



A Reference Guide for

MyCREST

Malaysian Carbon Reduction and Environmental
Sustainability Tool

Construction Stage Certification

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INTRODUCTION TO CONSTRUCTION STAGE

MYCREST Construction Stage is focusing on the activities during construction, especially on green practices in Construction. The main principles in the MYCREST Construction Stage are referred from the Guidebook on Planning and Implementation of Green Practices for Building Construction Works by CIDB.

Construction activities contribute to the negative impact or damage to the environment. Apart from its impact towards the environment, construction works also reflect the quality of the building and the functionality of the mechanical and electrical system of the building. The MYCREST Construction Stage is created to encourage the Contractors in implementing green practices and managing their construction activities properly including; the prevention plan on the environmental damages, health and safety of the staff and workers, workmanship of the buildings and promoting sustainable activities.

CALIBRATION METHODS

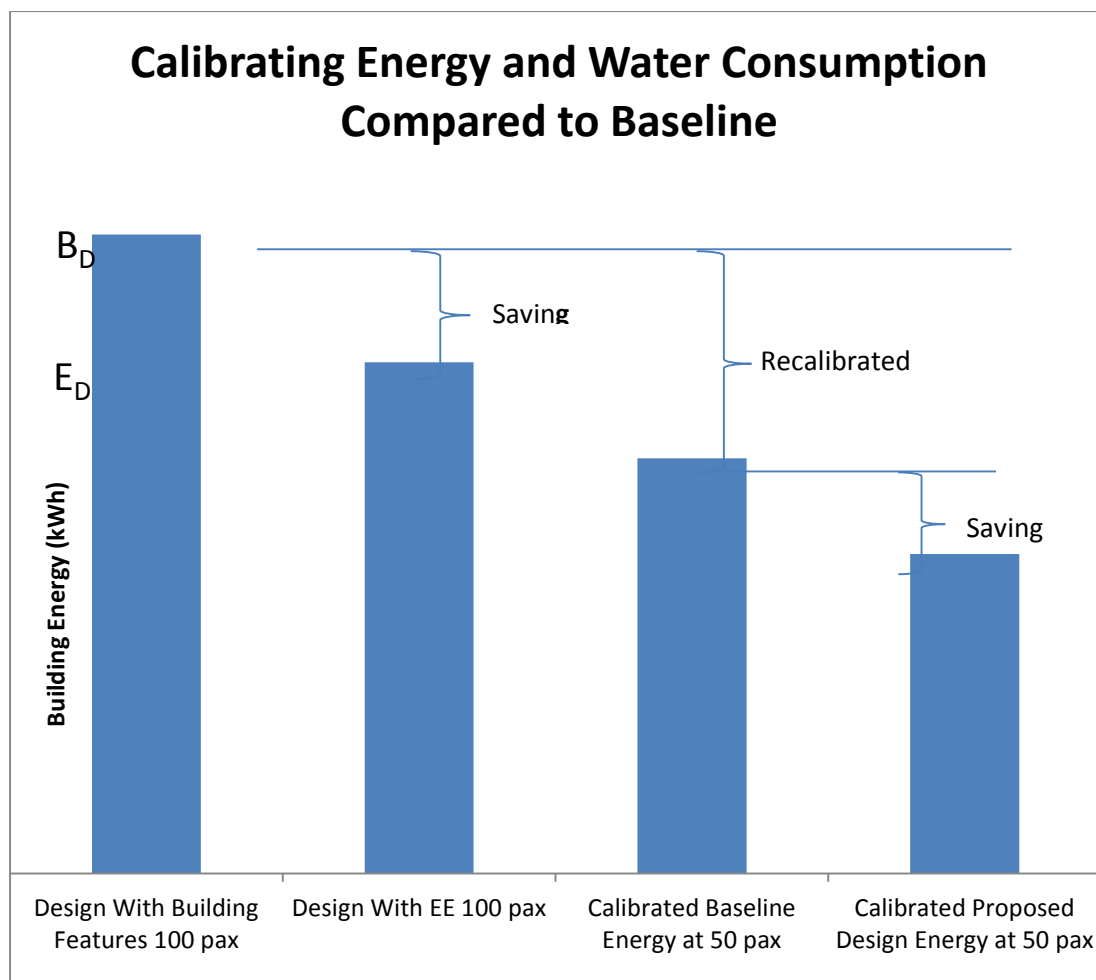


Figure 1: Calibration Analogy for Energy and Water Consumption

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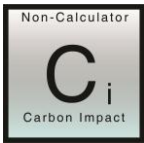
At the end of the construction and commissioning period, a calibration of the predicted energy and water consumption of the base line scenario and proposed model must be undertaken. Based on the actual occupancy patterns, profile and densities, both the baseline and proposed levels of energy and water usage must be recalculated or re-simulated. The calibration process is to ensure that the predicted energy use has been calibrated based on the actual occupant profile and occupant density of the building.

At the end of the construction period, MYCREST will award the energy (EP) and water (WP) points based on either of the following option = SAVINGS

1) Calibrated baseline scenario - calibrated proposed design (as-built design) scenario (energy /water consumption) = Savings

OR

1) Calibrated baseline scenario - actual metered value in -use (energy/water consumption) = Savings

INFRASTRUCTURE AND SEQUESTRATION		CONSTRUCTION		
IS8	Environmental Impact from Construction Activity	IS	8	CI
	8.1 Proper Timing of Erosion and Sedimentation Control Strategies with Respect to Monsoon Season and Confine Construction Activity 1 point	3 Points		
	8.2 Proper Implementation of Staging and Spill Prevention Plan 1 Point			
	8.3 Implementation of Erosion and Sedimentation Control Plan 1 Point			

Aims

To maximize the conservation and utilization of resources (land, water, natural habitat and energy) and to enhance efficiency of the systems and operations

To preserve the existing landscape and protect it from degradation during the process of construction

Requirements

Ensure proper timing of erosion and sedimentation control strategies; preserve top soil, staging and spill prevention, and effective erosion and sedimentation control

1 POINT:

Proper timing of erosion and sedimentation control strategies with respect to rain and confine construction activity to pre-designated areas

1 POINT:

Proper implementation of staging and spill prevention Plan

1 POINT:

Effective erosion and sedimentation control to prevent erosion

Justification

The timing of construction and application of erosion control measures include the protection of slopes greater than 10%. Sedimentation collection systems, drainage systems, and run-off diversion systems shall be in place before the commencement of a construction activity.

Staging area is dividing a construction area into two or more sections to minimize the area of soil that will be exposed at any time. Staging should be done to separate an undisturbed land from a land disturbed by construction activity and material storage. Measures should be followed for collecting drainage water run-off from the construction areas and material storage sites, and diverting water flow away from such polluted areas. Temporary drainage channels and perimeter swale should be constructed to carry the pollutant water directly to the treatment device or facility (municipal sewer line). The plan should indicate how the above was accomplished on-site, will in advance of the commencement of the construction activity.

Spill prevention and control plans should clearly state measures to contain the spill, and measures to dispose the contaminated material and hazardous wastes. It

should also state the designation of personnel trained to prevent and control spills, cleaners and petroleum products.

