



green

building

index



SEMINAR ON GREEN BUILDING INDEX MALAYSIA

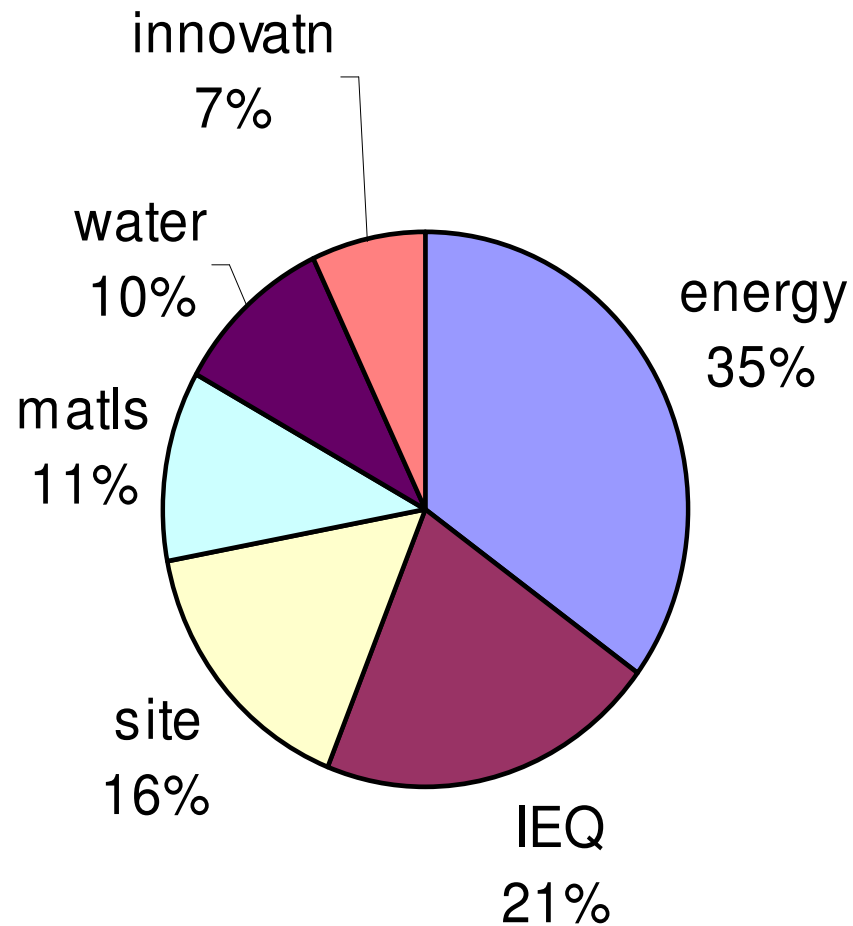
GBI Non-Residential New Construction

9th April 2009, JKR Kuala Lumpur
Ir CHEN Thiam Leong

CATEGORIES CONSIDERED

- 1) Energy Efficiency
- 2) Indoor Environmental Quality
- 3) Sustainable Site & Management
- 4) Materials & Resources
- 5) Water Efficiency
- 6) Innovation

Green Building Index (NRNC)



NON-RESIDENTIAL BUILDINGS

Rating Tools	Energy Effy	IEQ	Sustainable Site	Materials & Resources	Water Effy	Innovation
BREEAM 2008	19%	*13%	*37%	*17%	5%	*9%
LEED V2	25%	22%	20%	19%	7%	7%
Green Mark V3	62%	5%	*20%		9%	4%
Green Star	20%	19%	*33%	16%	8%	4%
Green Building Index	35%	21%	16%	11%	10%	7%
LEED 2009	35%	15%	26%	14%	10%	10%

* Denotes adjusted or amalgamated figures

1) Energy Efficiency

35 points

Design

EE1	Minimum EE Performance	1
EE2	Lighting Zoning	3
EE3	Electrical Sub-Metering	1
EE4	Renewable Energy	5
EE5	Advanced Energy Performance - BEI	15

