DESIGN REFERENCE GUIDE

Office Interior

Version 1.0

22nd June 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.

GreenRE Sdn Bhd
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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 Office Interior (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 are dedicated for office interior other than retail and hospitality.

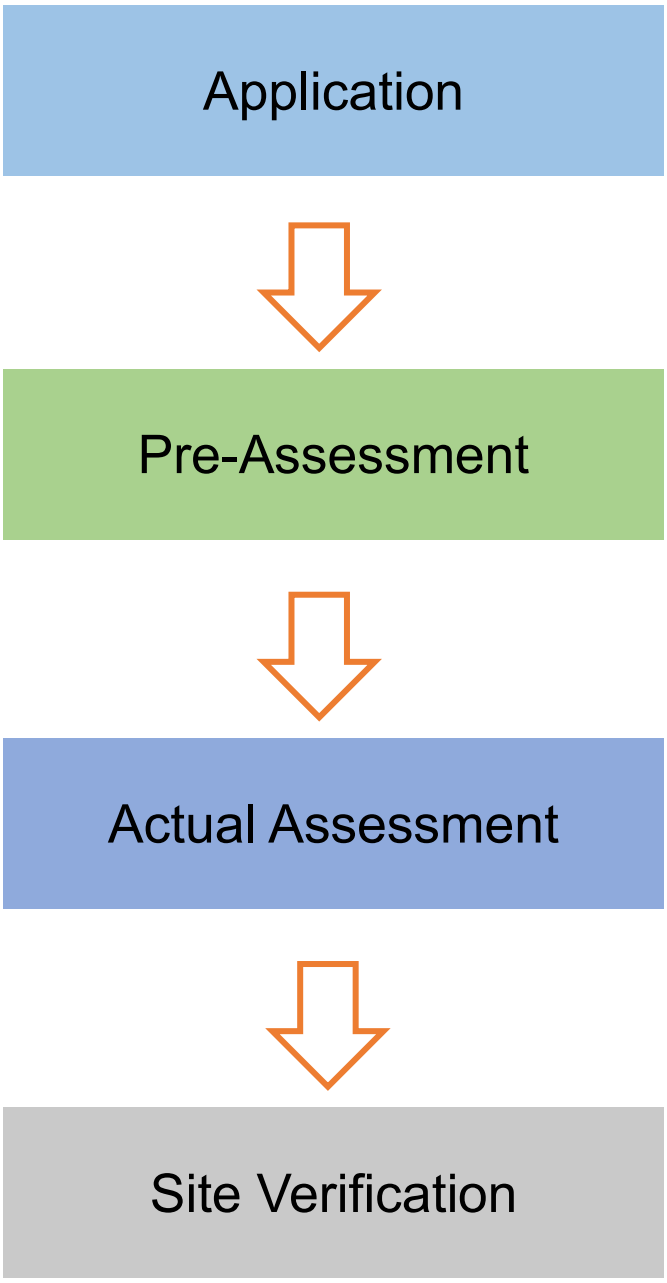
This Guideline is not intended to abridge safety, health, environmental or related requirements contained in other applicable laws, codes or policies administered by relevant authorities. Where there is a conflict between a requirement of this Guideline and such other regulations affecting the design,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

3. Revision Log

Revision	Description	Date Effective
1.0	Issued for Pilot	22nd June 2018

4. GreenRE Assessment Stages

The GreenRE Office Interior 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 selection of suitable design option to allow teams to identify and maximise opportunities at the earliest stages of the project.

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 pre-requisite requirement 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.

Final Certificate will be issued upon completion of this stage.

5. GreenRE Office Interior Rating System

Overview:

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

Part 1 - Energy Efficiency: This category focuses on the approach that can be used in the building design and system selection to optimise the energy efficiency of buildings.

Part 2 - Water Efficiency: This category focuses on the selection of fittings and strategies enabling water use efficiency during construction and building operation.

