRE rating.<br><br>
<table>
<tr><td>GreenRE Township Rating</td><td>At least 10% of the GFA or 5,000 sqm (whichever is higher) at <u>Phase 1</u></td></tr>
<tr><td>GreenRE Bronze</td><td>Bronze</td></tr>
<tr><td>GreenRE Silver</td><td>GreenRE Silver</td></tr>
<tr><td>GreenRE Gold</td><td>GreenRE Gold</td></tr>
<tr><td>GreenRE Platinum</td><td>GreenRE Platinum</td></tr>
</table></td></tr>
<tr><td>Documentary Evidences</td><td>• A copy of Certificate of GreenRE ‘s Provisional Certification on targeted building<br>• Site plan showing the certified building located on the Phase 1 of township development.<br>• Document showing the GFA of certified building & total GFA of all the building in township.<br>• Calculation of credit scoring based on weightage & GFA of certified GreenRE building over total GFA.</td></tr>
<tr><td>References</td><td>-</td></tr>
<tr><td>Worked Examples</td><td>Township: Gold<br>GreenRE certified building in Phase 1 rating: Gold<br>GFA of certified building: 10,458 $m^2$<br>Total Building GFA for the whole township: 653,647 $m^2$<br><br>10,458/653,647 x 100% =1.599%<br><br>Credit scored: 0.15 x 1.599<br>= 0.24 credit</td></tr>
</table>

## TS 5-2 GREEN URBAN DESIGN GUIDELINES

| | |
|---|---|
| **Objectives** | To ensure key green features at the township level are carried through to development at the individual parcels. |
| **Applicability** | Applicable to the whole township including lease land parcel or developed by developer. |
| **Baseline Standard** | • Local plan<br>• GreenRE Guidelines |
| **Requirements** | Provision of green urban design guidelines for all land parcels in the township (4 credits)<br><br>Provision of green urban design guidelines for all land parcels to be sold to other sub-developers (2 credits)<br><br>Provision of green urban design guidelines for strategic land parcels to be sold to other sub-developers (1 credit) |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • A copy of the green urban design guidelines highlighting key green features for all land parcels in the township. Provide drawings, tender specification and/or technical data of product where applicable.<br><br>• A copy of green urban design guidelines highlighting key green features for all land parcels to be sold to other sub-developers. Provide drawings, tender specification and/or technical data of product where applicable.<br><br>• A copy of green urban design guidelines highlighting key green features for strategic land parcels to be sold to other sub developers. Provide drawings, tender specification and/or technical data of product where applicable. |
| **References** | • Local plan |
| **Worked Examples** | - |

## TS 5-3 GREEN TRANSPORT WITHIN TOWNSHIP

| | |
|---|---|
| **Objectives** | • Promote environmentally friendly transportation options and facilities to reduce pollution from individual car use<br>• Promote cycling as a real alternative to cars for shorter journeys<br>• To improve the accessibility for the physically challenged |
| **Applicability** | Generally applicable to overall masterplan of the township development. |
| **Baseline Standard** | • Local Plan<br>• MS1184:2014<br>• Panduan Bandar Salamat |
| **Requirements** | 5-3(a) 2 credits for conducting traffic modelling for the township to assess and make improvements to the township masterplan<br><br>5-3(b) 2 credits for compact and walkable township pattern for master plan; major building entrances with good access to nearest LRT or bus stops in accordance to local planning guidelines or within a 500m walking distance, with sheltered and connected linkage.<br><br>5-3(c) 1credit for transit options connecting outwards from the main LRT nodes<br><br>5-3(d) 1 credit for providing dedicated shuttle services and facilities to mass transit<br><br>5-3(e) 1 credit for network of bicycles lanes and routes that are safe, well-lit and segregated with direct links to key areas and routes<br><br>5-3(f) 1 credit for provision of secure and sheltered bicycle facilities to public Amenities.<br><br>Extent of Coverage:<br>Bicycles parking lot: Minimum 10 number and maximum 50 numbers of bicycle parking lot.<br><br>5-3(g) 1 credit for reducing carpark footprint by employing underground or multi storey carpark, etc.<br><br>5-3(h) 1 credit for provision of >10% open air parking spaces can be designated for flexible use when not being used for parking, e.g., market stalls, play areas<br><br>5-3(i) 1 credit for provision of hybrid/electric vehicles refuelling/charging Stations.<br><br>Extent of coverage:<br>Minimum 1 number priority parking bays for every 100 public carpark lots. EV chargers – 1 for every 200 parking bays. (Cap at 3)<br><br>5-3(j) 1 credit for provision of universal design features (barrier-free accessibility)<br><br>5-3(k) 1 credit for way finding strategies<br><br>5-3 (i) 1 credit for accessible from major highway outlets and /or within proximity to major cargo services (i.e airport, seaport, railway station). Project to be within 10km of these facilities |
| **Prerequisite Requirements** | - |