Commissioning

EE6	Enhanced Commissioning	3
EE7	Post Occupancy Commissioning	2

Verification

EE8	EE Verification	2
EE9	Sustainable Maintenance	3

1) Energy Efficiency

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EE1 Minimum EE Performance

1

Create EE awareness and promote the use of MS 1525

Establish minimum energy efficiency (EE) performance to reduce energy consumption in buildings, thus reducing CO₂ emission to the atmosphere. Meet the following minimum EE requirements as stipulated in MS 1525:2007:

1. $OTTV \leq 50$, $RTTV \leq 25$. Submit calculations using the **BEIT** software or other GBI approved software/s, AND
2. Provision of Energy Management Control system where Air-Conditioned area ≥ 4000 m²

1

Building Energy Intensity

$$\text{BEI} = \frac{(\text{TBEC} - \text{CPEC} - \text{DCEC})}{(\text{GFA}_{\text{excluding carpark}} - \text{DCA} - \text{GLA} * \text{FVR}) * (52/\text{WOH})}$$

$$\text{BEI} = (\text{TBEC} - \text{CPEC} - \text{DCEC}) / (\text{GFAexcluding carpark} - \text{DCA} - \text{GLA} * \text{FVR}) * (52 / \text{WOH})$$

Where;

TBEC : Total Building Energy Consumption (kWh/year) for all landlord and tenancy areas.

CPEC : Carpark Energy Consumption (kWh/year) for carpark area (which is not air-conditioned) and typically covers artificial lighting, lifts, mechanical ventilation fans, sump pumps and plug loads (car washing facilities). Installations serving the whole building (such as hydraulic pumps and fire pumps) shall not be included.

DCEC : Data Centre Energy Consumption (kWh/year) for operation of the Data Centre equipment and for controlling its indoor environment (air-conditioning, mechanical ventilation, lighting and plug loads).

GFAexcluding carpark : Gross Floor Area of buildings exclusive of car park area (m²)

$$\text{BEI} = (\text{TBEC} - \text{CPEC} - \text{DCEC}) / (\text{GFAexcluding carpark} - \text{DCA} - \text{GLA} * \text{FVR}) * (52 / \text{WOH})$$

DCA : Gross area of Data Centre (m²)

GLA : Gross Lettable Area (m²) refers to the total functional use area for commercial purposes such as office, retail, cafeteria, restaurant, gymnasium and club house inside the building but excluding all common areas and service areas. The sum of GLA, common areas and service areas should equal the GFA excluding car park.

FVR : Floor Vacancy Rate is the weighted floor vacancy rate of office, retail and other functional spaces of GLA. The FVR (%) of GLA is equal to the non-occupied lettable area divided by the GLA.

52 : Typical weekly operating hours of office buildings in KL/Malaysia (hrs/wk) = 2,700 hrs/annum

WOH : Weighted Weekly Operating Hours of GLA exclusive of DCA (hrs/wk)

WOH e.g.:

- A building has GLA of 5400 m² comprising 5000 m² office (including 80 m² data centre) and 400 m² retail areas of which the corresponding operating hours are 55, 168 and 65 hrs/wk respectively.

Then WOH

$$= [(5000-80)*55 + 400*65] / (5400-80) = 55.75 \text{ hrs/wk.}$$

BEIT Software or Other GBI Approved Software/s

1. For GBI Certified or Silver rating, submission of BEI calculation may use BEIT Software or other GBI Approved Software, which use static energy calculation method
2. For GBI Gold or Platinum rating, BEI calculation may need to use dynamic energy simulation, employing GBI Approved Software such as ASHRAE Std 140 softwares, etc – which you need to confirm with the assigned GBI Certifier

Stipulate good engineering design practice

Provide flexible lighting controls to optimise energy savings:-

- | | |
|--|---|
| a. 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. | 1 |
| b. Provide auto-sensor controlled lighting in conjunction with daylighting strategy for all perimeter zones and daylit areas, if any | 1 |
| c. Provide motion sensors or equivalent to complement lighting zoning for at least 25% NLA | 1 |

EE3 Electrical Sub-Metering

1

To facilitate the ability to carry out EE improvements and trouble shooting.

Monitor energy consumption of key building services as well as all tenancy areas:-

Provide sub-metering for all energy uses of $\geq 100\text{kVA}$; with separate sub-metering for lighting and separately for power at each floor or tenancy, whichever is smaller.

