DESIGN REFERENCE GUIDE

Infrastructure

Version 1.0

January 30th 2018

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.

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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 Infrastructure Projects (referred to as “this Guideline”) is to establish environmentally friendly practices for the planning, design and construction of infrastructure projects, which would help to mitigate the environmental impact of built structures.

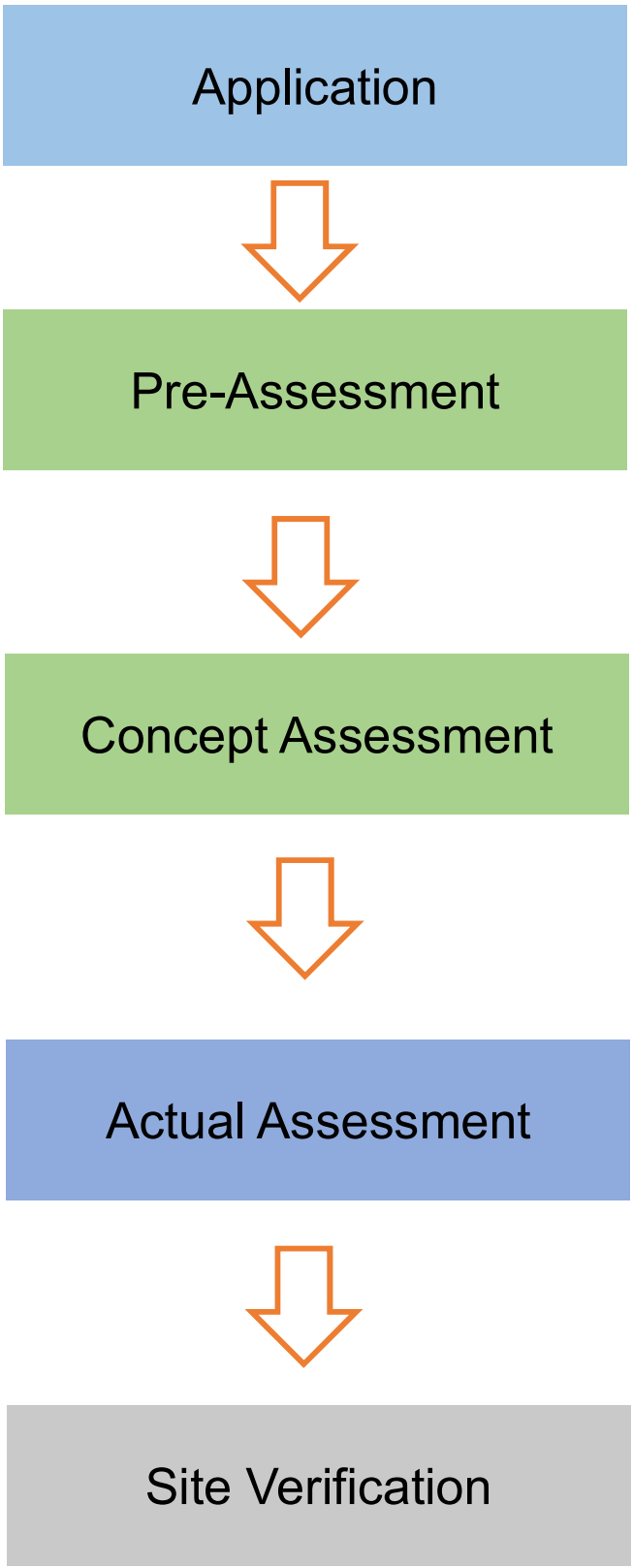
This Guideline is not intended to abridge safety, health, environmental or related requirements contained in other applicable laws, codes or policies administered by relevant authorities. Where there is a conflict between a requirement of this Guideline and such other regulations affecting the design,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

3. Revision Log

Revision	Description	Date Effective
1.0	Launched for Implementation	30-01-2018

4. GreenRE Assessment Stages

The GreenRE Infrastructure toolkit certification process is as follows:



Submittal of application with relevant supporting documents for certification upon strategic inception of infrastructure project.

A pre-assessment can be conducted (optional) to give the project team a better understanding of the criteria and evaluation of the certification level sought. This should be performed upon inception of project to allow teams to identify and maximize opportunities at the earliest stages of the project.

Concept Assessment is to be conducted once the selected design option has been finalized. Assessment process includes documentary reviews to verify if the infrastructure project meets:

(i) The intents of the criteria
(ii) Masterplan to be finalized
(iii) Confirmation from the developer to comply with the proposed criteria for target rating sought.

Concept Certificate will be issued upon completion of this stage.