Approach & Strategy

1. Ensure proper timing for the construction activity to minimize site disturbance such as soil pollution due to spilling of the construction material and, and the materials' mixing with rainwater, and
2. Specify and limit construction activity in pre-planned/designated areas (**1 Point**)
3. Use staging and spill prevention, and control plan to restrict the spilling of the contaminated materials on site
4. Protect the top soil from erosion. Use collection storage and re-application of the top soil, sediment basin, contour trenching, mulching, soil stabilization methods to protect the top soil from erosion during construction.
5. Effective erosion and sedimentation control to prevent erosion - ESCP must be prepared by the engineer before a project is initiated especially those that involve on-site earth works. The ESCP contains proposals for temporary works and best management practices which must be performed to avoid erosion and sedimentation.



Figure 2: Silt Fence and Earth Drain For Slope Surface Runoff



Figure 3: Silt Fence in Sediment Basin for Ease of Maintenance

Timing of Construction –The timing of construction and application of erosion control measures include protection of slopes greater than 10°. Sedimentation collection systems, drainage systems, and run-off diversion systems shall be in place before the commencement of construction activity.

Preservation of existing soil and vegetation – Preservation and protection of existing soil and vegetation by non-disturbance to specified site areas during construction is recommended. This practice enables retention of fully-grown mature trees and also reduces avoidable erosion of bare soil due to exposure to climate and human intervention during construction.

Carbon Calculator

None



Figure 4: Silt Trap Failure Due To Poor Maintenance and Under-Designed Silt Traps



Figure 5: Land degradation as a result of landslide

Submittals

The following documents are to be submitted:

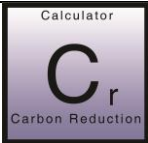
1. A work programme incorporating weather forecast and related work plan during rain.
2. Certificate of architect in prescribed format confirming the proper timing of the construction.
3. A drawing showing the site plan of existing and proposed buildings, existing vegetation and slopes, and drainage pattern. Demarcate areas on the site plan to which site activities will be limited.
4. Site Plan details of existing vegetation, buildings, slopes, and site drainage pattern, staging and spill prevention measures, erosion and sedimentation

control measures, and measures adopted for topsoil preservation during construction as mention in approach & strategy above.

5. One document to be submitted after construction of building, giving a brief description along with photographic records to show that other areas have not been disrupted during the construction. The documents should also include a brief explanation and photographic records to show erosion and sedimentation control measures adopted.

References, Standard and Codes

1. Assessment of the environmental impact of the construction or placement of structures, Ospar Commission, 2008
2. The Impacts of Construction and the Built Environment, Wilmott Dixon, 2010

INFRASTRUCTURE & SEQUESTRATION		CONSTRUCTION		
IS9	Carbon Accounting on Site (For Greenfield or Graded Site)	IS	9.1	Cr
	9.1 Carbon Sequestration - Preservation (for Mature Trees)	2 Points		

Aims

To implement carbon sequestration strategies through the preservation of trees and to reduce intrusion on the natural environment.

R
CONSTRUCTION CARBON ACCOUNTING ON SITE

Requirements

Verification on the Carbon sequestration preservation of tree $\geq 28\text{cm}$ by:

9.1. i Non-urban areas:

2 POINTS:

Preserve more than 80 Percent of trees with trunk diameter larger than 28 cm (11 inch)

OR

9.1. ii Urban areas:

2 POINTS:

Preserve more than 80 Percent of trees with trunk diameter larger than 28 cm (11 inch)

**Urban infill projects with no existing trees will not able to score for carbon preservation under this sub criteria*

Justification

Trees have almost 350 million years' experience in sequestering carbon. Trees, like other green plants, use photosynthesis to convert carbon dioxide (CO₂) into sugar, cellulose and other carbon-containing carbohydrates that they use for food and growth. Trees are unique in their ability to lock up large amounts of carbon in their wood, and continue to add carbon as they grow.

Although forests do release some CO₂ from natural processes such as decay and respiration, a healthy forest typically stores carbon at a greater rate than it releases carbon. Saving trees and planting additional trees are vital for water resource management alone, but along with the use of Smart Growth and green infrastructure for developments, could ultimately lead to better communities where trees can make a much greater contribution to improving the environment.

Carbon sequestration rate varies greatly according to tree species, age of tree, density of tree, location, type of soil and climate. Due to that, we can roughly estimate the amount of CO₂ sequestered in a given tree/species. By the trees age

(weight, diameter and height), we can obtain a yearly sequestration rate regardless of the type of species, age, location and composition. Therefore, the critical point to estimate the sequestration rate is trunk diameter. The coefficient for trunk diameter of less than 11 inch is 0.25 compared to trunk diameter of more than 11 inch which is 0.15. Even though the coefficient for trunk diameter of more than 11 inch is lower than the other one but the total amount of carbon sequestration rate is greater. The MyCREST certification utilises a default rate of carbon sequestration for all trees while distinguishing mature and young trees based on the diameter of its trunk which must be measured at 1.5 meters above ground level.

Approach & Strategy

1. Inventory ID: IS/INV01 report
2. List, number and location of the trees with trunk diameter at breast height of more than 11 inches to be preserved.
3. Integration of shaded tree (height of tree ≥ 15 meter when achieve maturity) within 5 meter from building perimeter helps to reduce the heat island effect on a building.
4. Ensure all selected trees are preserved and are not disturbed by construction activity.

Carbon Calculator

Refer: Calculator ID: IS-CAL02:
Construction Carbon Accounting On Site

The input for this calculator is:

1. Diameter (by using the circumference for matured trees only)
2. Height
3. Age

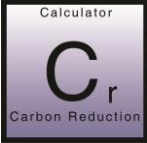
Submittals

1. Tree inventory
2. Earth work plans
3. Measurement plans show the location of present trees
4. Tree-planting plan

References, Standards and Codes

1. "Total-Tree Weight, Stem Weight, and Volume Tables for Hardwood Species in the Southeast," Alexander Clark III, Joseph R. Saucier, and W. Henry McNab, Research Division, Georgia Forestry Commission, January 1986.
2. KRISTIN L. GETTER, D. BRADLEY ROWE, G. PHILIP ROBERTSON, BERT M. CREGG, And JEFFREY A. ANDRESEN, Carbon Sequestration Potential of Extensive Green Roofs, Environ. Sci. Technol. 2009, 43, 7564–7570

3. H. Akbari, Shade trees reduce building energy use and CO₂ emissions from power plants, Environmental Pollution, Volume 116, Supplement 1, March 2002, Pages S119–S126, Elsevier Publishing
4. Asme General Position Statement On Reducing Carbon Dioxide Emissions Technology And Policy Recommendations And Goals For In The Energy Sector, April 2009

INFRASTRUCTURE & SEQUESTRATION		CONSTRUCTION		
IS9	Carbon Accounting on Site (For Greenfield or Graded Site)	IS	9.2	Cr
	9.2 Carbon sequestration – Preservation/Restoration/New Planting	5 Points		

Aims

To implement carbon sequestration strategies through the preservation of trees and to reduce intrusion on the natural environment.

CALCULATOR

IS-CAL02: CONSTRUCTION CARBON ACCOUNTING ON SITE

Requirements

Verification on the designed landscape:

2 POINTS:

Preserve and restore including planting new vegetation (native/ adaptive) on 20% of site area including building foot print, with at least 10% from this percentage of planting consisting of the trees measuring more than 28cm in diameter when fully mature.