1

EE4 Renewable Energy

5

Encourage use of renewable energy:-

Where 0.5 % or 5 kWp whichever is the greater, of the total electricity consumption is generated by renewable energy, OR	2
Where 1.0 % or 10 kWp whichever is the greater, of the total electricity consumption is generated by renewable energy, OR	3
Where 1.5 % or 20 kWp whichever is the greater, of the total electricity consumption is generated by renewable energy, OR	4
Where 2.0 % or 40 kWp whichever is the greater, of the total electricity consumption is generated by renewable energy	5

EE5 Advanced Energy Performance - BEI

15

Encourage developments to strive for world class EE standards.

Exceed EE performance better than the baseline minimum to reduce energy consumption in the building. Achieve Building Energy Intensity (BEI) \leq 150 kWh/m ² .yr as defined under GBI reference (using BEIT Software or other GBI approved software/s), OR	2
BEI \leq 140, OR	3
BEI \leq 130, OR	5
BEI \leq 120, OR	8
BEI \leq 110, OR	10
BEI \leq 100, OR	12
BEI \leq 90	15

1) Energy Efficiency

35 points

Design

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Ensure expensive installations are properly commissioned to realise their full potential.

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:-

1. Conducting at least one commissioning design review during the detail design stage and back-check the review comments during the tender documentation stage.
2. Developing and incorporating commissioning requirements into the tender documents.
3. Developing and implementing a commissioning plan.
4. Verifying the installation and performance of the systems to be commissioned.
5. Reviewing contractor submittals applicable to systems being commissioned for compliance.
6. Developing a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.
7. Verifying that the requirements for training operating personnel and building occupants are completed.

Educate owners to realise the importance and EE benefits of post commissioning.

Carry out post occupancy commissioning for all tenancy areas after fit-out changes are completed

1. 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
2. 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 tenancy fit-outs. 1

1) Energy Efficiency

35 points

Design

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To make full use of installed EMS and ensure EE design intents are implemented.

Verify predicted energy use of key building services:-

1. Use Energy Management System to monitor and analyse energy consumption including reading of sub-meters, AND
2. Fully commission EMS including Maximum Demand Limiting programme within 12 months of practical completion (or earlier if there is at least 50% occupancy).

EE9 Sustainable Maintenance

3

Address the 1st Class installation 3rd Class maintenance mentality.

Ensure the building's energy related systems will continue to perform as intended beyond the 12 months Defects & Liability Period:-

1. 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
2. Provide for a designated building maintenance office that is fully equipped with facilities (including tools and instrumentation) and inventory storage. 2
3. Provide evidence of documented plan for at least 3-year facility maintenance and preventive maintenance budget (inclusive of staffing and outsourced contracts).

2) Indoor Environmental Quality 21 pts

<i>Air Quality</i>		
EQ1	Minimum IAQ Performance	1
EQ2	Environmental Tobacco Control	1
EQ3	Carbon Dioxide Monitoring & Control	1
EQ4	Indoor Air Pollutants	2
EQ5	Mould Prevention	1
<i>Thermal Comfort</i>		
EQ6	Thermal Comfort Control	2
EQ7	Air Change Effectiveness	1

Lighting, Visual & Acoustic Comfort

EQ8 Daylighting	2
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EQ9 Daylight Glare Control	1
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EQ10 Electric Lighting Levels	1
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EQ11 High Frequency Ballasts	1
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EQ12 External Views	2
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EQ13 Internal Noise Levels	1
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Verification

EQ14 IAQ Before & During Occupancy	2
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EQ15 Post Occupancy Comfort Survey	2
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2) Indoor Environmental Quality 21 pts

Air Quality

EQ1	Minimum IAQ Performance	1
EQ2	Environmental Tobacco Control	1
EQ3	Carbon Dioxide Monitoring & Control	1
EQ4	Indoor Air Pollutants	2
EQ5	Mould Prevention	1

Thermal Comfort

EQ6	Thermal Comfort Control	2
EQ7	Air Change Effectiveness	1

EQ1 Minimum IAQ Performance

1

Adopt high IAQ standards and provision.

Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in building, thus contributing to the comfort and well-being of the occupants:-

Meet the minimum requirements of ventilation rate in ASHRAE 62.1:2007 or the local building code whichever is the more stringent.