Part 3 – Sustainable Management & Operation: This category focuses on the design, sustainable management and operation that would reduce the environmental impacts of interior.

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

Part 5 - Other Green Features: This category focuses on the adoption of green practices and new technologies that are innovative and have potential environmental benefits.

Part 6 - Carbon Emission of Development: This category focuses on the use of carbon calculator to calculate the carbon emission of the development.

These environment impact categories are broadly classified under two main groups namely (I) Energy Related Requirements and (II) Other Green Requirements.

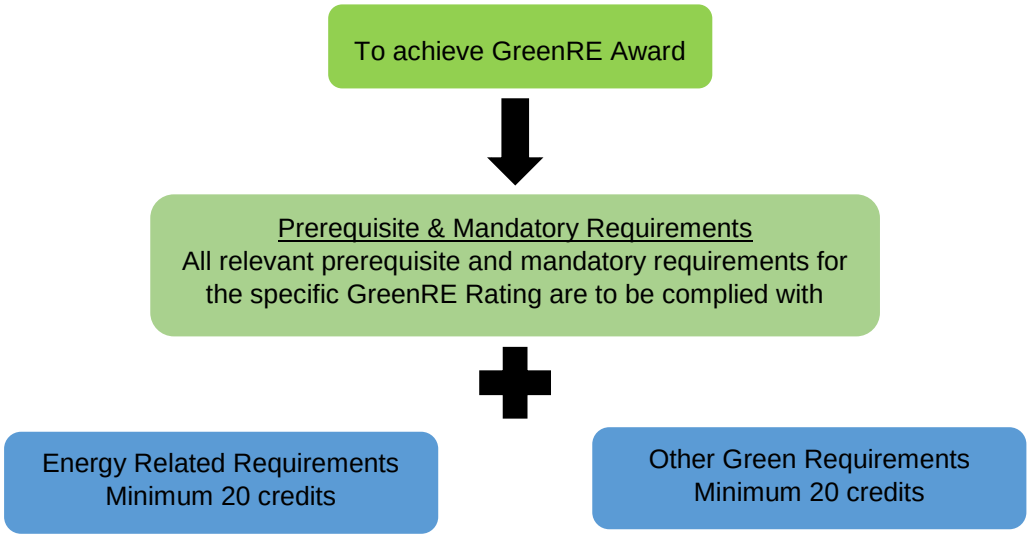
Energy Related Requirements consist of Part 1- Energy Efficiency where credits are allocated for the various energy efficient designs, practices and features used. A minimum of 20 credits must be obtained from this group to be eligible for certification.

Other Green Requirements consist of Part 2 - Water Efficiency; Part 3 - Environmental Protection; Part 4 - Indoor Environmental Quality; Part 5 - Other Green Features and Part 6 - Carbon Emission of Development. Credits are allocated for the water efficient features, environmentally friendly design practices, innovative green features used and carbon emission of development. A minimum of 20 credits must be obtained from this group to be eligible for certification.

The maximum GreenRE score achievable for a project is capped at 100 credits

This rating tool is to be read in conjunction with NRB v3.1 and ENRB v3.1

Framework:



Elective Requirement for Energy Improvement
(Combination of the following items to meet 20 credits)

Part 1 – Energy Efficiency
INT 1-1 Energy Efficiency
INT 1-2 Electricity Usage
INT 1-3 Air-Conditioning
INT 1-4 Lighting
INT 1-5 Office Equipment
INT 1-6 Energy Efficient Features

Elective Requirement for Other Areas (Combination of the following items to meet 20 credits)

Part 2 - Water Efficiency
INT 2-1 Water Efficient Fittings
INT 2-2 Water Usage
INT 2-3 Water Efficiency Improvement Plan

