



**NON-RESIDENTIAL NEW CONSTRUCTION
(NRNC): HOSPITAL**

VERSION 1.0 | JULY 2015

www.greenbuildingindex.org | info@greenbuildingindex.org

GREENBUILDINGINDEX SDN BHD (845666-V)
A-12-13A Menara UOA Bangsar, 5 Jalan Bangsar Utama 1, 59000 Kuala Lumpur, Malaysia Tel 603 2283 2566 Fax 603 2284 2566

CONTENTS

PAGE	2	COPYRIGHT AND ACKNOWLEDGEMENTS
		INTRODUCTION
PAGE	3	What is the Green Building Index (GBI)?
PAGE	3	Who can use the Green Building Index (Non-Residential)?
PAGE	3	How to Use the Green Building Index?
PAGE	4	PROJECT INFORMATION
PAGE	5	CONSULTANTS INFORMATION
		ASSESSMENT CRITERIA
PAGE	6	Summary of Final Score
PAGE	6	Green Building Index Classification
PAGE	7	Summary of Contents
		INDIVIDUAL ITEM SCORE
PAGE	9	PART 1: Energy Efficiency (EE)
PAGE	11	PART 2: Indoor Environmental Quality (EQ)
PAGE	14	PART 3: Sustainable Site Planning & Management (SM)
PAGE	17	PART 4: Materials & Resources (MR)
PAGE	18	PART 5: Water Efficiency (WE)
PAGE	19	PART 6: Innovation (IN)

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INTRODUCTION

WHAT IS THE GREEN BUILDING INDEX?

The Green Building Index (GBI) is an environmental rating system for buildings developed by PAM (Pertubuhan Arkitek Malaysia / Malaysian Institute of Architects) and ACEM (the Association of Consulting Engineers Malaysia). The Green Building Index is Malaysia's first comprehensive rating system for evaluating the environmental design and performance of Malaysian buildings based on the six (6) main criterias of Energy Efficiency, Indoor Environment Quality, Sustainable Site Planning & Management, Materials & Resources, Water Efficiency, and Innovation.

The Green Building Index is fundamentally derived from existing rating tools, including the Singapore Green Mark and the Australian Green Star system, but extensively modified for relevance to the Malaysian tropical weather, environmental context, cultural and social needs.

This GBI initiative aims to assist the building industry in its march towards sustainable development. The GBI environmental rating system is created to:

- **Define green building by establishing a common language and standard of measurement;**
- **Promote integrated, whole-building design;**
- **Recognise and reward environmental leadership;**
- **Transform the built environment to reduce the environmental impact of development; and**
- **Ensure new buildings remain relevant in the future and existing buildings are refurbished and thereafter sustained properly to remain relevant.**

WHO CAN USE THE GREEN BUILDING INDEX (NON-RESIDENTIAL)?

GBI encourage all members of Project Teams, Building owners, Developers and other interested parties (including Contractors, Government and Design and Build Contractors) to use the Green Building Index to validate environmental initiatives of the design phase of new non-residential construction or base non-residential building refurbishment; or construction and procurement phase of non-residential buildings. Use of the Green Building Index is encouraged on all such projects to assess and improve their environmental attributes.

Use of the Green Building Index tool without formal certification by an independent accredited GBI Certifier does not entitle the user or any other party to promote the Green Building Index rating achieved. No fee is payable for such use, however formal recognition of the Green Building Index rating - and the right to promote same - requires undertaking the formal certification process offered by Greenbuildingindex Sdn. Bhd. (GSB).

Whilst GBI NRNC is a generic rating tool for Office Buildings, GBI NRNC: HOSPITAL (developed in collaboration with the Ministry of Health and Healthcare Technical Services Sdn Bhd) is a bespoke rating tool developed for Hospitals.

All Green Building Index rating tools are reviewed annually; please forward any feedback to info@greenbuildingindex.org.

HOW TO USE THE GREEN BUILDING INDEX?

- Complete the Building Input worksheet as the building's type and location may affect the predicted rating.
- Complete the remaining worksheets by reviewing each credit in each category and entering the number of points you predict the building will achieve in the 'No. of Points Achieved' column. Calculators are provided for a number of the tool's credits.
- Enter any points that may be achieved but need to be confirmed in the 'Points to be Confirmed' column.
- Enter any comments required in the 'Comments' column.
- The predicted rating is shown in the Summary worksheet. More detail on point scores (both achieved and those to be confirmed) are shown in the Credit Summary and Graphical Summary worksheets at the end of the tool.

PROJECT INFORMATION

PROJECT NAME		
PROJECT REGISTRATION NO.		
PROJECT ADDRESS		
	<small>POSTCODE</small>	<small>STATE</small>
CONSTRUCTION TYPE		
TOTAL GROSS FLOOR AREA (GFA)		
LAND AREA (FOR LANDED PROPERTY)		
REGISTRATION FEE (EXCLUDING GST)		
TARGETTED RATING		
TOTAL POINTS CLAIM		
EXPECTED CONSTRUCTION DATE	<small>COMMENCED</small>	<small>COMPLETION</small>
DATE BUILDING COMPLETED (NREB/IEB ONLY)		
PROJECT DESCRIPTION & MAJOR DESIGN FEATURES		