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| **Documentary Evidences** | For 5-3(a)<br>• A copy of traffic modelling report summarising the analysis and modelling results for purpose of assessing and improving township master plan.<br>• Improvement plan responding on the traffic assessment<br><br>For 5-3(b)<br>• Masterplan of the overall township highlighting on the major building entrance to the nearest LRT or bus stops within 500m walking distance<br>• Detail drawings of sheltered walkway and connected linkage between the major building entrance to the nearest LRT or bus stops<br><br>For 5-3(c)<br>• Layout plan drawings and design brief showing location, routes of green transport features.<br>For 5-3(d)<br>• Provision of shuttle service connecting the township to mass transit (LRT/MRT/bus/integrated station)<br>• Provision of facilities (transportation hub/station) for the shuttle service<br><br>For 5-3(e)<br>• Bicycle route masterplan highlighting on the key area and route throughout the township<br>• Road cross section showing the segregation of bicycle route from main road<br>• Detail drawing of bicycle lane with sufficient lightings<br><br>For 5-3(f)<br>• Plan showing the location of shelter and secured bicycle facilities<br>• Detail drawing of the shelter and rack with lock designated for the bicycles<br><br>For 5-3(g)<br>• Plan showing the location of underground or multi storey carpark<br>• The carpark must be located and accessible for public usage<br><br>For 5-3(h)<br>• Plan showing the location of open-air carpark can be used for other purpose<br>• To show percentage over total open-air carpark in the township<br>• To provide the plan of flexible usage or activity for that area<br><br>For 5-3(i)<br>• Extract tender specification showing provision for charging station<br>• Plan showing the location of charging station<br><br>For 5-3(j)<br>• Universal design plan showing the strategies consists of carpark space, kerb ramp, tactile walking surface indicator (TWSI), flush threshold drainage grating etc. as per MS 1184:2014<br><br>For 5-3(k)<br>• Extract tender specification showing the requirement to provide way finding strategies/features throughout the township for all type of users.<br>• Plan on way finding strategies to cater for all level of users (pedestrian, vehicles, physically challenged)<br>• Detail drawing for the strategies and location<br><br>For 5-3(i)<br>• Site / Layout plan drawings and design brief showing location, cargo delivery routes and major highway |

| | |
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| **References** | • MS 1184:2014<br>• Garis Panduan Perancangan Reka Bentuk Sejagat (GP015-A)<br>• Panduan Perlaksanaan Pengasingan Laluan Bermotor: Pemasangan Tonggak Laluan dan Rel Penghadang<br>• Panduan Perlaksanaan Inisiatif Pembangunan Kejiranan Hijau – Penyediaan Laluan Basikal |
| **Worked Examples** | - |



Part 6 – Community and Innovations

TS 6-1 Stakeholder Engagement, Feedback and Evaluation
TS 6-2 Public Awareness, Education and Community Involvement
TS 6-3 Green Lease
TS 6-4 Intelligent Infrastructure
TS 6-5 Safe Environment
TS 6-6 Light Pollution Reduction
TS 6-7 Other Green Features and Innovation