Part 3 – Sustainable Management & Operation
INT 3-1 Sustainable Office Design
INT 3-2 Sustainable Material Selection
INT 3-3 Office Operation
INT 3-4 Post Occupancy Evaluation
INT 3-5 Waste Management
INT 3-6 Greenery
INT 3-7 Green Transport Accessibility
INT 3-8 Professional Consultant

Part 4 - Indoor Environmental Quality
INT 4-1 Indoor Air Quality (IAQ) Performance
INT 4-2 Indoor Air Pollutants
INT 4-3 Lighting Quality
INT 4-4 Thermal Comfort
INT 4-5 Internal Noise Level

Part 5 – Other Green Features
INT 5-1 Green Features & Innovations

Part 6 – Carbon Emission of Development
INT 6-1 Carbon Emission of Development

Credit Allocation:

Category		Credits Allocation
	(I) Energy Related Requirements	
Minimum 20 credits	**Part 1: Energy Efficiency**	
	INT 1-1 Energy Efficiency	4
	INT 1-2 Electricity Usage	1
	INT 1-3 Air – Conditioning	8
	INT 1-4 Lighting	17
	INT 1-5 Office Equipment	10
	INT 1-6 Energy Efficient Features	8
	Category Score for Part 1 – Energy Efficiency	**48**
	(II) Other Green Requirements	
Minimum 20 credits	**Part 2: Water Efficiency**	
	INT 2-1 Water Efficiency	6
	INT 2-2 Water Usage	1
	INT 2-3 Water Efficiency Improvement Plan	1
	Category Score for Part 2 – Water Efficiency	**8**
	Part 3: Sustainable Management & Operation	
	INT 3-1 Sustainable Office Design	5
	INT 3-2 Sustainable Material Selection	12
	INT 3-3 Office Operation	3
	INT 3-4 Post Occupancy Evaluation	3
	INT 3-5 Waste Management	4
	INT 3-6 Greenery	3
	INT 3-7 Public Transport Accessibility	2
	INT 3-8 Professional Consultants	2
	Category Score for Part 3 – Environmental Protection	**34**
	Part 4: Indoor Environmental Quality	
	INT 4-1 IAQ Performance	8
	INT 4-2 Indoor Air Pollutants	4
	INT 4-3 Lighting Quality	5
	INT 4-4 Thermal Comfort	1
	INT 4-5 Internal Noise Level	1
	Category Score for Part 4: Indoor Environmental Quality	**19**
	Part 5: Other Green Features	
	INT 5-1 Green Features & Innovations	8
	Category Score for Part 5: Other Green Features	**8**
	Part 6: Carbon Emission of Development	
	INT 6-1 Carbon Emission of Development	2
	Category Score for Part 6: Carbon Emission of Development	**2**
	Category Score for Part 2 to Part 6 – Other Green Requirements	**71**
GreenRE Non-Residential Building Score:		**119 (MAX)**

6. GreenRE Office Interior 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 Office Interior Rating System Criteria

Pre-requisites:

To be eligible for GreenRE for Office Interior, the office's temperature setting should not be lower than 23°C unless due to specific needs which will be reviewed on a case by case basis.

To be eligible for GreenRE certification, the office has to meet the following pre-requisite requirements:

General

- For buildings in operation for more than one (1) year, full IAQ audit to be performed once in three (3) years that complies with Code of Practice on Indoor Air Quality, Department of Occupational Safety and Health, Ministry of Human Resources Malaysia (2005).

For GreenRE Gold Rating

- Energy Efficiency Index (EEI) of 80 Kwh/m^2/year or lower

  Note: For office where each staff is occupying office space of 12 square meter or lower, higher EEI will be considered on a case by case basis, but the EEI should not be more than 90 Kwh/m^2/year

- Lighting power budget of 10 W/m^2 or lower

- Setting of sustainable and environmentally friendly procurement and purchasing policy and use and purchase of sustainable and environmentally friendly products for office stationery and cleaning products

- For offices whereby air-conditioning is non-centralized (i.e unitary systems), system efficiency shall comply with Suruhanjaya Tenaga 5-star or equivalent.