3 POINTS:

Preserve and restore including planting new vegetation (native/ adaptive) on 25% of site area including building foot print, with at least 10% from this percentage of planting consisting of the trees measuring more than 28cm in diameter when fully mature.

4 POINTS:

Preserve and restore including planting new vegetation (native/ adaptive) on 30% of site area including building foot print, with at least 10% from this percentage of planting consisting of the trees measuring more than 28cm in diameter when fully mature

5 POINTS:

Preserve and restore including planting new vegetation (native/ adaptive) on 35% of site area including building foot print, with at least 10% from this percentage of planting consisting of the trees measuring more than 28cm in diameter when fully mature.

1 POINT:

Produce carbon sequestration of not less than 0.5 tCO₂e
 (Calculation is **excluded** the existing preserve vegetation in IS9.1)

Justification

A social and environmental benefit of Greenfield is the extent to which it can contribute to the policy objective of reducing CO₂ in the atmosphere by locking up carbon through carbon sequestration. Carbon stored in a Greenfield and carbons accumulating into new plants create social benefits by keeping that carbon out of the atmosphere.

Approach & Strategy

The project team must demonstrate that they have protected, restored, and / or replanted a portion of the site according to the threshold on greenery preservation restoration and / or replanting which must comply with the percentages stated above.

The protected or restores area can include vegetation, water bodies or other ecosystem. The use of native or adapted species in landscaping is a key aspect.

If the site area is small in comparison to the building footprint, green roofs, roof garden, and green walls; green terraces can be included to achieve the threshold.

Green roof must provide a diversity of native or adaptive species that provide ecological habitat. Extensive use of sedum monoculture and common turf grass cannot be accepted. The project must show that if they have no significant existing greenery on site then effort must be made to add to the existing landscape and greenery through native and adaptive vegetation. The project must undertake the following:

1. List, number and location of the soft scape elements as detailed in planting design
2. Calculation of carbon sequestration rate
3. Once established, native/adapted plants require minimal or no irrigation; do not require active maintenance like mowing or chemical inputs such as fertilizers, pesticides or herbicides; provide habitat value and promote biodiversity through avoidance of Monoculture plantings.
4. Integration of shaded trees (height of tree ≥ 15 meter when achieve maturity) within 5 meter from the building perimeter helps to reduce the heat island effect on a building.

Where possible there must be efforts toward the following:

1. Integration of shaded trees (height of tree ≥ 15 meter when achieve maturity) within 5 meters from the building perimeter to help reduce heat island effect that occurs on the building.
2. Integrate bio-sequestration strategies at new slope area

Carbon Calculator

Refer: Calculator ID: IS-CAL02:
Construction Carbon Accounting On Site

The input for this calculator is:

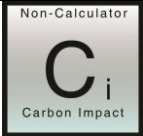
1. Diameter (using circumference of trees measured)
2. Height
3. Age

Submittals

1. As Built Drawing of Landscape Layout plan

References, Standards and Codes

1. Akta Perancang Bandar dan Desa 1976
2. Dasar Landskap Negara 2011, Jabatan Landskap Negara
3. Garis Panduan Landskap Negara 2008, Jabatan Landskap Negara

INFRASTRUCTURE & SEQUESTRATION		CONSTRUCTION		
IS10	Implement Environmental Management Plan (EMP)	IS	10	Ci
	Implement Environmental Management Plan (EMP)	3 Points		

Aims

To implement a comprehensive environmental management system To reduce effects of pollution on site as a result of erosion and sedimentation produced during earth works.

Requirements

3 POINTS:

Prepare an Environmental Management Plan and conduct a complete Erosion Sedimentation Control Plan (ESCP);

- Implementing the ESCP
- Implementing the EMP strategies including monitoring of air quality by controlling the generation of fumes, dust and smoke on-site and provide noise control measures on site to reduce noise pollution; AND

Adhere to the requirements of MSMA, as well as attain approval by the Department of Irrigation and Drainage and related agencies.

Justification

The EMP is very crucial as it specifies on how to go about for the potential impacts created by the proposed development or redevelopment.

Approach & Strategy

1. Identify the aspects of and impacts on the environment at the planning stage in order for mitigation steps to be systematically prepared.
2. Mitigation steps taken must be monitored on its level of efficiency through water, air and noise monitoring.
3. Auditing by an environmental consultant every 3 months.

Carbon Calculator

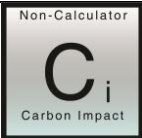


None

Submittals

1. EMP and Report

References, Standards & Codes

1. Environmental Quality Act 1974 and its amendment
2. *Manual Saliran Mesra Alam (MSMA)*", by Department of Irrigation and Drainage Malaysia.
3. Environmental Quality Act 1974 and its amendment

INFRASTRUCTURE & SEQUESTRATION		CONSTRUCTION		
IS11	Environmental Management Practice	IS	11	Ci
  	11.1 Effective environmental friendly programs 1 Point	3 Points		
	11.2 Main contractor has good track records in green practice 1 Point			
	11.3 Construction team to certify and implement the ISO 14001 procedure 1 Point			

Aims

This criterion is to encourage the adoption of environmental-friendly practices during construction and also encourage effective environmental training to raise environmental awareness and knowledge of the construction project team and workers.

Requirements

1 POINT:

Effective implementation of environmental friendly programs including monitoring and setting targets to minimize energy use, water use and construction waste

1 POINT:

Main Contractor/ Developer that has good track records in the adoption of green during construction

1 POINT:

All design and Construction team to certify and implement ISO 14001 procedure

Justification

Good and effective environmental management practice will foster sustainable development from the proposed project.

Approach & Strategy

1. All staff involved in the construction project shall be included in this programme, from site management level to worker level.
2. Environmental training provided for the major contractors' management, supervisory staff and construction workers at the early stage of construction process.
3. The Guidebook on Planning and Implementing Green Practices for Building Construction Works, published by Construction Industry Development Board, Malaysia (CIDB), shall be referred.

4. Main Contractor / Developer has good track records in the adoption of sustainable, environmentally friendly and considerate practices during construction
5. An Environmental Management System is an overall management system, which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy. It provides a framework for systematic presentation of environmental information for decision making as well as improving the environmental performance of the contractors, and enhancing their creditability with financial institutions, insurance companies, regulators and building Developers / Owners. The widely recognised ISO 14001 standard shall be referred. Major contractors include the main builder and main building services contractors.

Carbon Calculator

None

Submittals

1. Extract of the tender specification, showing the requirements for contractor to provide and implement environmental friendly programmes to minimize energy use, water use and construction waste, in addition to details of the environmental-friendly programmes implemented.
2. A certified copy of the Main Contractor/Developer award or previous green certification for the building that the main contractor was involved in; details of track records in the adoption of sustainable, environmentally friendly and considerate practices during construction.

References, Standards & Codes

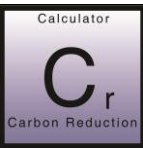
1. Guidebook on Planning and Implementing Green Practices for Building Construction Works, page 40-41 published by Construction Industry Development Board, Malaysia (CIDB)
2. ISO 14001



Figure 6: Materials Organized On Site According to Usage Frequency



Figure 7: Water Pollution from Sediment Runoff at a Construction Site

INFRASTRUCTURE AND SEQUESTRATION		CONSTRUCTION		
IS12	Emissions Reporting - Construction Machinery	IS	12	Cr
	Emissions Reporting - Construction Machinery	2 Points		

Aims

To reduce carbon emission release from transportation and machineries use during construction activity.