## TS 6-1 STAKEHOLDER ENGAGEMENT, FEEDBACK AND EVALUATION

| | |
|---|---|
| **Objectives** | • To solicit feedback to enhance the quality of the living environment in common facilities/public amenities<br>• To provide effective feedback channels (e.g., hotlines, emails, etc) for residents to take ownership of the township |
| **Applicability** | Applicable during Design Phase and Construction Phase/Post Completion |
| **Baseline Standard** | - |
| **Requirements** | For 6-1(a)<br>• 1 credit for consultation with stakeholders during construction / post completion (based in extent of consultation and community involvement)<br><br>For 6-1(b)<br>• 1 credit for consultation of at least two key stakeholder group<br><br>For 6-1(c)<br>• 1 credit for providing proper evaluation of feedback/survey findings<br><br>For 6-1(d)<br>• 1 credit for release of findings and feedback received.<br>• Additional 2 credits for addressing follow-up actions. |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 6-1(a)<br>• Copy of final draft of development report/planning permission/master plan<br>• Copy of survey for post completion<br>• Minutes of meeting, attendance list and photographic evidence on public consultation/feedback sessions on stipulated key stakeholders.<br><br>For 6-1(b)<br>• Minutes of meeting, attendance list and photographic evidence on public consultation/feedback sessions on stipulated key stakeholders:<br>- Public Sector/Government agencies<br>- Community/residents committee<br>- NGOs<br>- Professional Bodies<br>- Trade Unions<br><br>For 6-1(c)<br>• Evaluation of feedback from item TS 6-1 (b).<br>• Raw data of the survey analysis<br>• Survey report<br><br>For 6-1(d)<br>• Relevant documents and photographic evidence on the released findings and feedback from item TS 6-1 (a) and/or (b) including list of follow-up actions taken. |
| **References** | - |
| **Worked Examples** | - |

## TS 6-2 PUBLIC AWARENESS, EDUCATION AND COMMUNITY INVOLVEMENT

<table>
<tr><td>Objectives</td><td>To encourage and promote sustainable lifestyle and integration within the township through the production of a dedicated outreach or education programme to increase public awareness on environmental sustainability and green features of the township</td></tr>
<tr><td>Applicability</td><td>Generally applicable to overall masterplan of the township development.</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>
<u>For 6-2(a)</u><br>
• Up to 2 credits based on extent of outreach or education programmes and contents.<br><br>
Table 6-2.1: Weightage for Credits Allocation
<table>
<tr><th>Extent of outreach or education programmes and contents</th><th>Weightage for Credit Allocation</th></tr>
<tr><td>Low Impact</td><td>0.5</td></tr>
<tr><td>Medium Impact</td><td>1</td></tr>
<tr><td>High Impact</td><td>2</td></tr>
</table>
User guide brochures, information portals and facilities (such as visitor centres and exhibits) should be provided where appropriate to facilitate public awareness and education.<br><br>
<u>These areas may include:</u><br>
• Online energy efficiency and energy tracker<br>
• Refuse collection<br>
• Recycling facilities<br>
• Water conservation and usage<br>
• Environmental technologies and info<br>
• Local transport information<br>
• Local amenities and local information<br>
• Community groups and activities<br>
• Religious building locations<br>
• Biodiversity of the area<br><br>
Strategies that covered any two areas specified will be considered as <u>low impact</u> (0.5 credits).<br><br>
Strategies that covered any five areas specified will be considered as <u>medium impact</u> (1 credit).<br><br>
Strategies that covered more than five areas will be considered as <u>high impact</u> (2 credits).<br><br>
The credits awarded on condition that all strategies are applicable to all users of the township including residents, visitors & managements.<br><br>
<u>For 6-2(b)</u><br>
• 2 credits for at least 1 activity per year<br>
• Additional 1 credit for each additional green activity organised per year (up to 3 credits)
</td></tr>
<tr><td>Prerequisite Requirements</td><td>-</td></tr>
</table>