Note: This can be prescribed and enforced via DMC and green fit out guidelines to unit owner / tenant if not installed by developer. However, credit scoring will not be allowed under section 1-3

For GreenRE Platinum Rating

- Energy Efficiency Index (EEI) of 70 Kwh/m^2/year or lower

  Note: For office where each staff is occupying office space of 12 square meter or lower, higher EEI will be considered on a case by case basis, but the EEI should not be more than 80 Kwh/m^2/year

- Lighting power budget of 8 W/m^2 or lower

- Setting of sustainable and environmentally friendly procurement and purchasing policy and use and purchase of sustainable and environmentally friendly products for office stationery and cleaning products

- For offices whereby air-conditioning is non-centralized (i.e unitary systems), system efficiency shall comply with Suruhanjaya Tenaga 5-star or equivalent.

Note: This can be prescribed and enforced via DMC and green fit out guidelines to unit owner / tenant if not installed by developer. However, credit scoring will not be allowed under section 1-3.

Note:

1. EEI calculation is based on 55 hours working week and excludes air-conditioning usage which is normally provided by landlord.

2. Office interior assessment also excludes server rooms.

<table>
<tr><th>Part 1 - Energy Efficiency</th><th>GreenRE Credits</th></tr>
<tr><td><u>INT 1-1 ENERGY EFFICIENCY</u>

(a) Encourage selection of energy efficient base building.

Building is awarded GreenRE Gold / Platinum rating and/or demonstrates 25%-30% energy savings trend over last three years.

(b) Encourage office with energy efficiency improvement plan

Setting target to improve office energy performance.

To show intent, measures and implementation strategies of energy efficiency improvement plans over the next three years.

Committed energy savings accrued from proposed measures should be quantified.</td><td>Gold: 2 credits
Platinum: 3 credits

1 credit</td></tr>
<tr><td><u>INT 1-2 ELECTRICITY USAGE</u>

Encourage the design of system that monitor and manage electricity consumption.

(a) Provision of sub-meter to monitor electricity use of each floor.

.</td><td>1 credit</td></tr>
<tr><td><u>INT 1-3 AIR-CONDITIONING</u>

Encourage the use of more efficient air-conditioning to minimize energy consumption

(a) A/C system efficiency

For centralized air-conditioning systems:

Use of centralized air-conditioning system which meet the efficiency requirement as per NRB v3.1. Central plant efficiency as per adjacent table. Air-side efficiency to meet fan power limitations stated.</td><td>
<table>
<tr><th colspan="2">Water-Cooled Chilled Water PlantBuilding Cooling Load (RT)</th><th rowspan="3">Credit</th></tr>
<tr><th>< 500</th><th>≥ 500</th></tr>
<tr><th colspan="2">Efficiency (kW/RT)</th></tr>
<tr><td>0.85</td><td>0.75</td><td>1</td></tr>
<tr><td>0.80</td><td>0.70</td><td>2</td></tr>
<tr><td>0.75</td><td>0.68</td><td>3</td></tr>
<tr><td>0.70</td><td>0.65</td><td>4</td></tr>
</table>
</td></tr>
</table>

Allowable nameplate motor power	
Constant volume	Variable volume
1.7 kW/m^3/s	2.4 kW/m^3/s

Air-Cooled Chilled Water Plant

Building Cooling Load (RT)		Credit
< 500	≥ 500	
Efficiency (kW/RT)		
1.1	1.0	1
1.0	Not applicable	2
0.85		3
0.78		4

For unitary air-conditioning systems:

Efficiency of air-conditioning system to be as per Suruhanjaya Tenaga or equivalent.

Energy Efficiency Rating	Credit
****	3
*****	4

Note: This can be prescribed and enforced via DMC and green fit out guidelines to unit owner / tenant if not installed by developer.