CONSULTANTS INFORMATION

OWNER'S NAME			
COMPANY			
OWNER'S REPRESENTATIVE	NAME	DESIGNATION	

ARCHITECT	NAME	PROFESSIONAL REG. NO.	COMPANY
CIVIL ENGINEER	NAME	PROFESSIONAL REG. NO.	COMPANY
STRUCTURAL ENGINEER	NAME	PROFESSIONAL REG. NO.	COMPANY
MECHANICAL ENGINEER	NAME	PROFESSIONAL REG. NO.	COMPANY
ELECTRICAL ENGINEER	NAME	PROFESSIONAL REG. NO.	COMPANY
QUANTITY SURVEYOR	NAME	PROFESSIONAL REG. NO.	COMPANY
LAND SURVEYOR	NAME	PROFESSIONAL REG. NO.	COMPANY
LANDSCAPE ARCHITECT	NAME	PROFESSIONAL REG. NO.	COMPANY
COMMISSIONING SPECIALIST (CxS)	NAME	PROFESSIONAL REG. NO.	COMPANY
GBI FACILITATOR	NAME	PROFESSIONAL REG. NO.	COMPANY
OTHER SPECIALIST CONSULTANT(S)			
MAIN CONTRACTOR			
LOCAL AUTHORITY			

DETAIL ASSESSMENT CRITERIA SUMMARY OF FINAL SCORE

PART	ITEM	MAXIMUM POINTS	SCORE
1	Energy Efficiency (EE)	35	
2	Indoor Environmental Quality (EQ)	21	
3	Sustainable Site Planning & Management (SM)	16	
4	Material & Resources (MR)	11	
5	Water Efficiency (WE)	10	
6	Innovation (IN)	7	
TOTAL SCORE		100	

GREEN BUILDING INDEX CLASSIFICATION

POINTS	GBI RATING
86 to 100 points	Platinum
76 to 85 points	Gold
66 to 75 points	Silver
50 to 65 points	Certified

DETAIL ASSESSMENT CRITERIA

SUMMARY OF CONTENTS

PART	CRITERIA	ITEM	POINTS	TOTAL	
1	EE	ENERGY EFFICIENCY		35	
	Design				
	EE1	Minimum EE Performance	1		
	EE2	Lighting Zoning	3		
	EE3	Electrical Sub-metering	1		
	EE4	Renewable Energy	5		
	EE5	Advanced EE Performance - BEI	15		
	Commissioning				
	EE6	Enhanced Commissioning	3		
	EE7	Post Occupancy Commissioning	2		
	Verification & Maintenance				
EE8	EE Verification	2			
EE9	Sustainable Maintenance	3			
2	EQ	INDOOR ENVIRONMENTAL QUALITY		21	
	Air Quality				
	EQ1	Minimum IAQ Performance	1		
	EQ2	IAQ Treatment of Recirculating Conditioned Air	1		
	EQ3	Carbon Dioxide Monitoring and Control	1		
	EQ4	Indoor Air Pollutants	2		
	EQ5	Mould Prevention	1		
	Thermal Comfort				
	EQ6	Thermal Comfort: Design & Controllability of Systems	2		
	EQ7	Air Change Effectiveness	1		
	Lighting, Visual & Acoustic Comfort				
	EQ8	Daylighting	2		
	EQ9	Daylight Glare Control	1		
	EQ10	Electric Lighting Levels	1		
	EQ11	High Frequency Ballasts	1		
EQ12	External Views	2			
EQ13	Internal Noise Levels	1			
Verification					
EQ14	IAQ Before & During Occupancy	2			
EQ15	Post Occupancy Comfort Survey: Verification	2			

DETAIL ASSESSMENT CRITERIA

SUMMARY OF CONTENTS (CONTINUED)

PART	CRITERIA	ITEM	POINTS	TOTAL
3	SM	SUSTAINABLE SITE PLANNING & MANAGEMENT		16
	Site Planning			
	SM1	Site Selection	1	
	SM2	Brownfield Redevelopment	1	
	SM3	Development Density & Community Connectivity	2	
	SM4	Environment Management	2	
	Construction Management			
	SM5	Earthworks - Construction Activity Pollution Control	1	
	SM6	QLASSIC	1	
	SM7	Workers' Site Amenities	1	
	Transportation			
	SM8	Public Transportation Access	1	
	SM9	Green Vehicle Priority	1	
	SM10	Parking Capacity	1	
Design				
SM11	Stormwater Design – Quantity & Quality Control	1		
SM12	Greenery & Roof	2		
SM13	Building User Manual	1		
4	MR	MATERIALS & RESOURCES		11
	Reused & Recycled Materials			
	MR1	Materials Reuse And Selection	2	
	MR2	Recycled Content Materials	2	
	Sustainable Resources			
	MR3	Regional Materials	1	
	MR4	Sustainable Timber	1	
	Waste Management			
	MR5	Storage & Collection of Recyclables	1	
	MR6	Construction Waste Management	2	
Green Products				
MR7	Refrigerants & Clean Agents	2		
5	WE	WATER EFFICIENCY		10
	Water Harvesting & Recycling			
	WE1	Rainwater Harvesting	2	
	WE2	Water Recycling	2	
	Increased Efficiency			
	WE3	Water Efficient - Irrigation/Landscaping	2	
WE4	Water Efficient Fittings	2		
WE5	Metering & Leak Detection System	2		
6	IN	INNOVATION		7
	IN1	Innovation in Design & Environmental Design Initiatives	6	
	IN2	Green Building Index Facilitator	1	
			TOTAL POINTS	100

1

ENERGY EFFICIENCY (EE)