| | |
|---|---|
| **Documentary Evidences** | For 6-2(a)<br>• User guide brochures and/or documentation on information portals, facilities used.<br>• Provide drawings, tender specification and/or photograph where applicable.<br>• Report showing proposed responsible parties, type of activities, budgeting and controls on green activities.<br>• Provide details on extent of outreach or education programmes and contents.<br><br>For 6-2(b)<br>• Provide drawings, tender specification and/or photograph where applicable.<br>• Report showing proposed responsible parties, type of activities, budgeting and controls on green activities. |
| **References** | - |
| **Worked Examples** | For 6-2(a)<br>Provision of township apps where the people who live or work there able to monitor their house/premise energy & water consumption, apply for visitor permit, view latest announcement by management regarding refuse schedule, recycling schedule, bus routes map and daily schedule, location of bicycle parking & electric car charging, events and program, emergency hotline & maintenance fee payment with notification function are considered **high impact, 2 credits.**<br><br>Provision of one stop centre for management and residents/users as centralised information centre, community centre where all the educational activity conducted including recycling points, e-waste, compositing, etc. are considered **medium impact, 1 credit.**<br><br>The management provide brochure with content of township info, green features, sustainable initiative and any printed educational material are considered **low impact, 0.5 credit.** |

## TS 6-3 GREEN LEASE

| | |
|---|---|
| **Objectives** | To encourage green lease as an alternative to regular economic rental models within the township. |
| **Applicability** | Applicable to all leased parcel within the township |
| **Baseline Standard** | - |
| **Requirements** | 2 credits for provision of green lease contract documents |
| **Prerequisite Requirements** | Not applicable |
| **Documentary Evidences** | • Extract of tender specification showing the provision of green lease agreement.<br>• Proposed green lease agreement contents. |
| **References** | - |
| **Worked Examples** | The green lease contract documents should specify, but not limited to:<br>• The township GreenRE rating<br>• Minimum specification requirement for energy efficiency<br>• Water management plan<br>• Green design, practices and selection of material and resources<br>• IAQ management plan to enhance air quality, thermal comfort, acoustic control & daylighting.<br>• Building capacity supporting green commute<br>• Building users involvement and innovative features for the benefit of overall community |

## TS 6-4 INTELLIGENT INFRASTRUCTURE

| | |
|---|---|
| **Objectives** | To allow for future growth and maintenance and to utilise the current technology such as IoT (Internet of Things) for public access in decision making an automated transport information |
| **Applicability** | Generally applicable to public-accessed communication infrastructures and transport information in the township development. |
| **Baseline Standard** | - |
| **Requirements** | For 6-4(a)<br>• 2 credits for provision of infrastructure supporting high speed communication (digital, fibre optic, etc) and allowing for future growth and maintenance.<br><br>For 6-4(b)<br>• 1 credit for provision of public access to intelligent transport information, to reduce the transport demand. |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | For 6-4(a)<br>• Technical information on communications infrastructure, including information on its speed and etc.<br>• Layout plan drawing showing future ready communication infrastructure.<br><br>For 6-4(b)<br>• Technical information on intelligent transport information, including the content and features/usage.<br>• Related drawing showing provision of public access to the intelligent transport information.<br>• Report on intelligent infrastructure including transit routes, schedules, carpark lot availability, amenities nearby and etc. |
| **References** | • Smart Cities Initiative<br>• MS ISO 37122:2019 Sustainable Cities and Communities – Indicators for Smart Cities |
| **Worked Examples** | Intelligent infrastructure is a digital transformation focused on improving communication and transportation management.<br><br>• Apps that turn data into intelligence, helping in decision making to avoid delays and speed restrictions when using public transportation, public facilities and amenities.<br>• Easy to use apps with interactive maps and aerial survey imagery to support evidence-based decision making and help out the community worked and move smarter. |