1

EQ2 Environmental Tobacco Control

1

Discourage smoking.

Minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to Environmental Tobacco Smoke (ETS):-

Prohibit smoking in the building, AND

Locate any exterior designated smoking areas at least 10m away from entries, outdoor air intakes and operable windows

1

EQ3 Carbon Dioxide Monitoring & Control

1

Adopt EE strategies in conjunction with high IAQ provisions.

Provide response monitoring of carbon dioxide levels to ensure delivery of minimum outside air requirements:-

Install carbon dioxide (CO₂) monitoring and control system with at least one (1) CO₂ sensor at all main return points on each floor to facilitate continuous monitoring and adjustment of outside air ventilation rates to each floor, and ensure independent control of ventilation rates to maintain CO₂ level $\leq 1,000$ ppm

1

Encourage use of non toxic products.

Reduce detrimental impact on occupant health from finishes that emit internal air pollutants:-

Use low VOC paint and coating throughout the building.
Paints and Coatings to comply with requirements specified in international labelling schemes recognized by GBI, AND

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, AND

Use low VOC adhesive and sealant or no adhesive or sealant used.

Use products with no added urea formaldehyde. These include:

- a) Composite wood and agrifiber products defined as: particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores, AND
- b) Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies, AND
- c) Insulation foam, AND
- d) Draperies

Prevention of mould growth problems.

Design system/s which reduce the risk of mould growth and its associated detrimental impact on occupant health:-

Where it is demonstrated that the mechanical air-conditioned 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.

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

OR

The building is fully naturally ventilated

2) Indoor Environmental Quality 21 pts

Air Quality

EQ1	Minimum IAQ Performance	1
EQ2	Environmental Tobacco Control	1
EQ3	Carbon Dioxide Monitoring & Control	1
EQ4	Indoor Air Pollutants	2
EQ5	Mould Prevention	1

Thermal Comfort

EQ6	Thermal Comfort Control	2
EQ7	Air Change Effectiveness	1

EQ6 Thermal Comfort Control

2

Encourage provision of close comfort control.

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 in conjunction with the relevant localised parameters as listed in MS 1525

1

Provide individual comfort controls for $\geq 50\%$ of the building occupants 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.

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.

1

EQ7 Air Change Effectiveness

1

Recognise innovative air side strategies.

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 90% of the NLA:

The ventilation systems are designed to achieve an ACE of ≥ 0.95 when measured in accordance with ASHRAE 129-1997: Measuring air change effectiveness where ACE is to be measured in the breathing zone (nominally 1.0 m from finished floor level)

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	2

EQ8 Daylighting

2

Promote Daylighting

Provide good levels of daylighting for building occupants:-

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

2

Prevent daylighting from being made redundant.

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;
- b) Eliminate glare from diffuse sky radiation for occupant workspace at viewing angles of 15° to 60° from the horizontal at eye level (typically 1.2m from floor level)
- c) Control with an automatic monitoring system (for atrium and windows with incident direct sun light only - not applicable for fixed blinds/screens); AND
- d) Equip with a manual override function accessible by occupants (not applicable for fixed blinds/screens)

EQ10 Electric Lighting Levels

1

Discourage over provision of artificial lighting.

Baseline building office lighting not to be over designed:-

Demonstrate that office lighting design maintains a luminance level of no more than specified in MS1525:2007 for 90% of NLA as measured at the working plane (800mm above the floor level).

1

EQ11 High Frequency Ballasts

1

Encourage high IEQ fixtures.

Increase workplace amenity by avoiding low frequency flicker that may be associated with fluorescent lighting:-

Install high frequency ballasts in fluorescent luminaires over a minimum of 90% of NLA.

1

EQ12 External Views

2

Encourage external views as part of IEQ.

Reduce eyestrain for building occupants by allowing long distance views and provision of visual connection to the outdoor.

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

EQ13 Internal Noise Levels

1

Control excessive internal noise level to assure good IEQ.

Maintain internal noise levels at an appropriate level. Demonstrate that 90% of the NLA do not exceed the following ambient internal noise levels:-

Within the entire baseline building general office, space noise from the building services does not exceed 40dB Aeq.