DESIGN | COMMISSIONING | VERIFICATION & MAINTENANCE

35 POINTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
DESIGN				
EE1	MINIMUM EE PERFORMANCE (MANDATORY COMPLIANCE)			
	Establish minimum energy efficiency (EE) performance to reduce energy consumption in buildings, thus reducing CO ₂ emission to the atmosphere. Meet the following minimum EE requirements as stipulated in MS 1525:		1	
	a) OTTV ≤ 50, RTTV ≤ 25, Roof U-Value ≤ 0.4 (Light weight) or ≤ 0.6 (Heavy weight). Submit calculations (use of the BEIT software or other GBI approved software is acceptable), AND b) Provision of Energy Management Control system where Air-conditioned space ≥ 4000 m ² .	1		
EE2	LIGHTING ZONING			
	Provide flexible lighting controls to optimise energy savings:-		3	
	All individual or enclosed spaces to be individually switched; and the size of individually switched lighting zones shall not exceed 100m ² for 90% of the NLA; with switching clearly labelled and easily accessible by building occupants/management.	1		
	Provide auto-sensor controlled lighting in conjunction with daylighting strategy for all perimeter zones and daylight areas.	1		
	Provide motion sensors or similar to complement lighting zoning for floor area equivalent to at least 25% of NLA.	1		
EE3	ELECTRICAL SUB-METERING & TENANT SUB-METERING			
	Monitor energy consumption of key building services as well as all tenancy areas:-		1	
	Provide sub-metering for all energy uses of ≥ 100kVa; with separate sub-metering for lighting and/or for power at each floor or tenancy.	1		
EE4	RENEWABLE ENERGY			
	Encourage use of renewable energy:-		5	
	Where 0.5 % or 5 kWp (PV or equiv) whichever is the greater, of the total electricity consumption is generated by renewable energy, OR	2		
	Where 1.0 % or 10 kWp (PV or equiv) whichever is the greater, of the total electricity consumption is generated by renewable energy, OR	3		
	Where 1.5 % or 20 kWp (PV or equiv) whichever is the greater, of the total electricity consumption is generated by renewable energy, OR	4		
	Where 2.0 % or 40 kWp (PV or equiv) whichever is the greater, of the total electricity consumption is generated by renewable energy	5		
EE5	ADVANCED EE PERFORMANCE			
	Exceed Energy Efficiency (EE) performance better than the baseline minimum to reduce energy consumption in the building. Achieve Building Energy Intensity (BEI) as defined by GBI for the following corresponding credit points. The default operating hours for this Hospital rating tool is 24/7. Non-electricity fuel energy is excluded in the BEI calculation. BEI ₁ values listed below apply to Hospital providing limited clinical services such as day surgery, etc. BEI ₂ values apply to Hospital that provides major clinical services (requiring high energy intensity) which must include the following:- a) Surgery under general anaesthetic b) Intensive Care Unit c) Radiology		15	
	BEI ₁ ≤ 200, BEI ₂ ≤ 290, OR	2		
	BEI ₁ ≤ 190, BEI ₂ ≤ 270, OR	3		
	BEI ₁ ≤ 175, BEI ₂ ≤ 250, OR	5		
	BEI ₁ ≤ 160, BEI ₂ ≤ 233, OR	8		
	BEI ₁ ≤ 150, BEI ₂ ≤ 212, OR	10		
	BEI ₁ ≤ 135, BEI ₂ ≤ 195, OR	12		
	BEI ₁ ≤ 120, BEI ₂ ≤ 175.	15		

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GREEN BUILDING INDEX ASSESSMENT CRITERIA FOR NRNC: HOSPITAL

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
COMMISSIONING				
EE6	ENHANCED COMMISSIONING OF BUILDING ENERGY SYSTEMS			
	<p>Ensure building's energy related systems are designed and installed to achieve proper commissioning so as to realise their full potential and intent. Appoint an independent GBI recognised Commissioning Specialist (CxS) at the onset of the design process to verify that comprehensive pre-commissioning and commissioning is performed for all the building's energy related systems in accordance with ASHRAE Commissioning Guideline or other GBI approved equivalent standard/s by:</p> <p>a) Conducting at least one commissioning design review during the detail design stage and back-check the review comments during the tender documentation stage.</p> <p>b) Developing and incorporating commissioning requirements into the tender documents.</p> <p>c) Developing and implementing a commissioning plan.</p> <p>d) Verifying the installation and performance of the systems to be commissioned.</p> <p>e) Reviewing contractor submittals applicable to systems being commissioned for compliance.</p> <p>f) Developing a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.</p> <p>g) Verifying that the requirements for training operating personnel and building occupants are completed.</p>	3	3	
EE7	POST OCCUPANCY COMMISSIONING			
	Carry out post occupancy commissioning for all occupied areas after fit-out changes are completed:-			
	a) Design engineer shall review all tenancy fit-out plans to ensure original design intent is not compromised and upon completion of the fit-out works, verify and fine-tune the installations to suit.	1		
	b) Within 12 months of practical completion (or earlier if there is at least 50% occupancy), the CxS shall carry out a full post/re-commissioning of the building's energy related systems to verify that their performance is sustained in conjunction with the completed fit-outs.	1	2	
VERIFICATION & MAINTENANCE				
EE8	EE VERIFICATION			
	Verify predicted energy use of key building services:-			
	a) Use Energy Management System to monitor and analyse energy consumption including reading of sub-meters, AND			
	b) Fully commission EMS including Maximum Demand Limiting programme within 12 months of practical completion (or earlier if there is at least 50% occupancy).	2	2	
EE9	SUSTAINABLE MAINTENANCE			
	Ensure the building's energy related systems will continue to perform as intended beyond the 12 months Defects & Liability Period:-			
	a) At least 50% of permanent building maintenance team to be on-board one (1) to three (3) months before practical completion and to fully participate (to be specified in contract conditions) in the Testing & Commissioning of all building energy services.	1		
	b) Provide for a designated building maintenance office that is fully equipped with facilities (including tools and instrumentation) and inventory storage, AND			
	c) Provide evidence of documented plan for at least 3-year facility maintenance and preventive maintenance budget (inclusive of staffing and outsourced contracts).	2	3	
EE SUB-TOTAL		35	35	