**TS 6-5 SAFE ENVIRONMENT**

| | |
|---|---|
| **Objectives** | To provide good natural surveillance of public spaces |
| **Applicability** | Applicable to all public area within the township |
| **Baseline Standard** | - |
| **Requirements** | 1 credit for designing good natural surveillance of public spaces.<br><br>One of universal principal of CPTED is natural surveillance. The main purpose of this principle is to increase the level of public surveillance through 'eyes on the street' approach for potential crimes and subsequently be able to raises the uncertainty of the criminals to commit crime.<br><br>Natural surveillance means that environmental capacity creates clear opportunities and extensive surveillance from various angles either from outside or inside the building by residents or security guards through design approach.<br><br>The strategies should, but not limited to:<br>• Security signage<br>• Education, public awareness and publicity<br>• Safety mirror<br>• Pedestrian walkway and railings<br>• Lighting<br>• Unobstructed route or path from public view<br>• Police bit |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Report detailing natural surveillance of public spaces in project site and drawings showing distance and range of sight.<br>• Internal road lighting drawing<br>• Landscape design masterplan (if applicable) |
| **References** | • Crime Prevention Through Environmental Design (CPTED)<br>• Panduan Bandar Selamat |
| **Worked Examples** | - |

**TS 6-6 LIGHT POLLUTION REDUCTION**

| | |
|---|---|
| **Objectives** | To minimise light trespass from site, only light areas as required for safety and comfort |
| **Applicability** | Applicable to all public area within the township |
| **Baseline Standard** | - |
| **Requirements** | 2 credits for minimizing light trespass from site for 80% of township.<br><br>Lamp Type and Shielding Standards: |

| | *Lighting Zones* | | | | |
|---|---|---|---|---|---|
| *Use Class and Lamp Type* | *E4* | *E3* | *E2* | *E1* | *E1A* |
| ***Class 1 Lighting (Colour Rendition)*** | | | | | |
| *i)Initial output greater than or equal to 2000 lumens* | *F* | *F* | *F* | *F* | *F* |
| *ii)Initial output below 2000 lumens* | *A (1)* | *A (1)* | *A (1)* | *F* | *F* |
| ***Class 2 lighting (General Illumination)*** | | | | | |
| *i)Initial output greater than or equal to 2000 lumens* | *F* | *F* | *F* | *F* | *F* |
| *ii)Initial output below 2000 lumens (2)* | *A (1)* | *A (1)* | *A (1)* | *F* | *F* |
| ***Class 3 Lighting (Decorative) (3):*** | | | | | |
| *Initial output greater than or equal to 2000 lumens* | *F* | *F* | *X* | *X* | *X* |
| *Initial output below 2000 lumen (2)* | *A (1)* | *A (1)* | *F* | *F* | *F* |
| ***Residential Lighting (all Classes) (4):*** | | | | | |
| *Initial output greater than or equal to 2000 lumens* | *F* | *F* | *F* | *F* | *F* |
| *Initial output below 2000 lumens (2)* | *A (1)* | *A (1)* | *A (5)* | *A (5)* | *F* |

| IDA light Zone | |
|---|---|
| E1 | Intrinsic Dark Sky Zone<br><br>Area with intrinsically dark landscapes. These Zones include all areas within 50km of astronomical observatories and within 10km of local or national park boundaries, as well as the park themselves. In these areas the preservation of a naturally -dark environment, both in the sky and in the viable landscape is considered of paramount concern. These zones may also include rural areas, that have identified preservation of natural darkness as high priority or other areas where the preservation of a naturally dark landscape is of utmost priority. |
| E2 | Low Ambient Lighting Zones<br><br>These Zone generally include rural residential and agricultural rea but may also include small outlying neighbourhood commercial and industrial area surrounded by rural residential areas |
| E3 | Medium Ambient Lighting Zones<br><br>These Zone generally include urban areas with primary land used for commercial, business and industrial activities including highway and downtown district. |

| | |
|---|---|
| E4 | High Ambient Lighting Zones<br><br>These zones generally include urban areas with primary land uses for commercial, business and industrial activities including highway and downtown district. |