(up to 4 credits)

(b) Zoning and controls

Encourage the use of air-conditioning design practices that offer greater flexibility and makes it easier to serve area with different usage efficiently, such as the following:

(i) Zoning of air-conditioning system to serve areas with different usage/ occupancy needs. — 1 credit

(ii) Scheduling control to switch on and/or off the air-conditioning with some localized override control where air-conditioning is needed beyond the scheduled period. — 1 credit

(iii) Meeting rooms, pantry, etc with specialty occupancies having controls capable of sensing space use and responding to space demand. — 1 credit

(iv) Room temperature and humidity display in applicable areas — 1 credit

(up to 4 credits)

INT 1-4 LIGHTING Encourage the use of better efficient lighting to minimise energy consumption from lighting usage. (a) Lighting power budget Baseline: Maximum lighting power budget as per MS-1525:2014.	0.3 credit for every percentage improvement Credits awarded = 0.3 x (%improvement) (up to 12 credits)
(b) Lighting controls Encourage the use of lighting control circuits to minimize energy usage, such as provision of the following control strategies:	
(i) Zoning of lighting for different usage/ locations.	1 credit
(ii) Scheduling control to switch on and/or off the lightings with some localized override control where lighting is needed beyond the scheduled period.	1 credit
(iii) Use of dimmers, i.e. so that lighting can be dimmed during lunch hours.	1 credit
(iv) Minimize use of general lighting level by using task lighting.	1 credit
(v) Use of motion sensors for areas with infrequent usage.	1 credit (up to 5 credits)

INT 1-5 OFFICE EQUIPMENT Encourage the use of energy efficient office equipment to save energy. Use of energy efficient office equipment such as: • Computer • Monitor • Fax machine • Printer • Photocopier • Etc.	Credits awarded based on the number (type of equipment) and energy efficiency rating (highest rating for applicable labelling scheme) of the equipment used. (up to 10 credits)
INT 1-6 ENERGY EFFICIENT FEATURES Encourage the use of energy efficient features which are innovative and/or have positive environmental impact. Examples: • Use of overnight equipment management software to pre-set, back-up and shut down computer at night. • Use of solar panel to replace electricity • Use of heat recovery system	2 credits for every 1% energy saving over the total office energy consumption. (Up to 8 credits)
PART 1 – ENERGY EFFICIENCY CATEGORY SCORE:	Sum of GreenRE credits obtained from INT 1-1 to 1-6

<table>
<tr><th>Part 2 – Water Efficiency</th><th>GreenRE Credits</th></tr>
<tr><td><u>INT 2-1 WATER EFFICIENT FITTINGS</u>

Encourage the use of water efficient fittings covered under the Water Efficiency Labelling Scheme (WELS) or adopt equivalent water efficient flowrates for water fittings.

(a) Basin Taps and Mixers
(b) Flushing Cistern
(c) Showers
(d) Sink/Bib Taps and Mixers
(e) All other water fittings</td><td><table><tr><td colspan="3">Rating Based on Water Efficiency Products Labelling Scheme (WEPLS)</td></tr><tr><td>Efficient *</td><td>Highly Efficient **</td><td>Most Efficient ***</td></tr><tr><td>2 credit</td><td>4 credits</td><td>6 credits</td></tr></table>
Credits can be scored based on the number and water efficiency rating of the fitting type used.

(Up to 6 credits)</td></tr>
<tr><td><u>INT 2-2 WATER USAGE</u>

Encourage the design of system that monitors and manages water consumption

(a) Provision of meter to monitor the water usage of each floor.</td><td>1 credit</td></tr>
<tr><td><u>INT 2-3 WATER EFFICIENCY IMPROVEMENT PLANS</u>

Targets to improve office water performance should be set. To show intent, measures and implementation strategies of water efficiency improvement plans over the next three years.