CALCULATOR
IS-CAL03: CONSTRUCTION MACHINERY

Requirements

2 POINTS:

Submit emission reporting for construction machineries and transportation within site.

Justification

The construction industry has seen an increase in the variety of engine fuel for site transport and machineries which emits lesser carbon emission. The aim of this credit is to create awareness to the construction team in efforts to reduce carbon emission.

Approach & Strategy

A number of methods can be used to reduce carbon emission from construction plants and ancillary equipment, including:

1. Choosing the right machine for the task – avoid inefficiently oversized machines.
2. Selecting a plant/machine that is more fuel efficient
3. Servicing plant/machine correctly
4. Using sustainable low carbon fuels
5. Operating plant efficiently (e.g. minimizing idling time and using appropriate power)
6. Adopt fuel use benchmarks; set targets for establishing the fuel performance of plants and equipment in product range based on the industry standard duty cycles. Publish fuel performance along with product information.
7. Promote purchase and hire of efficient plants; set up procurement processes that favour the most efficient plant and equipment, as measured using standard duty cycles (e.g. : best in class, similar to A and B ratings for appliances)

This action focuses on encouraging plant operators to drive plants efficiently. In addition, it allows contractors and clients to favour fuel efficient plant; it is proposed that plant suppliers develop and advertise consistent fuel consumption benchmarks.

On many construction sites, site rules already encourage fuel efficient plant operation. There is a need for trainers, contractors and sub-contractors to reinforce these requirements.

Plant suppliers presently publish fuel consumption (typically litres per hour of diesel) for various plant sizes and applications. However, fuel consumption information is not always directly comparable. There is a need to develop standard duty cycles to create comparable benchmarks.

Suppliers are beginning to make use of telematics to remotely track the use of vehicles. This monitoring can provide useful data to benchmark performance and encourage operators to use plants appropriately.

To overcome challenges is to include staff to implement the training. Even after being trained, the transient nature of the construction workforce means that these skills should be reinforced at each site. The benefits include savings in fuel costs, less noise and particulate emission, improved plant/machine life expectancy, and site safety. The costs of training and awareness are minimal; they can be included in the existing training schemes and general site rules. Costs of producing standardised fuel consumption data would be borne by the supplier.

Carbon Calculator

Refer: Calculator ID: IS-CAL03:
Construction Machinery

The input for this calculator is:

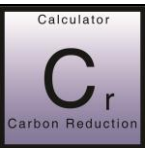
1. Total machineries involved
2. Distance (km)
3. Usage (hrs.)

Submittals

1. List of transport and machineries used
2. Carbon calculator for transportation and machineries within the construction site

References, Standards & Reference(s)

1. GreenPASS
2. Joan Ko, Strategic Forum for Construction & Carbon Trust, Carbon: Reducing the footprint of the construction process, July 2010.

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP Req7	Building Energy Efficiency Performance- Verification	EP	Req7	Cr
	Verification on the Improvement of 6% Energy Savings from Baseline	Required		

Aims

This mandatory criterion is to encourage the contractor to comply and achieve the 6% Energy Reduction from the baseline as strategized during the Design Stage. The building envelope, ACMV, lighting and other systems is designed to reduce the energy consumption and carbon emission significantly above the baseline.

Requirement

Verification on the reduction of 6% Energy Savings from baseline.

AND

Ensure thermal comfort parameters that comply with MS1525:2007

Justification

Energy efficiency is the corner stone and crucial objective of low carbon design. The aim is to design the building envelope and systems to maximize energy performance. In general, this can be achieved through efficient design, deliberate mechanical and electrical system selection, proper commissioning and monitoring. These energy savings will translate directly into costs and operational savings.

A computer simulation model will be used to assess the energy performance and identify the energy impact of the measures. This will quantify energy performance as compared to a baseline building. A building cannot be considered green if it is not energy efficient. The energy used by buildings is mostly generated by burning fossil fuels, which release greenhouse gas emission that contributes to climate change. No building should define itself as "green" unless it consumes less energy and generates fewer greenhouse gas emissions than average or conventional buildings.

Approach & Strategy

Demonstrate a 6% improvement for new buildings in the proposed building performance rating compared to the baseline building performance rating by a whole building project verification:

- Meets the requirements of the baseline
- Maximize passive strategies and opportunities such as orientation of the main façade to North/South to reduce the heat impact transferred into building. Minimize the opening at East/West façade
- Optimize facade systems such as Install low E glass and shading device at east/west facade.
- Install efficient mechanical equipment.

Project teams must demonstrate that on completion, their predicted energy performance via Static Simulation (MyCREST 1, 2 or 3 star rating) or Dynamic Simulation (4 or 5 star rating has been calibrated and their proposed design achieve at least 6 percent savings above the baseline).

The Baseline Model

All the characteristics, requirements and parameters of the Baseline model are based on the basic characteristics derived from the MS1525: 2007. **The characteristics of the baseline model must follow MyCREST requirements and are as outlined in the 'MyCREST BASELINE MODELLING GUIDE' in Appendix 2 at the end of this guide.** Among the parameters are:

A. Passive Design:

The baseline building envelope must achieve a minimum of OTTV = 50 W/m², RTTV = 25W/m² (with skylights and minimum U values for roof) as stated in MS1525.

The following of the characteristics are additional characteristics of the baseline model:

Windows

WWR = 50% and must be evenly distributed on ALL facades

B. Active Design:

Equipment

Active design shall follow the minimum requirement for OTTV, RTTV, lighting and ACMV components and equipments under item 5, 6, 7 and 8 as stated in MS 1525:2007. **Details modelling guideline can be referred in the Appendix 2.**

Baseline spaces by space Lighting Power Density (LPD) are as stated in EP15 Artificial Lighting.

ACMV Basis of Design must comply with ASHRAE 62.1 and ASHRAE 55.

The calculation of the project windows, skylight, glazing and wall are required to meet its respective baseline value.

Demonstrate improvement for new buildings in the proposed building performance rating compared to the baseline building performance rating by a whole building project simulation. During the Design Stage, the designer has to plan appropriately to reflect local climate.

At the completion of the construction, energy consumption of the building must be audited or derived from the BMS or EMS records. Comparison must be made with the load apportioning the final prediction during the Design Stage

Calibration must be undertaken to adjust any discrepancy in occupancy schedules or occupancy density input.

Should the calibrated report and final design simulation report not match significantly (with an error of more than five percent), the project teams must propose measures to reduce energy consumption of the building until prediction matches with performance.

Carbon Calculator

All energy calculation for this sub criterion contributes to:
Calculator ID: EP-CAL03 Verification Energy Performance

Submittals

For Construction Stage

The following information shall be provided to demonstrate compliance with the criteria strategy:

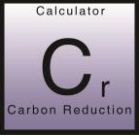
1. Final Energy performance report
2. EM/BMS output or overall energy audit report
3. As built drawing plan of the air-conditioning layout showing the thermostat location.

For Commissioning & Verification Stage

1. Confirm the projects meet the minimum requirements of MS 1525 and have achieved 6% energy savings.

References, Standard and Codes

1. MS *Code of Practice on Energy Efficiency and Use of Renewable Energy*.
2. ASHRAE 90.1

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP13	Lighting Systems Control - Verification	EP	12	Cr
	Automatic Motion Sensors at All Toilet and Staircase	1 Point		

Aims

To verify the performance and effectiveness of the installed motion/occupancy sensors at the occupied building areas and enclosed transitional areas.