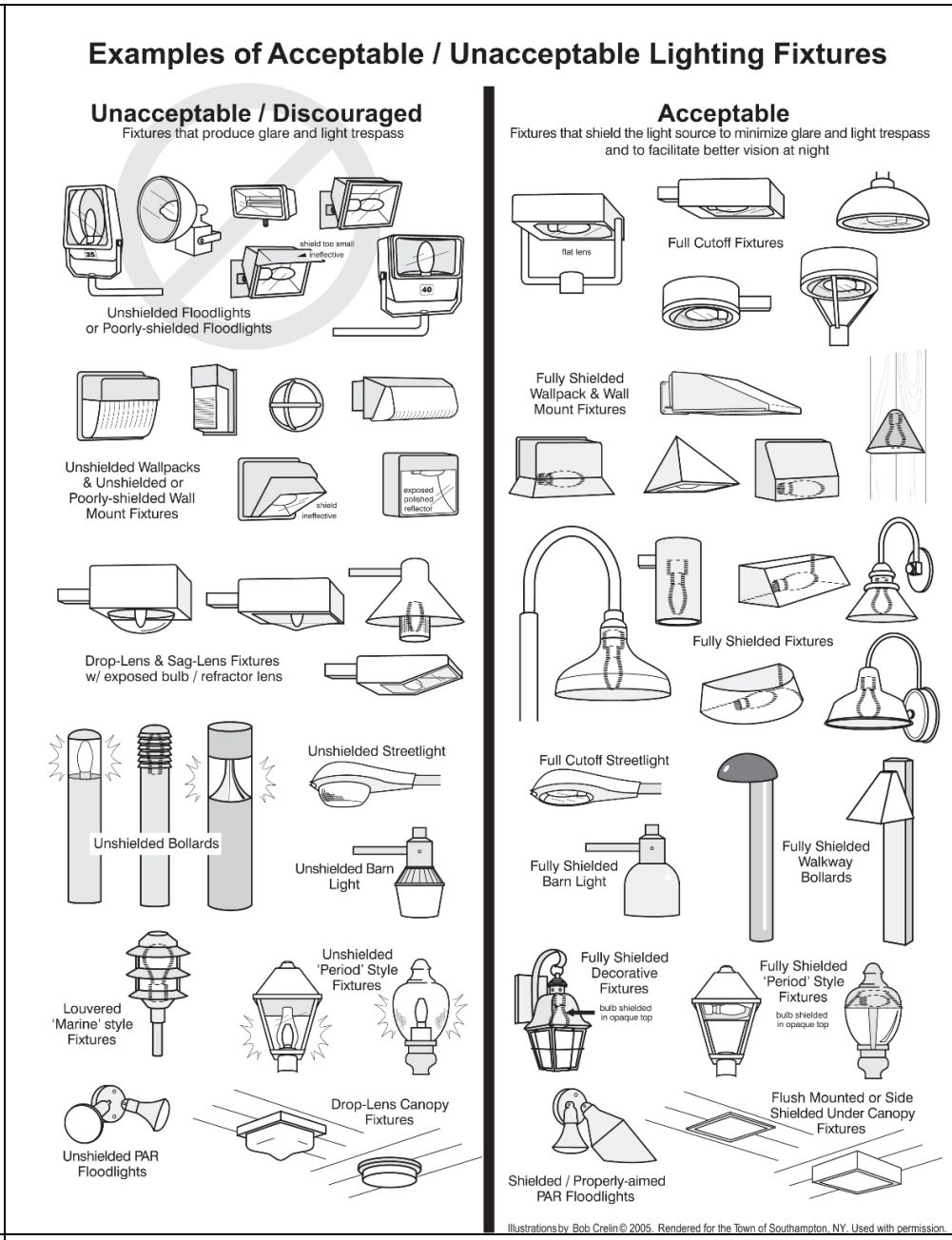
Notes
1. A =all types of lighting fixtures allowed; shielding not required but highly recommended, except any spot or flood light must be aimed no higher than 45 degrees above straight down.
F =only fully shielded fixtures allowed.
X =not allowed.