Committed water savings accrued from proposed measures should be quantified.</td><td>1 credit</td></tr>
<tr><td>PART 2 – WATER EFFICIENCY CATEGORY SCORE:</td><td>Sum of GreenRE credits obtained from INT 2-1 to 2-3</td></tr>
</table>

<table>
<tr><th>Part 3 – SUSTAINABLE MANAGEMENT & OPERATION</th><th>GreenRE Credits</th></tr>
<tr><td><u>NRB 3-1SUSTAINABLE OFFICE DESIGN</u>

Encourage the selection of more sustainable base building and the adoption of office designs and materials that are environmentally friendly and sustainable.

(a) Office renovation conserves at least 50% (by area) of the existing finishing for walls, flooring and ceilings.

(b) Office layout design encourages open, flexible and maximal space usage such as:

• Provision of open and flexible layout with minimum enclosed space.
• Provision of space saver, mobile station, etc.
• Layout encourages external views.</td><td>2 credits

1 credit

1 credit

1 credit

(Up to 3 credits)</td></tr>
<tr><td><u>INT 3-2 SUSTAINABLE MATERIAL SELECTIONS</u>

Encourage the adoption of office materials that are environmentally friendly and sustainable.

(a) Maintain at least 50% (by volume) of the existing furniture.

(b) Use of environmental friendly products that are certified by approved local certification body.</td><td>2 credits

<table><tr><th>Extent of use of environmentally friendly product</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>
Credits scored will be based on the extent of use of environmentally friendly product.

(Up to 10 credits)

Note: High impact is for products whereby quantities used by percentage is more than 50% of quantities used for same intended purpose.</td></tr>
</table>

INT 3-3 OFFICE OPERATION	
(a) Commitment from tenant – environmental policy	1 credit
(b) A green guide for office occupants should be disseminated. Best practices pertaining to reduction of energy use, water use and maintenance of a good indoor environment should be documented in this green guide. Evidence of office occupants' involvement in environmental sustainability should also be demonstrated.	1 credit
c) Provision of green fit-out guidelines by building owner.	1 credit
INT 3-4 POST OCCUPANCY EVALUATION	
(a) Conduct yearly post occupancy evaluation to assess occupant's satisfaction with the indoor environmental conditions.	2 credits
(b) List of corrective actions taken following the post occupancy evaluation.	1 credit
INT 3-5 WASTE MANAGEMENT	
Encourage recycling facilities within office to reduce waste going to landfill.	
Provision of recycling facilities (for recycling glass, paper, metal as well as one for non-recyclable waste)	
(i) At a central location	1 credit
(ii) At every floor or strategic locations to encourage recycling	1 credit
(iii) To prepare and implement waste management improvement plan and include targets for waste reduction.	2 credits
INT 3-6 GREENERY	
Encourage greater use of greenery to create a more conducive office environment	
(a) Sky garden, roof garden or common recreation areas for staff with greenery.	Extent of Coverage: At least 1% of the office area 1 credit
(b) Planter or potted plants	Extent of Coverage: At least 2% of the office area

	2 credits (Up to 3 credits)
INT 3-7 PUBLIC TRANSPORT ACCESSIBILITY Promote the use of public transport or bicycles to reduce pollution from individual car use. (a) Good access to nearest MRT/LRT or bus stops. (<800m) (b) Adequate bicycles parking lots.	 1 credit 1 credit
INT 3-8 PROFESSIONAL CONSULTANTS (a) Selection of a qualified design team apart from the Interiors Designers, representing the other interior fit out trades and shall consist of either of the following: i. MEP Engineers ii. C&S Engineer iii. Sustainability Consultants iv. Quantity Surveyors (b) Project team comprises one of Certified GreenRE/Green Mark Manager (GM)	 1 credit 1 credit
PART 3–ENVIRONMENTAL PROTECTION CATEGORY SCORE:	Sum of GreenRE credits obtained from INT 3-1 to 3-8