2

INDOOR ENVIRONMENTAL QUALITY (EQ)

AIR QUALITY | THERMAL COMFORT | LIGHTING, VISUAL & ACOUSTIC COMFORT | VERIFICATION

21 POINTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
AIR QUALITY				
EQ1	MINIMUM IAQ PERFORMANCE			
	Establish minimum indoor air quality (IAQ) performance on ventilation rate to enhance indoor air quality in building, thus contributing to the comfort and well-being of the occupants:-		1	
	Meet the minimum requirements of ventilation rate in ASHRAE Std 62.1 or the local building code, whichever is the more stringent.	1		
EQ2	IAQ TREATMENT OF RECIRCULATING CONDITIONED AIR			
	Provide Ultraviolet Germicidal Irradiation (UVGI) or equivalent enhanced treatment of recirculating conditioned air for hospital environment to reduce concentration of microorganisms, thus contributing to the well-being of the occupants, patients and visitors:-		1	
	UVGI treatment to be installed for all AHUs serving clinical areas and public areas. Where FCUs are used, equivalent system as approved by GBI, is to be provided. <i>Equivalent system includes proven technology that can reduce concentration of microbial counts in the air or on surfaces.</i>	1		
EQ3	CARBON DIOXIDE MONITORING AND CONTROL			
	Provide response monitoring of carbon dioxide levels to ensure delivery of minimum outside air requirements:-		1	
	Install carbon dioxide (CO ₂) monitoring and control system with at least one (1) CO ₂ sensor at all main return points of each common AHU to facilitate continuous monitoring and adjustment of outside air ventilation rates to each zone, and ensure independent control of ventilation rates to maintain CO ₂ level ≤ 1,000 ppm. <i>Note that requirements of ASHRAE Std 170 shall take precedence for minimum OA settings to maintain required pressure differential for specific rooms.</i>	1		
EQ4	INDOOR AIR POLLUTANTS			
	Reduce detrimental impact on occupant health from finishes that emit internal air pollutants:-		2	
	Use low VOC paint and coating throughout the building. <i>Paints and Coatings to comply with requirements specified in international labelling schemes recognized by GBI, AND</i>	1		
	Use low VOC carpet or flooring throughout the building. Carpets to comply with requirements specified in international labelling schemes recognized by GBI. Other types of flooring to comply with requirements under FloorScore developed by Science Certification System or equivalent, <i>AND</i>			
	Use low VOC adhesive and sealant or no adhesive or sealant used.			
	Use products with no added urea formaldehyde. These include:	1		
	a) Composite wood and agrifiber products defined as: particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores, <i>AND</i>			
	b) Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies, <i>AND</i>			
	c) Insulation foam, <i>AND</i> d) Draperies			
EQ5	MOULD PREVENTION			
	Design system/s which reduce the risk of mould growth and its associated detrimental impact on occupant health:-		1	
	a) For 24/7 airconditioned rooms: Where it is demonstrated that the mechanical air-conditioning ventilation system will maintain a positive indoor air pressure relative to the exterior and can actively control indoor air humidity to be no more than 60% RH, <i>AND</i> b) For non 24/7 airconditioned rooms: Where it is demonstrated that the mechanical air-conditioning ventilation system will maintain a positive indoor air pressure relative to the exterior and can actively control indoor air humidity to be no more than 70% RH without the use of active control that will consume additional energy. For both a) and b), ensure that excessive moisture in building is controlled during the Design, Construction and Operation stages by the consideration and the control of the following: i) Rainwater leakage through roof and walls ii) Infiltration of moist air iii) Diffusion of moisture through walls, roof and floors iv) Groundwater intrusion into basements and crawl spaces through walls and floors v) Leaking or burst pipes vi) Indoor moisture sources vii) Construction moisture viii) Wall/floor separating 24/7 airconditioned room and unconditioned space on the other side to be of appropriate insulating properties	1		