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. Assessment process includes design and documentary reviews to verify if the infrastructure project meets:

(i) The intents of the criteria
(ii) The requirements for GreenRE Bronze, Silver, Gold and Platinum rating where applicable.

Provisional Certificate will be issued upon completion of this stage.

Site verification to be conducted upon project completion.
A Final Certificate will be issued upon completion of this stage.

5. GreenRE Infrastructure Rating System

Overview:

The GreenRE Infrastructure rating system is divided into six (6) sections as follows:

(a) Part 1 – Landscape, Ecology and Land Efficiency: This category focuses on the approach that can minimize impact to existing biodiversity of site area and provision of public amenities that are easily accessible.

(b) Part 2 – Energy: This category focuses on the design of infrastructure and public amenities to optimize energy efficiency. Incorporation of renewable energy systems are also encouraged.

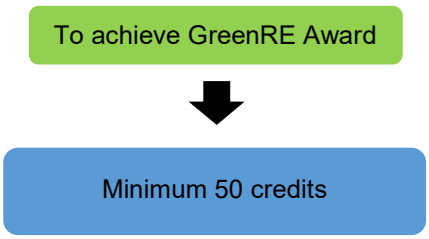
(c) Part 3 – Water: This category focuses on the selection of water fittings and strategies towards efficient water usage and management.

(d) Part 4 – Project Management: This category focuses on the application of appropriate management practices to facilitate enhanced environmental standards and stakeholder engagement in planning and execution of project.

(e) Part 5 – Waste Management and Environmental Protection: This category focuses on the application of sustainable waste management practices, storm water design and selection of materials that would reduce environmental impacts.

(f) Part 6- Innovation: This category focuses on the adoption of green practices and new technologies that are innovative and have potential environmental, social and economic benefits.

Framework:



Part 1 - Landscape, Ecology and Land Efficiency
IS 1-1 Avoid use of the land with high ecological, agricultural value
IS 1-2 Loss and mitigation of greenery area
IS 1-3 Conservation of matured trees and protected species
IS 1-4 Habitat creation and connectivity
IS 1-5 Use of brownfield sites and clean-up of contaminated land
IS 1-6 Minimise the use of land through exploring alternative design layout
IS 1-7 Provision of amenities for public usage and ease of Accessibility
IS1-8 Interconnectivity of project site

Part 2a - Energy
IS 2a-1 Energy Efficiency – M&E services
IS 2a-2 Energy Efficiency – Functional and process loads
IS 2a-3 Sub-metering and Energy Monitoring System
IS 2a-4 On-site Energy Generation
IS 2a-5 Energy Management Plan

Part 2b – Renewable Energy
IS 2b-1 Use of renewable energy (e.g. solar, wind, tidal, geothermal etc)

Part 3 – Water
IS 3-1 Rainwater harvesting and Grey water recycling
IS 3-2 Water usage during construction stage
IS 3-3 Water Efficient Fixtures
IS 3-4 Water monitoring and sub-metering
IS 3-5 Water efficiency management

Part 4 – Project Management
IS 4-1 Environmental Risk Analysis (aspect/impact identification)
IS 4-2 Environmental management system (EMS)
IS 4-3 Green Credentials of Design Team
IS 4-4 Consultation with relevant agencies and other organization (Design Phase)
IS 4-5 Follow up consultations during construction phase

Part 5 – Waste Management and Environmental Protection
IS 5-1 Buildability
IS 5-2 Minimise Cut and Fill
IS 5-3 Use of recycled material / Environment-friendly material
IS 5-4 Use of locally sourced construction material
IS 5-4 Public awareness on environmental sustainability
IS 5-5 Sustainable Stormwater Management

Part 6 – Innovation
IS 6-1 Other Environment-friendly features

Credit Allocation:

Category	Credit Allocation
Part 1 – Landscape, Ecology and Land Efficiency	
IS 1-1 Avoid use of the land with high ecological, agricultural value	3
IS 1-2 Loss and mitigation of greenery area	3
IS 1-3 Conservation of matured trees and protected species	2
IS 1-4 Habitat creation and connectivity	3
IS 1-5 Use of brownfield sites and clean-up of contaminated land	3
IS 1-6 Minimise the use of land through exploring alternative design layout	3
IS 1-7 Provision of amenities for public usage and ease of accessibility	2
IS 1-8 Inter-connectivity of project site	2
Category Score for Part 1 – Landscape, Ecology and Land Efficiency	21
Part 2a – Energy	
IS 2a-1 Energy Efficiency – M&E services	6
IS 2a-2 Energy Efficiency – Functional and process loads	7
IS 2a-3 Sub-metering and energy monitoring system	2
IS 2a-4 On-site energy generation	5
IS 2a-5 Energy management plan	2
Category Score for Part 2a – Energy	22
Part 2b – Renewable Energy	
IS 2b-1 Use of renewable energy (e.g. solar, wind, tidal, geothermal etc)	10
Category Score for Part 2b – Renewable Energy	10
Category Score for Part 2	32
Part 3 – Water	
IS 3-1 Rainwater harvesting and grey water recycling	4
IS 3-2 Water usage during construction stage	3
IS 3-3 Water efficient Fixtures	3
IS 3-4 Water monitoring and sub-metering	2
IS3-5 Water efficiency management	2
Category Score for Part 3 – Water	14
Part 4 – Project Management	
IS 4-1 Environmental Risk Analysis (aspect/impact identification)	3
IS 4-2 Environmental management system (EMS)	3
IS 4-3 Green credentials of design Team	6
IS 4-4 Consultation with relevant agencies and other organizations during design phase	4
IS 4-5 Follow up consultations during construction phase	4
Category Score for Part 4 – Project Management	20
Part 5 – Waste Management and Environmental Protection	
IS 5-1 Buildability	4
IS 5-2 Minimise cut and fill	1
IS 5-3 Use of recycled materials / environmentally-friendly materials	6
IS 5-4 Use of locally sourced construction material	2
IS 5-5 Public awareness on environmental sustainability	2
IS 5-6 Sustainable stormwater management	3
Category Score for Part 5 – Waste Management and Environmental Protection	18
Part 6 – Innovation	
IS 6-1 Other Environment-friendly features	30
Category Score for Part 6 – Innovation	30
	135 (Max)

6. GreenRE Infrastructure Rating System Scoring

Score	Rating
90 and above	GreenRE Platinum
80 to < 90	GreenRE Gold
70 to < 80	GreenRE Silver
50 to < 70	GreenRE Bronze

7. GreenRE Infrastructure Rating System Criteria

Part 1 – Landscape, ecology and land efficiency	GreenRE credit
IS 1-1 Avoid use of land with high ecological, agricultural value The identification of high ecological and biodiversity valuable areas could be done through ecological and biodiversity studies or in consultation with Nature Society/Universities to determine if there are any areas that should be conserved. The findings and feedback should be considered in the planning and design in the project footprint. No significant impact on the ecological value of site - 3 points Some minor impact but mitigation measures adopted – 2 points Some minor impact – 1 point	3 pts
IS 1-2 Loss and mitigation of greenery area Minimise the impact of the project on greenery and enhance the greenery area where possible. Greenery area to be calculated on plan before and after project implementation. Greenery Provision before and after project construction: No change in GnP – 1 point 5% improvement in GnP – 2 points 10% improvement in GnP – 3 points	3 pts
IS 1-3 Conservation of matured trees and protected species Encourage conservation of matured trees and protected species. Evidence to show that efforts were made in the design and construction to conserve mature trees and protected species. Transplanting of the trees shall be performed where applicable.	2 pts
IS 1-4 Habitat creation and connectivity No impact on wildlife habitat or where it is not possible to conserve existing wildlife habitat areas, re-instatement of existing habitat should be carried out (2 points) Interconnectivity of the green areas not disturbed. (1 point)	3 pts

IS 1-5 Use of brownfield sites and clean-up of contaminated land Area of site which was previously built-on: 100% - 2 points 50% - 1 point If building on a contaminated site, proper remediation measures are carried out to restore the land for use. (1 point)	3 pts
IS 1-6 Minimise the use of land through exploring alternative design layout Demonstrate that the planning and design process has explored various alternative proposals to optimize the use of land while achieving the intended performance of the infrastructure project. Explored proposals and implemented optimal design option – 3 points Explored proposals but did not implement optimal design option – 1 point	3 pts
IS 1-7 Provision of amenities for public usage and ease of accessibility Provide recreation facilities the public e.g children playground, cycling track, exercise corner for elderly (1 point) Universal design features (barrier-free accessibility) to improve the accessibility for the physically-challenged (1 point)	2 pts
IS 1-8 Inter-connectivity of project site Project is accessible from major highway outlets and / or within close proximity to major cargo services (i.e airport, seaport, railway stations). Project to be within 10km of these facilities.	2 pts
Part 1- Landscape, ecology and land efficiency Category Score:	**Sum of GreenRE credits obtained from IS 1-1 to 1-8 21 Credits Maximum**

<table>
<tr><th>Part 2a - Energy</th><th>GreenRE credit</th></tr>
<tr><td><u>IS 2a-1 Energy efficiency – M&E services</u>

Demonstrate the energy saving of the project mechanical and electrical services compared to guidelines stipulated in MS-1525:2014. The energy consumption calculation per year should include all equipment and systems such as lightings, air-conditioning, escalator and lift, pumps, etc.