Requirement

1 POINT:

Verify the Installation of automatic motion/occupancy sensors covering all toilets and staircases.

Justification

Automatic motion sensor controlled lighting is an inexpensive and sure way to reduce lighting energy costs for up to 60 %.

Approach & Strategy

Conduct a field inspection of lighting control and verify that 30% of the total occupied building spaces must be controlled with automatic motion/occupancy sensors. For best practice, the placement of sensors must be incorporated in terms of coverage area, coverage patterns, field of view, sensitivity and time delay. Although manufacturers publish maximum coverage areas, the actual coverage areas depend on the mounting location and height, furniture layout, the size of the motion to be detected, and the sensitivity setting of the occupancy sensor.

Potential Issues to Arise

Unsuitable locations for automatic motion sensors

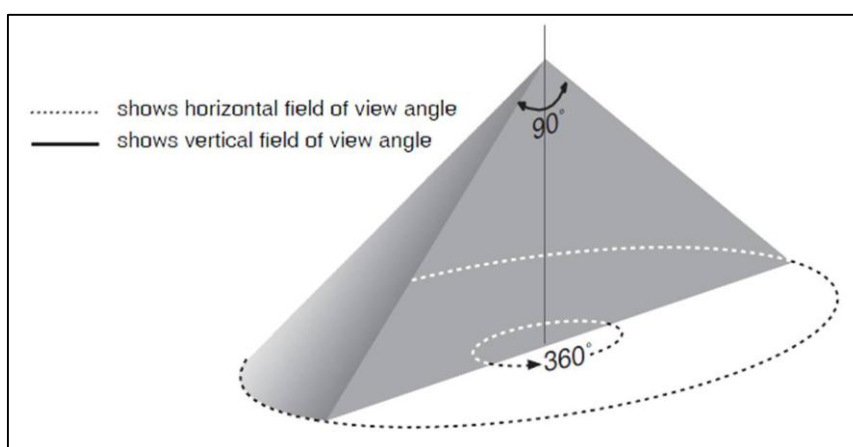


Figure 8: Ceiling Mounted Infrared Passive Occupancy /Motion Sensors

Submittals

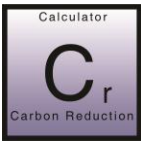
1. Present a floor plan drawing which shows the location of automatic motion/occupancy sensors including the detailed electrical schematic drawings for installation of the automatic sensors.
2. Manufacturer technical data of the installed photo-sensors.
3. Summary of field inspection results must include the location of inspections areas, location of devices installed in floor plan drawings for each floor levels, manufacturer's information/specification of the motion/occupancy sensors used and photograph of the device installed in the building.

Carbon Calculator

All energy calculation for these sub criteria contributes to:
Calculator ID: EP-CAL03 Verification Energy Performance

References, Standards and Codes

1. MS 1525 *Code of Practice for Energy Efficiency and Use of Renewable Energy*.
2. Energy Efficiency Guidelines for CKE Design

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP14	Admission of Daylight Zone and Provision of Controls - Verification	EP	14.1	Cr
	14.1 Ensure the automatic photo-sensors are installed and perform as the proposed design	1 Point		

Aims

To ensure the automatic photo sensors devices are installed accordingly and performs as proposed in the design phase.

Requirement

1 POINT:

Verify that automatic photo sensors (daylight light sensors) devices are installed and managed to regulate occupied building spaces perimeter lighting as per designed.

Justification

Daylight sensors in conjunction with well-designed artificial lighting systems can maximize the quality of daylight. The highest efficiency can be reached in environments with ample daylight coming through windows. The intensity of artificial lighting is constantly adjusted to reflect the incoming natural luminous flux. At noon, all or most of the illumination can be provided by sun while early or late in the day, this function is taken over by artificial lighting systems. Therefore, the provision of daylight sensor seems to be a useful in order to regulate day lighting of the entire occupied building spaces perimeter.

Approach & Strategy

Ensure the automated photo-sensors have been installed at the building perimeters to control the usage of electrical lightings in the presence of effective day lighting.

Carbon Calculator

All energy calculation for this sub criterion contributes to:
 Calculator ID: EP-CAL03 Verification Energy Performance

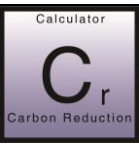
Submittals

1. Present a floor plan drawing which shows the location of the automatic photo-sensors including the detailed electrical schematic drawings for the installation of the automatic sensors.
2. Manufacturer technical data on the installed photo-sensors.
3. Summary of the field measurement results must include the location of inspections area, luminance results (lux), location of devices installed in floor

plan drawings for each floor levels, manufacturer's information/specification of the photo sensors used and photograph of the device installed in building.

References, Standards and Codes

1. MS 1525 *Code of Practice for Energy Efficiency and Use of Renewable Energy*.
2. Energy Efficiency Guidelines for CKE Design
3. Dynamic Daylight Performance Metrics for Sustainable Building Design
LEUKOS: The Journal of the Illuminating Engineering Society of North America
Volume 3, Issue 1, 2006
4. B. Roisina, M. Bodartb, A. Deneyerc, P. D'Herdte Lighting energy savings in offices using different control systems and their real consumption, *Energy and Buildings*, Volume 40, Issue 4, 2008, Pages 514–523
5. JULITTA YUNUS, SABARINAH SH AHMAD^{1,2}, AZNI ZAIN-AHMED³ Evaluating Day lighting of Glazed Atrium Spaces through Physical Scale Model Measurements under Real Tropical Skies Condition , *Recent Researches in Energy, Environment, Entrepreneurship, Innovation* , ISBN: 978-1-61804-001-5

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP 14	Admission of Day lit Zone and Provision of Controls- Verification	EP	14.2	Cr
	14.2 Natural Lighting	2 Points		

Aims

To verify the use of diffused interior daylighting

Requirements

1 POINT:

Verify that $\geq 20\%$ of a combination of **all occupied building spaces and transitional spaces** (enclosed or perimeter circulation spaces) achieve daylight luminance with an above of 250 lux (for occupied area) and 50 lux (for transitional area) as measured at the working plane, 800mm from floor level

2 POINTS:

Verify that $\geq 30\%$ of a combination of **all occupied building spaces and transitional spaces** (enclosed or perimeter circulation spaces) achieve daylight luminance with an above of 250 lux (for occupied area) and 50 lux (for transitional area) as measured at the working plane, 800mm from floor level

AND

The use of automated or manual solar shading blind, shades or light shelves to regulate the glare and maintain brightness levels **below 1000 cd/m²** at **occupied building spaces***. Project team must conduct glare assessment with the MYCREST recommended software tools at the beginning of the project and should the luminance levels are found to be more than 1000cd/m², the team must propose glare reduction strategies. Based on the strategies, the project team must redo the simulation and get the acceptable luminance levels.