OR

Within the baseline building office space, the sound level does not exceed 45dB Aeq for open plan and not exceed 40dB Aeq for closed offices

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	2

Ensure achievement of high sustainable IAQ.

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:-

1. 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
2. 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
3. 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.

During Occupancy Stage:

Where a permanent air flushing system of at least 10 airchanges/hour operation is installed for use during occupancy stage

1

Ensure occupants truly benefit from the design intents.

Provide for the assessment of comfort of the building occupants:-

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.

2

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, CO2 level, VOCs, and particulate concentration

3. Sustainable Site & Management 16 pts

<i>Site Planning</i>	
SM1 Site Selection	1
SM2 Brownfield Redevelopment	1
SM3 Development Density & Community Connectivity	2
SM4 Environment Management	2
<i>Construction Management</i>	
SM5 Earthworks, Pollution Control	1
SM6 QLASSIC Construction	1
SM7 Workers' Site Amenities	1

Transportation

SM8 Public Transport Accessibility

1

SM9 Green Vehicles Priority

1

SM10 Parking Capacity

1

Design

SM11 Stormwater Control

1

SM12 Greenery & Roof

2

SM13 Building User Manual

1

3. Sustainable Site & Management 16 pts

Site Planning

SM1	Site Selection	1
SM2	Brownfield Redevelopment	1
SM3	Development Density & Community Connectivity	2
SM4	Environment Management	2

Construction Management

SM5	Earthworks, Pollution Control	1
SM6	QLASSIC Construction	1
SM7	Workers' Site Amenities	1

SM1 Site Selection

1

During site selection process, give preference to sites that are not environmentally sensitive; and if unavoidable, locate the building in a suitable location and with a minimal footprint so as to minimize disruption of environmentally sensitive areas.

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:-

- a) Prime farmland as defined by the Structure Plan of the area or the National Physical Plan
- b) Forest reserve or State Environmental Protection Zones that is specifically identified as habitat for any species found on the endangered lists
- 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

- 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.
- e) Previously undeveloped land that is within 20 m of lake, river, stream and tributary which support or could support wildlife or recreational use.
- f) Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is provided.

SM2 Brownfield Redevelopment

1

Developer to decontaminate a site, where the site was contaminated at the time of purchase, and the developer has undertaken full remedial steps to decontaminate the site prior to construction. This helps channel development to brownfield sites and thus reduce pressure on opening up new greenfield sites.

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

SM3 Development Density & Community Connectivity

2

Channel development to urban area with existing infrastructure, protect greenfield and preserve habitat and natural resources:-

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)

1

SM3 Development Density & Community Connectivity cont'd

2

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.

1

Basic Services include, but are not limited to:

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) Medical / Dental; 12) Senior Care Facility; 13) Park; 14) Pharmacy; 15) Post Office; 16) Restaurant; 17) School; 18) Supermarket; 19) Theatre; 20) Community Centre; 21) Fitness Centre.

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.

Encourage protection or restoration of the habitat in Conservation and Open Space. One useful strategy is to carefully place buildings to ensure minimum disruption to the existing ecosystems by minimizing the building footprint. Another is to restore the site area with native or adaptive vegetation; or by increasing the total area for planting by introducing planting on the roof.

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:-

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. OR

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.

Greenfield sites are those that are not previously developed or graded and remain in a natural state. Previously developed sites are those that previously contained building, roadway, parking lot, or were graded or altered by direct human activity.

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%. OR

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. OR

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.

3. Sustainable Site & Management 16 pts

<i>Site Planning</i>	
SM1 Site Selection	1
SM2 Brownfield Redevelopment	1
SM3 Development Density & Community Connectivity	2
SM4 Environment Management	2
<i>Construction Management</i>	
SM5 Earthworks, Pollution Control	1
SM6 QLASSIC Construction	1
SM7 Workers' Site Amenities	1

Construction sites are usually responsible for significant environmental pollution. Encourage introduction and implementation of a policy to achieve ALL 3 objectives of control soil erosion, sedimentation and surface run-off, and air pollution.

SM5 Earthworks, Pollution Control cont'd

1

Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation:-

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.