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GREEN BUILDING INDEX ASSESSMENT CRITERIA FOR NRNC: HOSPITAL

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
THERMAL COMFORT				
EQ6	THERMAL COMFORT: DESIGN & CONTROLLABILITY OF SYSTEMS			
	Provide a high level of thermal comfort system control by individual occupants or by specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants:-			
	Design to ASHRAE 55 standards.	1	2	
	Provide individual comfort controls for 100% of patient occupied rooms to enable adjustments to suit individual task needs and preferences. AND Provide comfort system controls for all shared multi-occupant spaces to enable adjustments to suit group needs and preferences. <i>Conditions for thermal comfort include the primary factors of air temperature, radiant temperature, air speed and humidity. Comfort system control for this purpose is defined as the provision of control over at least one of these primary factors in the occupants' local environment.</i>	1		
EQ7	AIR CHANGE EFFECTIVENESS			
	Provide effective delivery of clean air through reduced mixing with indoor pollutants in order to promote a healthy indoor environment. Demonstrate that the Air Change Effectiveness (ACE) meets the following criteria for at least 50% of the NLA (excluding patient bedrooms and Back-of-the-House Areas): The ventilation systems are designed to achieve an ACE of ≥ 0.95 when measured in accordance with ASHRAE 129: Measuring air change effectiveness where ACE is to be measured in the breathing zone (nominally 1.0 m from finished floor level). <i>Note: Displacement ventilation or task-air ventilation are deemed to meet ACE requirement without need for design simulation and measurement upon completion.</i>	1	1	
LIGHTING, VISUAL & ACOUSTIC COMFORT				
EQ8	DAYLIGHTING			
	Provide good levels of daylighting for building occupants:-		2	
	Demonstrate that $\geq 30\%$ of the NLA has a daylight factor in the range of 1.0 – 3.5% as measured at the working plane, 800mm from floor level, OR	1		
	Demonstrate that $\geq 50\%$ of the NLA has a daylight factor in the range of 1.0 – 3.5% as measured at the working plane, 800mm from floor level. <i>Note that rooms that require 'black out' conditions such as medical rooms and function rooms are exempted from Daylighting NLA computation.</i>	2		
EQ9	DAYLIGHT GLARE CONTROL			
	Reduce discomfort of glare from natural light. Where blinds or screens are fitted on all glazing and atrium as a base building, incorporate provisions to meet the following criteria; a) Eliminate glare from all direct sun penetration and keep horizontal workspace lux level below 2000; AND b) Eliminate glare from diffuse sky radiation for occupant workspace at viewing angles of 15° to 60° from the horizontal at eye level (typically 1.2 m from floor level). <i>Note: Adjustable blinds or screens should be of the horizontal (not vertical) type especially at the E-W facades.</i>	1	1	
EQ10	ELECTRIC LIGHTING LEVELS			
	Baseline building lighting not to be over designed:-		1	
	Demonstrate that lighting design maintains a luminance level of no more than specified in MS1525 for 90% of NLA as measured at the working plane (800 mm above the floor level).	1		
EQ11	HIGH FREQUENCY BALLASTS			
	Increase workplace amenity by avoiding low frequency flicker that may be associated with fluorescent lighting:-		1	
	Install high frequency ballasts in fluorescent luminaires over a minimum of 90% of NLA.	1		

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GREEN BUILDING INDEX ASSESSMENT CRITERIA FOR NRNC: HOSPITAL

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
LIGHTING, VISUAL & ACOUSTIC COMFORT				
EQ12	EXTERNAL VIEWS			
	Reduce eyestrain for building occupants by allowing long distance views and provision of visual connection to the outdoor:-		2	
	Demonstrate that $\geq 60\%$ of the NLA has a direct line of sight through vision glazing at a height of 1.2m from floor level.	1		
	Demonstrate that $\geq 75\%$ of the NLA has a direct line of sight through vision glazing at a height of 1.2m from floor level.	2		
	<i>Note that rooms that require 'black out' conditions such as medical rooms and function rooms are exempted from this NLA computation.</i>			
EQ13	INTERNAL NOISE LEVELS			
	Maintain internal noise levels at an appropriate level. Demonstrate that 90% of the NLA do not exceed the following ambient internal noise levels:-		1	
	Within the entire baseline building general office, space noise from the building services does not exceed 40dB(A)eq. OR Within the baseline building office space, the sound level does not exceed 45dB(A)eq for open plan and not exceed 40dB(A)eq for closed offices.	1		
	<i>Note that internal noise level thresholds for areas other than office space shall not exceed values stipulated in ASHRAE Standard or other GBI approved Standards, Code of Practice or Design Guides; e.g. CIBSE Guide.</i>			
VERIFICATION				
EQ14	IAQ BEFORE & DURING OCCUPANCY			
	Reduce indoor air quality problems resulting from the construction process in order to help sustain the comfort and well-being of building occupants. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the Pre-Occupancy phase as follows:- a) Perform a building flush out by supplying outdoor air to provide not less than 10 airchanges/hour for at least 30 minutes operation before occupancy and continuous minimum 1 ACH during the initial 14 days occupancy of the completed building. OR b) If low VOC materials and low formaldehyde composite wood are used, then building flush out can be performed by supplying outdoor air to provide not less than 10 airchanges/hour for at least 15 minutes operation or not less than 6 airchanges/hour for at least 30 minutes operation and continuous 1ACH during the initial 7 days occupancy of the completed building. OR c) Within 12 months of occupancy, conduct IAQ testing to demonstrate maximum concentrations for pollutants are not exceeded according to the Indoor Air Quality Code of Malaysia or any regulating Authority whichever is more stringent.	1	2	
	During Occupancy Stage: Where a permanent air flushing system of at least 10 airchanges/hour operation is installed for use during occupancy stage AND to conduct IAQ testing to demonstrate maximum concentrations for pollutants are not exceeded according to the Indoor Air Quality Code of Malaysia or any regulating Authority whichever is more stringent.	1		
EQ15	POST OCCUPANCY COMFORT SURVEY: VERIFICATION			
	Provide for the assessment of comfort of the building occupants:-		2	
	Conduct a post-occupancy comfort survey of building occupants within 12 months after occupancy/building completion. This survey should collect anonymous responses about thermal comfort, visual comfort and acoustic comfort in a building. It should include an assessment of overall satisfaction with thermal, visual and acoustic performance and identification of thermal-related, visual-related and acoustic-related problems. AND Develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with the overall comfort in the building. This plan should include measurement of relevant environmental variables in problem areas. The relevant environmental variables include 1) Temperature, relative humidity, air speed and mean radiant temperature, 2) Lighting level and glare problem, 3) Background noise level, 4) Odour problem, CO ₂ level, VOCs, and particulate concentration.	2		
EQ SUB-TOTAL		21	21	