Justification

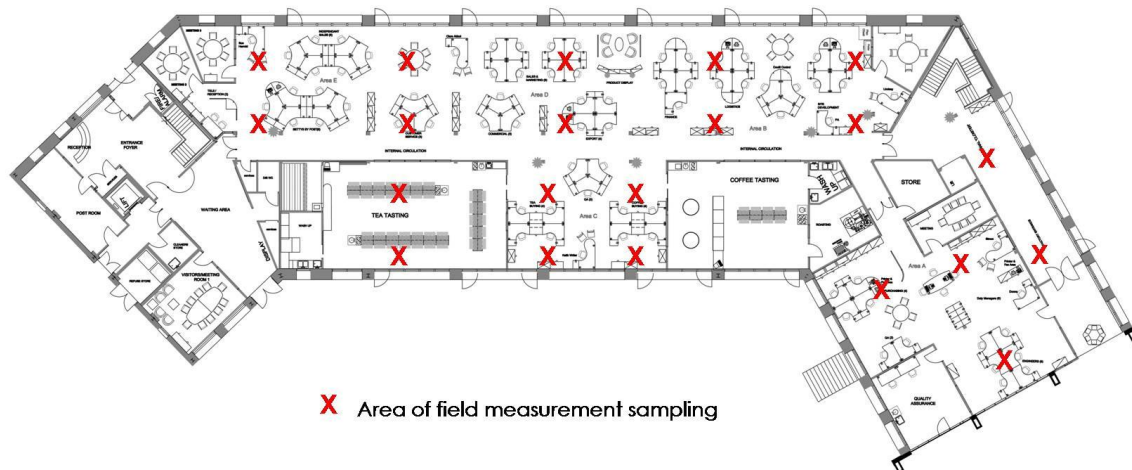
The two primary reasons for using daylight to meet the illumination requirements in occupied building spaces and transitional spaces are the **psychological benefits** and the energy **savings benefits**. Good day-lighting has been shown to improve the overall attitude, satisfaction and wellbeing of building occupants.

A number of research studies have shown a variety of benefits of day-lighting in different building types and functions; among them are improved retail sales, increased worker productivity, reduced absenteeism in office buildings, improved student educational performance, and improved patient recovery times in hospitals. Exposure to daylight has also been shown to improve general health and circadian rhythm.

Daylighting, with proper electric lighting controls, can result in significant energy savings by reducing electric lighting loads and associated cooling loads. In addition, with proper solar control, solar gains during cooling load periods can be mitigated and solar gains during heating load periods can be utilized, reducing the energy requirements of both cooling and heating a space.

Approach & Strategy

Conduct a verification survey and ensure that the provision of natural daylighting credit is met accordance to the proposed design.



Carbon Calculator

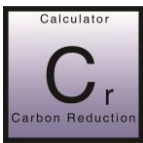
All energy calculation for these sub criteria contributes to:
Calculator ID: EP-CAL03 Verification Energy Performance

Submittals

1. Present as built floor plan drawing which clearly marks the location of the occupied building spaces, transitional spaces and the position of glare control system.
2. Summary of field measurement sampling results must include the location of inspections area, luminance results (lux) in floor plan drawings for each floor levels, manufacturer's information/specification of the photo sensors used and photograph of the device installed in building.

References, Standards and Codes

1. MS 1525 Code of Practice for Energy Efficiency and Use of Renewable Energy for Non- Residential Buildings by SIRIM
2. Undang-undang Kecil Seragam Bangunan 1984
3. Design Strategies for Energy Efficiency in New Building (Non- Domestic from DANIDA

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP 15	Artificial Lighting - Verification	EP	15.1	Cr
	15.1 Design lighting in Lighting Power Density (LPD) by:	4 Points		
	1 point: 15% improvement in Lighting Power Density			
	2 points: 20% improvement in Lighting Power Density			
	3 points: 25% improvement in Lighting Power Density			
	4 points: 30% improvement in Lighting Power Density			

Aims

Encourage the use of energy efficient lighting in building to minimize energy consumption from lighting usage while maintaining proper lighting level

Requirements

1 POINT:

Verify that 15% to 19% improvement in Lighting Power Density (LPD) from baseline

2 POINTS:

Verify that 20% to 24% improvement in Lighting Power Density (LPD) from baseline

3 POINTS:

Verify that 25% to 29% improvement in Lighting Power Density (LPD) from baseline

4 POINTS:

Verify that 30% to 34% improvement in Lighting Power Density (LPD) from baseline

AND

Comply with the lux levels recommended (space by space) are based on the minimum standards in IESNA Standard 2000 (with the exception of office spaces based on MS).

Justification

Comply with the LPD guidelines improve energy efficiency by reducing wasteful design by limiting power allowed for lighting without compromising occupant comfort and visual performance. Reduce connected lighting power density below than allowed by IESNA or ASHRAE standard 90.1 2007 using either space by space method or area weighted whole building lighting power average.

Approach & Strategy

Below is the LPD guideline from ASHRAE 90.1.

ASHRAE 90.1

Common Space Types	LPD, W/m ²
Office – Enclosed	15*
Office – Open Plan	15*

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Conference/Meeting/Multipurpose	14
Classroom/Lecture/Training	15
For Penitentiary	14
Lobby	14
For Hotel	12
For Performing Arts Theatre	36
For Motion Picture Theatre	12
Audience/Seating Area	10
For Gymnasium	4
For Exercise Centre	3
For Convention Centre	8
For Penitentiary	8
For Religious Buildings	18
For Sports Arena	4
For Performing Arts Centre	28
For Motion Picture Theatre	13
For Transportation	5
Atrium – First Three Floors	6
Atrium – Each Additional Floor	2
Lounge/Recreation	13
For Hospital	9
Dining Area	15*
For Penitentiary	14
For Hotel	15*
For Motel	15*
For Bar Lounge/Leisure Dining	15
For Family Dining	23

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Food Preparation	13
Laboratory	15
Restrooms	10
Dressing/Locker/Fitting Room	6
Corridor/Transition	5
For Hospital	11
For Manufacturing Facility	5
Stairs - Active	6
Active Storage	9
For Hospital	10
Inactive Storage	3
For Museum	9
Electrical/Mechanical	16
Workshop	20
Sales Area [for accent lighting, see Section 9.6.2(b)]	18

Building-Specific Space Types	LPD, W/m ²
Gymnasium/Exercise Centre	
Playing Area	15
Exercise Area	10
Courthouse/Police Station/Penitentiary	
Courtroom	20
Confinement Cells	10
Judges' Chambers	14
Fire Stations	
Engine Room	9
Sleeping Quarters	3

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Post Office – Sorting Area	13
Convention Centre – Exhibit Space	14
Library	
Card File and Cataloguing	12
Stacks	18
Reading Area	13
Hospital	
Emergency	29
Recovery	9
Nurse' Station	11
Exam/Treatment	16
Pharmacy	13
Patient Room	8
Operating Room	24
Nursery	6
Medical Supply	15
Physical Supply	10
Radiology	4
Laundry – Washing	6
Automotive – Service/Repair	8
Manufacturing	
Low Bay (<25 ft. Floor to Ceiling Height)	13
High Bay (\geq 25 ft. Floor to Ceiling Height)	18
Detailed Manufacturing	23
Equipment Room	13
Control Room	5
Hotel/Motel Guest Rooms	12

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Dormitory – Living Quarters	12
Museum	
General Exhibition	11
Restoration	18
Bank/Office – Banking Activity Area	16
Religious Buildings	
Worship Pulpit, Choir	26
Fellowship Hall	10

Building-Specific Space Types	LPD, W/m ²
Retail	
Sales Area [for accent lighting, see Section 9.6.3(c)]	18
Mall Concourse	18
Sports Arena	
Ring Sports Area	29
Court Sports Area	25
Indoor Playing Field Area	15
Warehouse	
Fine Material Storage	15
Medium/Bulky Material Storage	10
Car park	5*
Transportation	
Airport – Concourse	6
Air/Train/Bus – Baggage Area	11
Terminal – Ticket Counter	16

*Values taken from MS in order to take into account the technology present in the market.