<table><tr><td>M&E Services of the Infrastructure</td></tr><tr><td>Percentage savings compared to MS1525:2014

10% - 2 points
20% - 3 points
30% - 4 points
40% - 5 points
50% - 6 points</td></tr></table></td><td>6 pts</td></tr>
<tr><td><u>IS 2a-2 Energy Efficiency – Functional and process loads</u>

To create an energy breakdown of entire facility to indicate major energy consumers within the facility. (1 point)

To benchmark functional and process loads within the facility against industry norms and demonstrate savings.

<table><tr><td>Functional and Process loads of the Infrastructure</td></tr><tr><td>Percentage savings compared to industrial norms

10% - 2 points
20% - 3 points
30% - 4 points
40% - 5 points
50% - 6 points</td></tr></table></td><td>7 pts</td></tr>
<tr><td><u>IS 2a-3 Sub-metering and energy monitoring system</u>

Provision of sub-meters for major energy uses which includes cooling, pumps, fans (1 point).

Linking all sub-meters to the Building Management System (BMS) (1 point).</td><td>2 pts</td></tr>
</table>

IS 2a-4 On-site energy generation Use of cogeneration / tri-generation system or biofuel power generation for the project energy needs. On-site Energy Generation Percentage replacement of on-site energy needs 1-5% - 1 point 6-10% - 2 points 11-15% - 3 points 16-20% - 4 points 21-25% - 5 points	5 pts
IS 2a-5 Energy management plan Provide energy management plan at design stage such as setting targets, developing measures and strategies for energy reduction during operation.	2 pts
Part 2a – Energy Category Score:	**Sum of GreenRE credits obtained from IS 2a-1 to 2a-5: 22 Credits Maximum**

2b - Renewable Energy	GreenRE credit
IS 2b-1 Use of renewable energy (e.g. solar, wind, tidal, geothermal etc.) 1 point for every 0.5% replacement of total energy needs of facility **or** 1 point for every 10% of roof area used for solar power generation.	Up to 10 pts
Part 2b- Renewable Energy Category Score:	**Sum of GreenRE credits obtained from IS 2b-1 10 Credits Maximum**

Part 3 - Water	GreenRE credits
IS 3-1 Rainwater harvesting and grey water recycling Collection and use of rainwater or grey water recycling for non-potable use such as irrigation and flushing of toilets. Points will be pro-rated based on the extensiveness of use. 100% replacement using non-potable water – 4 points 75% replacement using non-potable water – 3 points 50% replacement using non-potable water – 2 points 30% replacement using non-potable water – 1 point Credits will be pro-rated based on effectiveness of use	4 pts
IS 3-2 Water usage during construction stage Implement non-chemical waste water/rainwater collection and treatment system to recycle the water for construction usage e.g. casting of concrete, washing, curing concrete etc.	3 pts
IS 3-3 Water efficient fixtures Reduce potable water by using water efficient fittings covered under the Water Efficiency Product Labelling Scheme (WEPLS) or Water Efficiency Labelling Scheme (WELS). All water fittings having: • Efficient Rating – 1 point • Highly Efficient Rating – 2 points • Most Efficient Rating – 3 points *Note: Points will be pro-rated based on extensiveness of use.*	3 pts
IS 3-4 Water monitoring and sub-metering Provision of sub meters to monitor water usage during operation (1 point) Linking of sub-meters to a monitoring system for detection system (1 point)	2 pts
IS3-5 Water efficiency management Targets to improve water performance should be set. To show intent, measures and implementation strategies of water efficiency improvement plans during construction and operation of infrastructure project.	2 pts
Part 3- Water Category Score:	**Sum of GreenRE credits obtained from IS 3-1 to 3-5: Maximum 14 Credits**