3

SUSTAINABLE SITE PLANNING & MANAGEMENT (SM)

SITE PLANNING | CONSTRUCTION MANAGEMENT | TRANSPORTATION | DESIGN

16 POINTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
SITE PLANNING				
SM1	SITE SELECTION			
	<p>Do not develop building, hardscape, road or parking area on a site or part of a site that meet any one of the following criteria:-</p> <p>a) Prime farmland as defined by the Structure Plan of the area or the National Physical Plan.</p> <p>b) Forest reserve or State Environmental Protection Zones that is specifically identified as habitat for any species found on the endangered lists.</p> <p>c) Within 30 m of any wetlands as defined by the Structure Plan of the area OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent.</p> <p>d) Previously undeveloped land that is within 30 m of Mean High Water Spring (MHWS) sea level which supports or could support wildlife or recreational use, or statutory requirements whichever is the more stringent.</p> <p>e) Previously undeveloped land that is within 20 m of lake, river, stream and tributary which support or could support wildlife or recreational use.</p> <p>f) Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is provided.</p>	1	1	
SM2	BROWNFIELD REDEVELOPMENT			
	Reduce pressure on undeveloped land by rehabilitating damaged sites where development is complicated by environmental contamination, thereby reducing pressure on undeveloped land. This would typically involve old rubbish tips, former mining land, old factory sites, etc.	1	1	
SM3	DEVELOPMENT DENSITY & COMMUNITY CONNECTIVITY			
	Channel development to urban area with existing infrastructure, protect greenfield and preserve habitat and natural resources:-			
	<p>A) DEVELOPMENT DENSITY Construct a new building or renovate an existing building on a previously developed site AND in a community with a minimum density of 20,300 m² per hectare net (87,000 ft² per acre net).</p>	1		
	<p>B) COMMUNITY CONNECTIVITY Construct a new building or renovate an existing building on a previously developed site AND within 1 km of a residential zone or neighbourhood with an average density of 25 units per hectare net (10 units per acre net) AND within 1 km of at least 10 Basic Services AND with pedestrian access between the building and the services.</p> <p><i>Basic Services include, but are not limited to:</i></p> <p>1) Bank; 2) Place of Worship; 3) Convenience / Grocery; 4) Day Care; 5) Police Station; 6) Fire Station; 7) Beauty; 8) Hardware; 9) Laundry; 10) Library; 11) Hotel/hostel; 12) Senior Care Facility; 13) Park; 14) Post Office; 15) Restaurant; 16) School; 17) Supermarket; 18) Theatre; 19) Community Centre; 20) Fitness Centre.</p> <p><i>Proximity is determined by drawing a 1 km radius around the main building entrance on a site map and counting the services found within that radius.</i></p>	1	2	

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GREEN BUILDING INDEX ASSESSMENT CRITERIA FOR NRNC: HOSPITAL

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
SITE PLANNING				
SM4	ENVIRONMENT MANAGEMENT			
	<p>A) Conserve existing natural area and restore damaged area to provide habitat and promote biodiversity & B) Maximize Open Space by providing a high ratio of open space to development footprint to promote biodiversity:-</p>		2	
	<p>A) CONSERVATION:- On previously developed or graded site, restore or protect a minimum of 50% of the site area (excluding the building footprint) with native or adaptive vegetation. Native or adaptive plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds. Applicable also to landscaping on rooftops and roof gardens so long as the plants meet the definition of native or adaptive vegetation.</p> <p>OR</p> <p>On greenfield sites, limit all site disturbance to within 12 m beyond the building perimeter; 3 m beyond surface walkway, patio, surface parking and utilities less than 300 mm in diameter; 4.5 m beyond primary roadway curb and main utility branch trench; and 7.5 m beyond constructed area with permeable surface (such as pervious paving area, storm water detention facility and playing field) that require additional staging area in order to limit compaction in the constructed area.</p>	1		
	<p>B) OPEN SPACE:- Reduce by 25%, the development footprint (defined as the total area of the building footprint, hardscape, access road and parking) and/or provide vegetated open space within the project boundary to exceed the local zoning's open space requirement for the site by 25%.</p> <p>OR</p> <p>For areas with no local zoning requirement (e.g., university campus, military bases), provide vegetated open space adjacent to the building whose area is equal to that of the building footprint.</p> <p>OR</p> <p>Where a zoning ordinance exists, but there is no requirement for open space (zero), provide vegetated open space equal to 20% of the project's site area.</p>	1		
CONSTRUCTION MANAGEMENT				
SM5	EARTHWORKS - CONSTRUCTION ACTIVITY POLLUTION CONTROL			
	<p>Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation:-</p>		1	
	<p>Create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the approved Earthworks Plans OR Local erosion and sedimentation control standards and codes, whichever is the more stringent.</p> <p>The plan shall describe the measures implemented to accomplish the following objectives:</p> <p>a) Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.</p> <p>b) Prevent sedimentation of storm sewer or receiving stream.</p> <p>c) Prevent polluting the air with dust and particulate matter.</p>	1		
SM6	QLASSIC - QUALITY ASSESSMENT SYSTEM FOR BUILDING CONSTRUCTION WORK			
	<p>Achieve quality of workmanship in construction works:-</p>		1	
	<p>Subscribe to independent method to assess and evaluate quality of workmanship of building project based on CIDB's CIS 7: Quality Assessment System for Building Construction Work (QLASSIC). Must achieve a minimum score of 70 %.</p>	1		
SM7	WORKERS' SITE AMENITIES			
	<p>Reduce pollution from construction activities by controlling pollution from waste and rubbish from workers. Create and implement a Site Amenities Plan for all construction workers associated with the project:-</p>		1	
	<p>The plan shall describe the measures implemented to accomplish the following objectives:</p> <p>a) Proper accommodation for construction workers at the site or at temporary rented accommodation nearby.</p> <p>b) Prevent pollution of storm sewer or receiving stream by having proper septic tank.</p> <p>c) Prevent polluting the surrounding area from open burning and proper disposal of domestic waste.</p> <p>d) Provide adequate health and hygiene facilities for workers on site.</p>	1		