The lux level shall be measured with no interference of daylighting.

Carbon Calculator

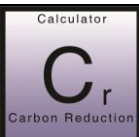
All energy calculation for these sub criteria contributes to:
Calculator ID: EP-CAL03 Verification Energy Performance

Submittals

1. As built drawing of lighting layout plan
2. Lighting schedules showing the numbers, locations and types of luminaries and power rate used
3. Calculation of the proposed lighting power rate and the percentage improvement
4. Technical product information of the lighting used
5. Report on the verification of lux level (measured on site)

References, Standards and Codes

1. MS 1525:2007 *Code of Practice for Energy Efficiency and Use of Renewable Energy*.
2. ASHRAE 90.1
3. Energy Efficiency Guidelines for CKE Design

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP15	Artificial Lighting - Verification	EP	15.2	Cr
	15.2 LED Lighting for 24 hour area and car park	1 Point		

Aims

The aim is to achieve increasing energy efficiency beyond the ref standard to reduce the CO₂ impact associated with high energy use.

Requirements

1 POINT:

Verify that LED lighting for 24 hours area (i.e. emergency and exit signage) and indoor car park area are installed.

Justification

Well-designed LED lighting fixtures can retain 70% of their initial output for 50,000 hours or more, depending on operating conditions and other factors. At 24 hours per day of continuous use, such fixtures can deliver useful light for six years or longer — many times as long as incandescent sources, and up to twice as long as long-life fluorescent sources.

Lumen maintenance describes how long a lighting fixture retains a certain percentage of its initial light output. White light sources used for general illumination are commonly considered to be at the end of their useful life when their light output falls below 70% of initial output. For white and coloured accent and non-task lighting, the lumen maintenance threshold is often considered to be 50%.

Approach & Strategy

Install LED bulb or light at the area where the artificial light are opened 24 hours such as emergency signage, exit signage and parking area.

Carbon Calculator

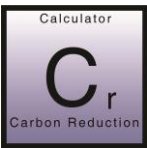
All energy calculation for this sub criterion contributes to:
 Calculator ID: EP-CAL03 Verification Energy Performance

Submittals

1. Specification of the LED lights.
2. As built drawing showing location of LED lights

References, Standard and Codes

1. MS 1525:2007 *Code of Practice for Energy Efficiency and Use of Renewable Energy*.
2. ASHRAE 90.1
3. Energy Efficiency Guidelines for CKE Design

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP16	Renewable Energy	EP	16	Cr
	1 point : Verify renewable energy of 0.5% from total building electrical consumption	4 Points		
	2 points : Verify renewable energy of 1% from total building electrical consumption			
	3 points : Verify renewable energy of 2 % from total building electrical consumption			
	4 points : Verify renewable energy of 3 % from total building electrical consumption			

Aims

To encourage building design that uses renewable energy and to decrease the effects of environment pollution and reduce the greenhouse gas emissions.

Requirements

Demonstrate compliance to the committed design specifications:

1 POINT:

Verify renewable energy of 0.5% from total building electrical consumption

2 POINTS:

Verify renewable energy of 1% from total building electrical consumption

3 POINTS:

Verify renewable energy of 2 % from total building electrical consumption

4 POINTS:

Verify renewable energy of 3 % from total building electrical consumption

Justification

Renewable energy has a host of social, environmental, and economic benefits. An energy source like solar power is a source of clean energy with no pollution impact. However to be sustainable and carbon reducing, an energy source must meet the following criteria:

- have minimal or no negative environmental or social impact
- not deplete natural resources
- meet the needs of people today and in the future in an accessible, equitable and efficient manner
- protect air, land and water
- have little or no net carbon or other greenhouse gas emissions
- Be safe today and not burden future generations with unnecessary risk

Approach & Strategy

These can include solar photovoltaic, micro/mini hydro sources , biogas and biomass sources ,wind and tidal wave energy systems -- all of which produce electrical energy. The system may be a grid connection system whereby the use of Feed-In-Tariff can be realized or a stand- alone systems which is highly relevant in

remote areas. Renewable energy may also produce energy in other forms such as heat for direct use without being transformed into other forms of energy (this include solar water heaters and co- generation systems)

Potential Issues to Arise

1. On site research and feasibility studies should be conducted before concept design. This includes ensuring no significant overshadowing occurs that can result in less optimum system performance.
2. The site and location of the installation at times may be not within the MYCREST project boundary. MYCREST allows this exception and unique conditions as long as the system designed is installed within a master plan boundary and owned and operated by the same owner ;
3. Feed-in-tariff incentives can be used to demonstrate the ROI (Return on investment) of such systems however when calculating the energy savings above the baseline, the savings must be based on kWh per year and not cost savings.
4. A system that is totally off-site (not within a project boundary or a master plan boundary) cannot be included in the savings calculations. However exceptions can be considered and subject to MYCREST review committee decision.

Carbon Calculator

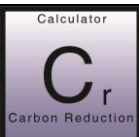
All energy calculation for these sub criteria contributes to:
Calculator ID: EP-CAL03 Verification Energy Performance

Submittals

1. Copies of As-built drawings and report of testing which meet the design requirements.
2. Determine the performance of the renewable energy generation systems by using trend logged-data of the energy generated.
3. Demonstrate the implementation and functionalities of the renewable energy generation systems and determine compliance with the committed design specifications.

References, Standard and Codes

1. MS 1525 *Code of Practice for Energy Efficiency and Use of Renewable Energy*.
2. *Specification for Grid Connected Photovoltaic (PV) System (CKE Specification)*
3. Renewable Energy Act 2010

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP17	Metered Electricity Usage During Construction	EP	17	CR
	Metered Electricity Usage During Construction	1 Point		

Aims

The aim is to record the electrical consumption used during construction stage.

CALCULATOR

EP-CAL02: ELECTRICITY USAGE
DURING CONSTRUCTION

Requirements

1 POINT:

Provide copy of monthly electrical bill during the entire construction period.

Justification

During construction period, carbon are being emit through the usage of electricity for site office, worker accommodation and some activities done during construction stage.

Approach & Strategy

Record and documented the electricity bills during the entire construction period.

Carbon Calculator

Refer: Calculator ID: EP-CAL02:
Electricity Usage during Construction

Submittals

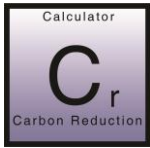
1. Copies of monthly electrical bill for the entire construction period
2. List of the area /activities (i.e. site office, worker amenities, canteen, etc.) that are included in electricity bills.

References, Standard and Codes

1. MS 1525 Code of Practice for Energy Efficiency and Use of Renewable Energy.
2. Energy Efficiency Guideline for CKE Design

MYCREST EP (Energy Performance) criteria scorecard

FOR AIR-CONDITIONED BUILDINGS
(Air-conditioned areas > 4000m²)

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP18	Air Penetration- Infiltration Test	EP	18	Cr
	1 point: Infiltration Test to ensure the air penetration rate does not exceed 0.5 ACH (air change per hour) or any equivalent expert requirement.	1 Point		

Aims

To prepare adequate measures to avoid unregulated air flow for air-conditioned areas.