Part 4 - Project Management	GreenRE Credits
IS 4-1 Environmental risk analysis (aspect/impact identification) The purpose of the environmental risk assessment is to ensure that planners and designers consider environmental impacts associated with the project, to determine environmental aspects and impacts of products/activities/services at an early stage. The risk analysis should include relevant impacts such as, but not limited to, soil contamination, air pollution, noise health effects, and ecology impacts, including endangered species, geological hazards, and water pollution.	3 pts
IS 4-2 Environmental Management System (EMS) An effective environmental management system should be implemented to include: • establishing an environmental policy, • planning environmental objectives and measurable targets, • implementation and operation of programs to meet objectives and targets, • checking and corrective action, and • management review.	3 pts
IS 4-3 Green credentials of design team Main builder has good track records in completing internationally recognized accredited Green Buildings and adoption of sustainable, environmentally friendly and considerate practices during construction. (2 points) Developer, main builder, consultants, architect etc. within project team are ISO 14000 certified. (0.5 points each up to 3 points) Project team comprises Certified GreenRE Manager/ Green Mark Manager (1 point)	6 pts

IS 4-4 Consultation with relevant agencies and other organizations during design stage The following groups should be consulted where applicable: • Local community and Resident's Committee • NGOs such as Nature Society • Government agencies • Professional bodies and associations The feedback and inputs from the consultation should be used to improve the design and construction process. If any negative impacts are unavoidable, mitigation measures should be implemented to reduce these impacts as far as possible. These shall be communicated to the community and interest groups in a timely manner	4 pts
IS 4-5 Follow up consultations during construction phase Further follow up sessions should be conducted when necessary, such as when there are changes to the original design of the project or change in the construction method which could have negative impacts on the environment and community.	4 pts
Part 4 - Project Management Category Score:	**Sum of GreenRE credits obtained from IS 4-1 to 4-5 Maximum 20 Credits**

Part 5 – Waste Management and Environmental Protection	GreenRE Credits
IS 5-1 Buildability To encourage efforts made in the design to increase the buildability of the design hence reducing wet trades on site and construction waste generation. IBS Content scoring: 1 point for IBS score ≥ 50% 2 points for IBS score ≥ 70% **and / or** Buildable design features such as standardization of grids, flat slab/plate. (2 pts)	4 pts
IS 5-2 Minimise cut and fill To encourage reduction in the quantity of excavated materials taken off or into the site by optimising the use of cut and fill material in the construction process.	1 pt
IS 5-3 Use of recycled material / environment-friendly material Use of environmental friendly products that are certified under any accredited local or international certification body and / or recycled materials (with at least 30% recycled content). 1 point for products used extensively (more than 50% of built up area) 0.5 point of product used in small area (less than 50% of built up area)	6 pts
IS 5-4 Use of locally sourced construction material Use of locally sourced construction material to support and promote local industries and the economy. This also reduces the embodied carbon of material used. (Applies to building material only and excludes mechanical and electrical services). 2 points for ≥ 20% (based on cost) of total construction material 1 point for ≥ 10% (based on cost) of total construction material	2 pts
IS 5-5 Public awareness on environmental sustainability Dedicated outreach programme to increase public awareness on environmental sustainability and green features of the infrastructure. User guide brochures and facilities such as visitor centres, exhibits should be provided where appropriate to facilitate public awareness.	2 pts

IS 5-6 Sustainable stormwater management Implementation of sustainable stormwater management to ensure: • Safety of the public • Control nuisance flooding and provide for the safe passage of less frequent or larger flood events • Stabilize landform and control erosion • Minimize the environmental impact of runoff • Enhance urban landscape and ecology Encourage the treatment of stormwater runoff through provision of infiltration or design features before discharge to public drains. Provision of infiltration features or design features for new development and redevelopment. Provisions of the stormwater management features or design features through Best Management Practices (BMPs) as recommended in Urban Stormwater Management Manual for Malaysia (MASMA) design guidelines.	Stormwater management system to comply with MSMA. Reduce post development stormwater runoff volume from exceeding pre-development runoff volume: ≥ 10% - 1 pt ≥ 20% - 2 pts ≥ 30% - 3 pts
Part5–Waste Management and Environmental Protection Category Score:	**Sum of GreenRE credits obtained from IS 5-1 to 5-6 Maximum 18 Credits**

Part 6 – Innovation	GreenRE Credits
<u>IS 6-1 Other environment-friendly features not mentioned in the assessment criteria.</u> These could vary widely for different types of infrastructure projects and the project team has to quantify and justify the positive environmental impacts and how it contributes to wider environmental impact. The following are examples that could be considered: • Enhance adjacent land valuations. • Tourism – the project could become eco-destination to attract both locals and foreign tourists. • Integration of innovative technologies e.g. waste heat from district cooling system recovered for generating hot water. • Life cycle analysis for the development with an effort to reduce the carbon footprint of the project construction and operation. • Any other features that contribute to sustainable development.	30 pts (Capped at 5 points per innovation)
Part 6 – Innovation Category Score:	**Sum of GreenRE credits obtained from IS 6-1: Maximum 30 Credits**