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GREEN BUILDING INDEX ASSESSMENT CRITERIA FOR NRNC: HOSPITAL

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
TRANSPORTATION				
SM8	PUBLIC TRANSPORTATION ACCESS			
	Reduce pollution and land development impacts from automobile use:- Locate project within 1 km of an existing, or planned and funded, commuter rail, light rail or subway station. <i>OR</i> Locate project within 500 m of at least one bus stop.	1	1	
SM9	GREEN VEHICLE PRIORITY - LOW EMITTING & FUEL EFFICIENT VEHICLES			
	Encourage use of green vehicles:- Provide preferred parking for low-emitting & fuel-efficient vehicles for 5% of the total provided parking spaces. <i>"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped).</i>	1	1	
SM10	PARKING CAPACITY			
	Discourage over-provision of car parking capacity:- Size parking capacity to meet, but not to exceed the minimum local zoning requirements, AND provide preferred staff parking bays for carpools or vanpools for 5% of the total provided parking bays.	1	1	
DESIGN				
SM11	STORMWATER DESIGN – QUANTITY & QUALITY CONTROL			
	Limit disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, and managing storm water runoff. Reduce or eliminate water pollution by reducing impervious cover, increasing onsite infiltration, eliminating sources of contaminants, and removing pollutants from storm water runoff:- <i>CONDITION 1: IF EXISTING IMPERVIOUSNESS IS ≤ 50%:</i> Implement a storm water management plan that prevents the post development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity in conformance to the Storm Water Management Manual for Malaysia (MSMA). <i>CONDITION 2: IF EXISTING IMPERVIOUSNESS IS > 50%:</i> Implement a storm water management plan that results in a 25% decrease in the volume of storm water runoff required under MSMA. <i>For either Condition, implement a storm water management plan that reduces impervious cover, promotes infiltration, and captures and treats the storm water runoff from 90% of the average annual rainfall using acceptable best management practices (BMPs).</i>	1	1	
SM12	GREENERY & ROOF			
	Reduce heat island (thermal gradient difference between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat:- A) HARDSCAPE & GREENERY APPLICATION: 1) Provide any combination of the following strategies for 50% of the site hardscape (including sidewalks, courtyards, plazas and parking lots): a) Shade (within 5 years of occupancy); b) Paving materials with a Solar Reflectance Index (SRI) of at least 29; c) Open grid pavement system.	1	2	
	B) ROOF APPLICATION: 1) Use roofing material with a Solar Reflectance Index (SRI) equal to or greater than the value in the table below for a minimum of 75% of the roof surface; <i>OR</i> 2) Install a vegetated roof for at least 50% of the roof area; <i>OR</i> 3) Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria: <i>(Area of SRI Roof / 0.75) + (Area of vegetated roof / 0.5) ≥ Total Roof Area</i> <i>Roof Type Slope SRI</i> <i>Low-Sloped Roof < 2:12 78</i> <i>Steep-Sloped Roof > 2:12 29</i>	1		
SM13	BUILDING USER MANUAL			
	Document Green building design features and strategies for user information and guide to sustain performance during occupancy:- Provide a Building User Manual which documents passive and active green features that should not be downgraded.	1	1	
SM SUB-TOTAL		16	16	

4

MATERIALS & RESOURCES (MR)