The plan shall describe the measures implemented to accomplish the following objectives:

- a) Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- b) Prevent sedimentation of storm sewer or receiving stream.
- c) Prevent polluting the air with dust and particulate matter.

1

SM6 QLASSIC Construction

1

Reward for achieving minimum score of 70% using QLASSIC Assessment System.

Achieve quality of workmanship in construction works:-

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 %

1

STANDARD INDUSTRI PEMBINAAN

(CONSTRUCTION INDUSTRY STANDARD)

CIS 7:2006

**QUALITY ASSESSMENT SYSTEM FOR
BUILDING CONSTRUCTION WORK**

Descriptors: quality of workmanship, structural, architectural, mechanical and electrical, external works, benchmark, site inspection, field testing, sampling

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LEMBAGA PEMBANGUNAN INDUSTRI PEMBINAAN MALAYSIA
Standard Writing Organisation



**Lembaga Pembangunan
Industri Pembinaan Malaysia**

CONSTRUCTION INDUSTRY DEVELOPMENT BOARD MALAYSIA

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P.O. Box. 12278, 50772 Kuala Lumpur. Tel: 603-26170200 Fax: 603-46451808
<http://www.cidb.gov.my>

Need to create and implement a Site Amenities Plan to achieve the objective of ensuring adequate health and hygiene facilities are available for workers in order to minimize pollution caused by workers.

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:-

The plan shall describe the measures implemented to accomplish the following objectives:

- a) Proper accommodation for construction workers at the site or at temporary rented accommodation nearby.
- b) Prevent pollution of storm sewer or receiving stream by having proper septic tank.
- c) Prevent polluting the surrounding area from open burning and proper disposal of domestic waste.
- d) Provide adequate health and hygiene facilities for workers on site.

Transportation

SM8	Public Transport Accessibility	1
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SM9	Green Vehicles Priority	1
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SM10	Parking Capacity	1
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Design

SM11	Stormwater Control	1
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SM12	Greenery & Roof	2
------	-----------------	---

SM13	Building User Manual	1
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SM8 Public Transport Accessibility

1

Reduce pollution and land development impacts from private car use. During site selection process, give preference to sites that are located within 1km radius of existing public transportation system, measured from the main entrance of the development or building.

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.

OR

Locate project within 500 m of at least one bus stop.

1

SM9 Green Vehicles Priority

1

Provide preferred parking areas for fuel efficient vehicles, to encourage the use of such vehicles (e.g. hybrid vehicles).

Encourage use of green vehicles:-

Provide low-emitting and fuel-efficient vehicles for 5% of Full-Time Equivalent (FTE) occupants AND provide preferred parking for these vehicles.

1

“Preferred parking” refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped or parking passes provided at a discounted price).

SM10 Parking Capacity

1

Reward for not over-providing parking capacity. This is to encourage the use of public transport and carpools and reduce single occupancy private vehicle use. The environmental benefits of travelling by public transport include the reduction in the emission of greenhouse gases by private cars, thereby reducing urban pollution and traffic congestion.

Discourage over-provision of car parking capacity:-

Size parking capacity to meet, but not to exceed the minimum local zoning requirements, AND provide preferred parking for carpools or vanpools for 5% of the total provided parking spaces.

1

Transportation

SM8 Public Transport Accessibility	1
SM9 Green Vehicles Priority	1
SM10 Parking Capacity	1

Design

SM11 Stormwater Control	1
SM12 Greenery & Roof	2
SM13 Building User Manual	1

Minimize impact of stormwater due to development.

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:-

Condition 1:

If existing imperviousness is $\leq 50\%$:

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 (MASMA).

Condition 2:

If existing imperviousness is $> 50\%$:

Implement a storm water management plan that results in a 25% decrease in the volume of storm water runoff required under MASMA.

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).

Minimize impact on microclimate and human wildlife habitat.

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;

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; OR
- 2) Install a vegetated roof for at least 50% of the roof area; OR
- 3) Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria:

$$\left(\frac{\text{Area of SRI Roof}}{0.75} \right) + \left(\frac{\text{Area of vegetated roof}}{0.5} \right) \geq \text{Total Roof Area}$$

Roof Type Slope SRI

Low-Sloped Roof < 2:12 78

Steep-Sloped Roof > 2:12 29

Reward for achieving any option. Roof application includes roofs over individual parking lots and roofs over parking structures.