2. Classes of lighting are as define by IDA (International Dark Sky Association) as follows:

**Class 1 Lighting -** All outdoor lighting used for, but not limited to, outdoor sales or eating areas, assembly or repair areas, advertising and other signs, recreational facilities and other similar applications where COLOR RENDITION IS IMPORTANT
to preserve the effectiveness of the activity. Recognized Class 1 uses are outdoor eating and retail food or beverage service areas; outdoor maintenance areas; display lots; assembly areas such as concert or theatre amphitheatres.
**Class 2 Lighting** - All outdoor lighting used for, but not limited to, illumination for walkways, roadways, equipment yards, parking lots and outdoor security where GENERAL ILLUMINATION for safety or security of the grounds is the primary concern.
**Class 3 Lighting** - Any outdoor lighting used for DECORATIVE effects including, but not limited to, architectural illumination, flag and monument lighting, and illumination of trees, bushes, etc.

The light pollution, unlike many other forms of pollution, is reversible. To minimize the harmful effects of light pollution, lighting should:

- Be fully shielded (pointing downward)
- Only use when and where it is necessary
- Install motion detector lighting and timers
- Yellow/orange light instead of white light, with more blue content or with ultraviolet content.
- Where white light is preferred, the white light sources must have blue light and ultraviolet filter.

| | |
|---|---|
| |  |
| **Prerequisite Requirements** | - |
| **Documentary Evidences** | • Extract of tender specification showing the requirement for the shielded outdoor lighting, sensor & timer within the township.<br>• Technical specification of the outdoor lighting, sensor & timer.<br>• Related drawing showing the location of all outdoor lighting including pedestrian, landscape and decorative lighting.<br>• Photographic evidence |
| **References** | • https://www.darksky.org/wp-content/uploads/bsk-pdf-manager/RASC-GOL_2018_51.pdf<br>• https://www.lightingassociates.org/i/u/2127806/f/tech_sheets/Light_Trespass_and_Light_Pollution.pdf |
| **Worked Examples** | - |

## TS 6-7 OTHER GREEN FEATURES AND INNOVATION

<table>
<tr><td>Objectives</td><td>To encourage the use of other green features which are innovative and have positive environmental impact</td></tr>
<tr><td>Applicability</td><td>Generally applicable to overall masterplan of the township development.</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>Up to 5 credits for the use of green features that are innovative and have positive environmental impact<br><br>Examples:<br>• Dedicated bus and tram lanes on public roads<br>• Car-free township<br>• Use of pre-cast / pre-fabricated construction materials for infrastructure and public amenities<br>• Common services tunnel<br>• Adoption of local labour to ensure economic sustainability<br><br>Table TS 6-7.1: Weightage for Credits Allocation<br><table><tr><th>Extent of environmental benefits or environmental impacts</th><th>Weightage for Credit Allocation</th></tr><tr><td>Low Impact</td><td>1</td></tr><tr><td>High Impact</td><td>2</td></tr></table></td></tr>
<tr><td>Prerequisite Requirements</td><td>-</td></tr>
<tr><td>Documentary Evidences</td><td>• Extracts of the tender specification showing the provision of the specific green features used and the extent of implementation where applicable.<br>• Technical product information (including drawing and supporting documents) of the green features.<br>• A summary sheet listing the breakdown and the extent of implementation as well as the total requirements for the same intended purpose for the specific green features used.<br>• Quantified evidences on the potential environmental benefits that the features can bring to the township.</td></tr>
<tr><td>References</td><td>-</td></tr>
<tr><td>Worked Examples</td><td>-</td></tr>
</table>