Part 4 – Indoor Environmental Quality	GreenRE Credits
INT 4-1 IAQ PERFORMANCE Encourage and recognize good indoor air quality (IAQ) to ensure the comfort and well-being of office occupants. (a) Conduct IAQ audit once every three years and ensure that the following recommended IAQ parameters are met. (b) Develop an active IAQ management programme. (c) CO2 monitoring to ensure delivery of sufficient/minimum outside air requirements.	5 credits 1 credit 2 credits
INT 4-2 INDOOR AIR POLLUTANTS Minimise airborne contaminants, mainly from inside sources to promote a healthy indoor environment. (a) Use and purchase of low VOC and low toxicity products recognised by approved local certification body or equivalent for: • Cleaning products • Carpeting/flooring • Adhesives • Paints (b) Setting of sustainable and environmentally friendly procurement and purchasing policy.	Up to 3 credits 1 credit

<table>
<tr><td><u>INT 4-3 LIGHTING QUALITY</u>

To encourage good workplace lighting quality to promote productivity and comfort of occupants.

(a) Design for proper lighting level.
<u>Baseline:</u> Luminance level stated in MS 1525:2014

(b) High frequency ballasts OR use of driver with output frequency < 200Hz and < 30% flicker for LED lighting.

(c) Include daylighting and glare control system.</td><td>1 credit

1 credit

3 credits</td></tr>
<tr><td><u>INT 4-4 THERMAL COMFORT</u>

Ensure thermal comfort of office occupants

(a) Comfort level
• Indoor operative temperature between 23ºC to 26ºC
• Relative Humidity 50% - 70%</td><td>1 credit</td></tr>
<tr><td><u>INT 4-5 INTERNAL NOISE LEVEL</u>

Occupied spaces in office are designed with good ambient sound level as follows:

<table><tr><td>Low dBA</td><td>Average dBA</td><td>High dBA</td></tr><tr><td>40</td><td>45</td><td>50</td></tr></table></td><td>1 credit</td></tr>
<tr><td>Part 4 – INDOOR ENVIRONMENTAL QUALITY CATEGORY SCORE:</td><td>Sum of GreenRE credits obtained from INT4-1 to 4-5</td></tr>
</table>

Part 5 – Other Green Features	GreenRE Credits
INT 5-1 GREEN FEATURES & INNOVATIONS Encourage the use of other green features which are innovative and/or have positive environmental impact. Examples: • Use of printing access through swipe access card to help minimize unnecessary printing. • Provision of internal staircase to discourage usage of lifts. • Use of non-disposable cups for meetings and staff. • Provision of green walls. • Use of tele-conferencing to reduce travelling needs. • etc	2 credits for high impact 1 credit for low impact (Up to 8 credits)
PART 5 – OTHER GREEN FEATURES CATEGORY SCORE:	Sum of GreenRE credits obtained from INT5-1

Part 6- Carbon Footprint of Development	GreenRE Credits
INT 6-1 CARBON FOOTPRINT OF DEVELOPMENT (a) Recognise the carbon emission based on operational carbon footprint computation of the building comprising energy and water consumption	1 credit
(b) To identify carbon debt and quantify environmental impact and embodied energy, as well as allow benchmarking of projects over time using BCA's online embodied carbon calculator.	1 credits – complete carbon footprint calculation for all building materials listed.
PART 6- CARBON FOOTPRINT OF DEVELOPMENT **CATEGORY SCORE:**	Sum of GreenRE credits obtained from INT6-1

GreenRE Score (Office Interior)

GreenRE Score (INT) = ∑Category score [(Part 1-Energy Efficiency)+
(Part 2-Water Efficiency)+
(Part 3- Sustainable Management & Operation)+
(Part 4-Indoor Environmental Quality)+
(Part 5-Other Green Features)+
(Part 6-Carbon Emission of Development)]

Where :
Category Score for Part 1≥ 20 credits and
∑Category score for Part 2 to Part 6 ≥ 20 credits