For vegetated roofs, refer also SM4.

The use of greenery on rooftops can help alleviate urban heat island effects through shading and evaporative cooling. It also enhances aesthetics and provides a more pleasant working environment, which is also discussed in Indoor Environment Quality.

A Building User Manual is intended to inform occupants about the active and passive design features that should be maintained throughout the lifespan of the building.

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 features that should not be downgraded.

4) Materials & Resources 11pts

Reused & Recycled Materials

MR1	Material reuse and selection	2
MR2	Recycled Content Materials	2

Sustainable Resources

MR3	Regional Materials	1
MR4	Sustainable Timber	1

Waste Management

MR5	Storage and Collection of Recyclables	1
MR6	Construction Waste Management	2

Green Products

MR7	Refrigerants & Clean Agents	2
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4) Materials & Resources 11pts

Reused & Recycled Materials

MR1	Material reuse and selection	2
MR2	Recycled Content Materials	2

Sustainable Resources

MR3	Regional Materials	1
MR4	Sustainable Timber	1

Waste Management

MR5	Storage and Collection of Recyclables	1
MR6	Construction Waste Management	2

Green Products

MR7	Refrigerants & Clean Agents	2
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MR1 Material reuse and selection

2

Encourage designers to specify the usage of reused building materials in new buildings.

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:-

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

2

Encourage designers to specify the usage of recycled content materials in new buildings.

Increase demand for building products that incorporate recycled content materials in their production:- (Recycled content shall be defined in accordance with the International Organization of Standards Document)

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

4) Materials & Resources 11pts

<i>Reused & Recycled Materials</i>		
MR1	Material reuse and selection	2
MR2	Recycled Content Materials	2
<i>Sustainable Resources</i>		
MR3	Regional Materials	1
MR4	Sustainable Timber	1
<i>Waste Management</i>		
MR5	Storage and Collection of Recyclables	1
MR6	Construction Waste Management	2
<i>Green Products</i>		
MR7	Refrigerants & Clean Agents	2

MR3 Regional Materials

1

Encourage sourcing of regional materials to reduce environmental impacts due to transportation.

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:-

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. Mechanical, electrical and plumbing components shall not be included. Only include materials permanently installed in the project.

1

MR4 Sustainable Timber

1

Promote responsible forest management.

Encourage environmentally responsible forest management:-

Where $\geq 50\%$ of wood-based materials and products used are certified. 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 Forest Stewardship Council FSC and Malaysian Timber Certification Council MTCC

1

4) Materials & Resources 11pts

<i>Reused & Recycled Materials</i>		
MR1	Material reuse and selection	2
MR2	Recycled Content Materials	2
<i>Sustainable Resources</i>		
MR3	Regional Materials	1
MR4	Sustainable Timber	1
<i>Waste Management</i>		
MR5	Storage and Collection of Recyclables	1
MR6	Construction Waste Management	2
<i>Green Products</i>		
MR7	Refrigerants & Clean Agents	2

MR5 Storage and Collection of Recyclables

1

Provide dedicated areas and storage bins for non-hazardous materials for recycling during BOTH construction and building occupancy.

Facilitate reduction of waste generated during construction and during building occupancy that is hauled and disposed off in landfills:-

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

2

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:-

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

4) Materials & Resources 11pts

Reused & Recycled Materials

MR1	Material reuse and selection	2
MR2	Recycled Content Materials	2

Sustainable Resources

MR3	Regional Materials	1
MR4	Sustainable Timber	1

Waste Management

MR5	Storage and Collection of Recyclables	1
MR6	Construction Waste Management	2

Green Products

MR7	Refrigerants & Clean Agents	2
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MR7 Refrigerants & Clean Agents

2

Demonstrate leadership in accelerating phase-out of all Ozone Depleting Substances.

Recognise and promote use of low Global Warming Substances.

Use environmentally-friendly Refrigerants and Clean Agents exceeding Malaysia's commitment to the Montreal & Kyoto protocols:-

Use zero Ozone Depleting Potential (ODP) products: non-CFC and non-HCFC refrigerants/clean agents;

1

Use non-synthetic (natural) refrigerants/clean agents with zero ODP and negligible Global Warming Potential.