## TS 6-8 OPERATIONAL EMBODIED CARBON CALCULATION

<table>
<tr><td>Objectives</td><td>To calculate the carbon emission resulted from the associated energy used during construction and operational phase of a development.</td></tr>
<tr><td>Applicability</td><td>Generally applicable to all building development.</td></tr>
<tr><td>Baseline Standard</td><td>-</td></tr>
<tr><td>Requirements</td><td>a) 1 credit for recognise the carbon emission based on operational carbon footprint computation of the public building / Infrastructure comprising energy [B6] and water consumption [B7].<br><br>b) 0.5 credit for calculation of product stage embodied carbon based on following building materials [A1-A3]:<br><br>- concrete<br>- steel<br>- bricks<br>- cement<br>- steel and metal<br><br>c) 0.5 credit for calculation of construction stage embodied carbon [A4-A5]<br><br>d) Up to 1 credit for reduction from reference embodied carbon (for Ready Mix Concrete, Cement, Steel Reinforcement, Bricks, Steel & Metal) as follow:<br><br>>10% 0.5 credit<br>>30% 1 credit<br><br>Baseline as follow:<br><br><table><tr><td colspan="5">EC ($tCO_2eq/t$)</td></tr><tr><td>Ready Mixed Concrete</td><td>Cement</td><td>Steel Reinforcement</td><td>Bricks</td><td>Steel & Metal</td></tr><tr><td>0.199~0.219</td><td>0.965~1.0857</td><td>1.39~2.41</td><td>0.24 9~ 0.279</td><td>1.478~2.498</td></tr></table></td></tr>
<tr><td>Prerequisite Requirements</td><td>-</td></tr>
<tr><td>Documentary Evidences</td><td><u>For 6-8 (a)</u><br>• Detail calculation for the estimated energy load for each component in the building e.g.: lighting, air-conditioning system, pump, receptacle load.<br>• Details calculation for estimated water consumption of the building e.g.: water fittings, landscape, water features.<br>• Technical product information on the energy efficient features and water efficient features used.<br>• Summary tabulation of estimated total energy savings and total water savings of the development for the year.<br>• Carbon emission calculation.<br><br><u>For 6-8 (b)</u><br>• Embodied carbon footprint calculation<br><br><u>For 6-8(c)</u><br>• Calculation of construction stage embodied carbon [A4-A5]<br><br><u>For 6-8 (d)</u><br>• Calculation showing the reduction from reference embodied carbon (for Ready Mix Concrete, Cement, Steel Reinforcement, Bricks, Steel & Metal)</td></tr>
</table>

<table>
<tr><td>References</td><td>-</td></tr>
<tr><td>Worked Examples</td><td>
<u>For 6-8 (a)</u><br><br>
Operational carbon calculation<br><br>
Table TS 1-1.2: Operational Carbon Calculation<br>
Energy:
<table>
<tr><th>Energy Consumption</th><th>Design (kWh/yr)</th><th>Baseline (kWh/yr)</th></tr>
<tr><td>Total Energy Usage</td><td>17,596,015</td><td>21,299,185</td></tr>
</table>
<br>
Water (Based on GreenRE Water Calculator Template):
<table>
<tr><th>Water Consumption</th><th>Design ($m^3$/yr)</th><th>Baseline ($m^3$/yr)</th></tr>
<tr><td>Total Water Usage</td><td>10,286</td><td>41,080</td></tr>
</table>
<br>
Operational Carbon Footprint
<table>
<tr><th>Type of Usage</th><th>Design</th><th>Baseline</th><th>Carbon Conversion Factor</th></tr>
<tr><td>Energy</td><td>12,211,634.4</td><td>14,781,634.4</td><td>0.694</td></tr>
<tr><td>Water</td><td>4,309.83</td><td>17,212.52</td><td>0.419</td></tr>
<tr><td>Total Annual Operational Carbon Footprint</td><td>12,215,944.2</td><td>14,789,846.9</td><td>*Energy $CO^2$ Conversion<br>0.694 – Peninsular<br>0.699 – Sarawak<br>0.536 - Sabah</td></tr>
</table>
<br>
Calculation of operational carbon: 1 credit
</td></tr>
</table>