REUSED & RECYCLED MATERIALS | SUSTAINABLE RESOURCES | WASTE MANAGEMENT | GREEN PRODUCTS

11 POINTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
REUSED AND RECYCLED MATERIALS				
MR1	MATERIALS REUSE AND SELECTION			
	Reuse building materials and products to reduce demand for virgin materials and reduce creation of waste. This serves to reduce environmental impact associated with extraction and processing of virgin resources. Integrate building design and its buildability with selection of reused building materials, taking into account their embodied energy, durability, carbon content and life cycle costs:-		2	
	Where reused products/materials constitutes $\geq 2\%$ of the project's total material cost value, OR	1		
	Where reused products/materials constitutes $\geq 5\%$ of the project's total material cost value.	2		
MR2	RECYCLED CONTENT MATERIALS			
	Increase demand for building products that incorporate recycled content materials in their production:- <i>(Recycled content shall be defined in accordance with the International Organization of Standards Document)</i>		2	
	Where use of materials with recycled content is such that the sum of post-consumer recycled plus one-half of the pre-consumer content constitutes $\geq 10\%$ (based on cost) of the total value of the materials in the project, OR	1		
	Where use of materials with recycled content is such that the sum of post-consumer recycled plus one-half of the pre-consumer content constitutes at least 30% (based on cost) of the total value of the materials in the project.	2		
SUSTAINABLE RESOURCES				
MR3	REGIONAL MATERIALS			
	Use building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation:-		1	
	Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500km of the project site for $\geq 20\%$ (based on cost) of the total material value. <i>Mechanical, electrical and plumbing components shall not be included. Only include materials permanently installed in the project.</i>	1		
MR4	SUSTAINABLE TIMBER			
	Encourage environmentally responsible forest management:-		1	
	Where $\geq 50\%$ of wood-based materials and products used are certified. <i>These components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. To include wood materials permanently installed and also temporarily purchased for the project. Compliance with Malaysian Timber Certification Council OR Forest Stewardship Council requirements.</i>	1		
WASTE MANAGEMENT				
MR5	STORAGE & COLLECTION OF RECYCLABLES			
	Facilitate reduction of waste generated during construction and during building occupancy that is hauled and disposed off in landfills:-		1	
	During Construction, provide dedicated area/s and storage for collection of non-hazardous materials for recycling, AND During Building Occupancy, provide permanent recycle bins.	1		
MR6	CONSTRUCTION WASTE MANAGEMENT			
	Develop and implement a construction waste management plan that, as a minimum identifies the materials to be diverted from disposal regardless of whether the materials will be sorted on site or co-mingled. Quantify by measuring total truck loads of waste sent for disposal:-		2	
	Recycle and/or salvage $\geq 50\%$ volume of non-hazardous construction debris, OR	1		
	Recycle and/or salvage $\geq 75\%$ volume of non-hazardous construction debris.	2		
GREEN PRODUCTS				
MR7	REFRIGERANTS & CLEAN AGENTS			
	Use environmentally-friendly Refrigerants and Clean Agents exceeding Malaysia's commitment to the Montreal & Kyoto protocols:-		2	
	Use zero Ozone Depleting Potential (ODP) products: non-CFC and non-HCFC refrigerants AND fire suppression clean agents;	1		
	Use non-synthetic (natural) refrigerants AND fire suppression clean agents with zero ODP and negligible Global Warming Potential of ≤ 10 .	1		
MR SUB-TOTAL		11	11	

5

WATER EFFICIENCY (WE)

WATER HARVESTING & RECYCLING | INCREASED EFFICIENCY

10 POINTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
WATER HARVESTING & RECYCLING				
WE1	RAINWATER HARVESTING			
	Encourage rainwater harvesting that will lead to reduction in potable water consumption:-		2	
	Rainwater harvesting that leads to ≥15% reduction in potable water consumption, OR	1		
	Rainwater harvesting that leads to ≥30% reduction in potable water consumption.	2		
WE2	WATER RECYCLING			
	Encourage water recycling that will lead to reduction in potable water consumption:-		2	
	Treat and recycle ≥10% wastewater leading to reduction in potable water consumption, OR	1		
	Treat and recycle ≥30% wastewater leading to reduction in potable water consumption.	2		
	<i>Note: Treatment of infected wastewater shall meet Authority's requirements.</i>			
INCREASED EFFICIENCY				
WE3	WATER EFFICIENT - IRRIGATION/LANDSCAPING			
	Encourage the design of system that does not require the use of potable water supply from the local water authority:-		2	
	Reduce potable water consumption for landscape irrigation by ≥50% (e.g. through use of native or adaptive plants to reduce or eliminate irrigation requirement), OR	1		
	Not use potable water at all for landscape irrigation.	2		
WE4	WATER EFFICIENT FITTINGS			
	Encourage reduction in potable water consumption through use of efficient devices:-		2	
	Reduce annual potable water consumption by ≥30%, OR	1		
	Reduce annual potable water consumption by ≥50%.	2		
WE5	METERING & LEAK DETECTION SYSTEM			
	Encourage the design of systems that monitors and manages water consumption:-		2	
	Use of sub-meters to monitor and manage major water usage for clinical, cooling towers, irrigation, kitchens and tenancy use.	1		
	Link all water sub-meters to EMS to facilitate early detection of water leakage.	1		
WE SUB-TOTAL		10	10	

6

INNOVATION (IN)

INNOVATION IN DESIGN & ENVIRONMENTAL DESIGN INITIATIVES | GBI FACILITATOR

7 POINTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE
IN1	INNOVATION IN DESIGN & ENVIRONMENTAL DESIGN INITIATIVES			
	Provide design team and project the opportunity to be awarded points for exceptional performance above the requirements set by GBI rating system:-			
	1 point for each approved innovation and environmental design initiative up to a maximum of 6 points, such as (refer to GBI website for updates and details); <ul style="list-style-type: none"> • Anti-Bacterial low VOC paint/coating; • Green healing garden; • Refrigerant leak detection and recovery facility; • Solar thermal technology/ Solar Airconditioners (generating at least 10% of total required capacity). 	6	6	
IN2	GREEN BUILDING INDEX FACILITATOR			
	To support and encourage the design integration required for Green Building Index rated buildings and to streamline the application and certification process:-			
	At least one principal participant of the project team shall be a Green Building Index Facilitator who is engaged at the onset of the design process until completion of construction and Green Building Index certification is obtained.	1	1	
IN SUB-TOTAL		7	7	