1

5) Water Efficiency

10 points

<i>Water Harvesting & Recycling</i>	
WE1 Rainwater Harvesting	2
WE2 Water Recycling	2
<i>Increased Efficiency</i>	
WE3 Water Efficient Irrigation	2
WE4 Water Efficient Fittings	2
WE5 Metering and Leak Detection System	2

5) Water Efficiency

10 points

Water Harvesting & Recycling

WE1	Rainwater Harvesting	2
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WE2	Water Recycling	2
-----	-----------------	---

Increased Efficiency

WE3	Water Efficient Irrigation	2
-----	----------------------------	---

WE4	Water Efficient Fittings	2
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WE5	Metering and Leak Detection System	2
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WE1 Rainwater Harvesting

2

Promote Rainwater Harvesting

Encourage rainwater harvesting that will lead to reduction in potable water consumption:-

Rainwater harvesting that leads to $\geq 15\%$ reduction in potable water consumption, OR

1

Rainwater harvesting that leads to $\geq 30\%$ reduction in potable water consumption

2

WE2 Water Recycling

2

Promote recycling of waste water.

Encourage water recycling that will lead to reduction in potable water consumption:-

Treat and recycle $\geq 10\%$ wastewater leading to reduction in potable water consumption, OR

1

Treat and recycle $\geq 30\%$ wastewater leading to reduction in potable water consumption

2

5) Water Efficiency

10 points

<i>Water Harvesting & Recycling</i>	
WE1 Rainwater Harvesting	2
WE2 Water Recycling	2
<i>Increased Efficiency</i>	
WE3 Water Efficient Irrigation	2
WE4 Water Efficient Fittings	2
WE5 Metering and Leak Detection System	2

WE3 Water Efficient Irrigation

2

Minimise use of expensive and energy intensive treated potable water wherever possible.

Encourage the design of system that does not require the use of potable water supply from the local water authority:-

Reduce potable water consumption for landscape irrigation by $\geq 50\%$ (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

2

Minimise wastage of energy intensive treated water.

Encourage reduction in potable water consumption through use of efficient devices:-

Reduce annual potable water consumption by $\geq 30\%$,
OR

1

Reduce annual potable water consumption by $\geq 50\%$

2

WE5 Metering and Leak Detection System

2

Minimise unnecessary loss of potable water.

Encourage the design of systems that monitors and manages water consumption:-

Use of sub-meters to monitor and manage major water usage for cooling towers, irrigation, kitchens and tenancy use

1

Link all water sub-meters to EMS to facilitate early detection of water leakage

1

6) Innovation

7 points

IN1	Innovation in Design & Environment Design Initiatives	6
IN2	Green Building Index Facilitator	1

IN1 Innovation in Design & Environment Design Initiatives	6
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Reward innovation and 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;

Condensate water recovery (accounting for at least 50% of total AHUs/FCUs) for use as cooling tower make-up water etc;

Design Initiatives cont'd

Co-generation / Tri-generation system; Thermal / PCM / Thermal Mass storage system (accounting for at least 25% of total required capacity);

Solar thermal technology / Solar Airconditioners (generating at least 10% of total required capacity);

Heat recovery system (contributing to at least 10% of total required capacity);

Heat pipe technology; Light pipes; Auto-condenser tube cleaning system (fitted to plant equipment serving at least 50% of total capacity);

Non-chemical water treatment system (serving at least 50% of total capacity);

IN1 Innovation in Design & Environment

6

Design Initiatives cont'd

Mixed mode / low energy ventilation system;

Advanced air filtration technology (serving at least 50% of the NLA);

Waterless urinals (fitted to all male toilets);

Central vacuum system (serving at least 50% of NLA);

Central Pneumatic Waste Collection system;

Self-cleaning façade;

Electrochromic glazed façade;

Refrigerant leakage detection and recycling facilities;

Recycling of all fire system water during regular testing;

6

IN2 Green Building Index Facilitator

1

Encourage and promote green technology service providers.

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

POINTS	GBI RATING
50 to 65	GBI CERTIFIED
66 to 75	GBI SILVER
76 to 85	GBI GOLD
86 +	GBI PLATINUM



Thank You

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