Requirement

1 POINT:

Infiltration Test to ensure the air penetration rate does not exceed 0.5 ACH (air change per hour) or any equivalent expert requirement.

Justification

Air infiltration (also referred to as leakage) is the uncontrolled flow of fresh air through gaps and cracks in the building envelope. This is a type of ventilation. Ventilation is a natural process that moves fresh air into the building (usually from the outside) and removes stale air. Although ventilation is an important part of healthy living environment, uncontrolled air infiltration can alter the desired airflow patterns, and temperature and humidity conditions within a building. Uncontrolled air infiltration can cause reduced air quality and comfort and reduced efficiency of the building's ACMV system. Common locations of air infiltration include door and window frames, a poorly insulated attic, electrical outlets, chimneys duct and plumbing penetrations.

Approach & Strategy

During the Design Stage, an effective area planning is required to avoid unregulated air flow for air-conditioned areas.

Infiltration Test is a method to measure the building air infiltration density by measuring the air-conditioning condensation rate. The purpose of this test is to ensure that the infiltration rate does not exceed 0.5ACH or any equivalent expert requirement.

The ASTM E 783 - Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors is a testing standard that describes the procedures to determine the air leakage rates of the installed windows and doors.

This testing standard is most often specified to determine the air leakage of newly installed windows and doors. It is intended to measure the air leakage associated with the assembly, and not the leakage through the openings and adjacent

constructions. The testing can be adapted for use to correlate potential paths of leakage from within the installed openings. This is helpful to identify air infiltrations so they can be controlled or eliminated.

Carbon Calculator

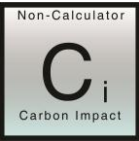
All energy calculation for these sub criteria contributes to:
Calculator ID: EP-CAL03 Verification Energy Performance

Submittals

1. As-built drawings
2. Test reports which verify air penetration rate not exceed 0.5 ACH

References, Standard and Codes

1. *MS 1525 Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Buildings.*
2. *Garis Panduan Pencegahan Kulat oleh JKR.*

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP19	Improved Commissioning	EP	19	Ci
	Begin the commissioning process early during the design process and execute additional activities after systems performance verification is completed	3 Points		

Aims

Begin the commissioning process early during the design process and execute additional activities after systems performance verification is completed.

Requirements

3 POINTS:

CxA shall be responsible for the following services in addition to the main commissioning items.

1. Prior to any fundamental commissioning activity, reviews at 50% and 90% CDs shall be conducted. The CxA shall provide a focused review of the design documentation (design intent, basis of design, and sequences of operation) for energy efficiency, proper functioning, and any recommendations for enhanced performance. The CxA shall review the specifications and drawings for the purpose of advising the owner and the design team on changes that may need to be made to promote successful commissioning.
2. The CxA reviews the Operation & Maintenance (O&M) documentation, project reports, and closeout documents for completeness.
3. The CxA reviews, pre-approves, and coordinates the training provided by the mechanical contractor and controls contractor and verifies that it was completed.
4. Post-Occupancy Check: Include a post-occupancy check-up as part of the commissioning proposal to verify how the building is actually operating between 8-10 months after construction. The CxA shall address a list of "events" or complaints compiled by the owner. This post-occupancy check-up will include verifying that the training requirements have been met and that a plan to resolve outstanding commissioning-related issues has been pursued.
5. The CxA shall develop a systems manual that contains the information necessary to fully re-commission the energy-related systems within the tenant space.

Justification

Commissioning is a process of verifying that building systems are performing in a way that meets your requirements. This can lead to a fully optimized building, using less energy and keeping occupants comfortable and productive. Commissioning is often thought of as a single-point in a construction project, carried out before handover. In reality, if your building is to be as efficient as possible, commissioning

will need to begin at the start of the project and include continuous monitoring and fine-tuning during operation.

Approach & Strategy

Commissioning (Cx) is a process of verifying that the building's systems operate as intended and according to the owner's requirements as set forth in the project documents. Commissioning helps fill the gap between the design team, whose members usually aren't meant to be responsible for checking minor construction details, and subcontractors, who may inadvertently err on key items like fan power settings or sensor locations.

Role and Function of the Commissioning Engineer in MYCREST Project

The commissioning or validating engineer agent (CxA) is generally contracted directly to the building owner as a third-party independent representative:

1. The CxA may be (but not preferred) a subcontractor (or employee) of the building owner, design engineer, test and balance contractor, or other trade contractor (i.e. HVAC / mechanical, electrical, Plumbing, fire protection, security, etc.) for specific trade testing. It is highly recommended by most all industry experts and standards that the CxA be an independent third-party consultant directly contracted by owner. It is also highly recommended that the CxA be contracted early in the project planning stages, included in design charrettes,
2. The CxA works closely with the owner's representative, building/facility operating engineer, architect, design engineer, general contractor, and all trade subcontractors.
3. The CxA typically is responsible for leading and managing the project commission process (design and/or construction) and works closely with the design, construction, and operation teams
4. CxA's ability to add value to a project is rooted in their ability to create positive working relationships with all parties involved and not pointing fingers when issues arise. It is important that the CxA clearly identifies the communication processes/streams, the project goals and expectations (from the OPR), and the team member responsibilities.
5. A CxA has to be able to give open constructive criticism while also being able to listen attentively.
6. The CxA's primary goal is to provide a completed and properly operating product to the building owner and occupant/user.
7. The CxA's work and performance of service is equally or primarily in the background performing design, submittal, O&M Manual reviews and development of testing and commissioning processes for the project, as well as documenting the commissioning efforts.
8. The CxA attends design and construction meetings, performs site construction observations, observes factory equipment testing, directs and observes functional performance testing of systems and equipment. The CxA typically

does not actually perform the hands-on testing, as these are actually performed by the manufacturer, vendor, or trade contractors, and directed and observed by the CxA utilizing testing procedures and expected performance outcome previously identified by the CxA during the commissioning document development process.

9. The CxA typically prepares a commissioning specification and commissioning plan during the project design phase. The design engineer also may develop the commissioning specification (and rarely the commissioning plan) in situations where the CxA has not been so contracted, or brought into the design team during the design process. The commissioning plan is a live document that outlines the commissioning processes and expectation based on the Owner's OPR, the design engineer's basis of design (BOD) and the project construction document (drawings and specifications). The commissioning plan is modified as the commissioning process progresses throughout the design, construction, and final acceptance of the facility. The functional performance test procedures are typically developed by the CxA with assistance of the trade contractors, vendors, and manufacturers based on the design engineer's contract documents.
10. These same parties and the design engineer, and owner's representative (typically the facility operating engineer) review the functional performance test procedures and expected outcomes prior to testing. The systems, equipment, items, processes, modes, and sequences of operations to be tested by the CxA (contractors or others) should be detailed and identified in the design engineer's construction documents (drawings and specifications), the construction request for proposal (RFP), the contractors bid submission, the commissioning specifications, the commissioning plan, and the contractors submittals.
11. Of high importance, often neglected by contractors, are the equipment/systems "installation and operations manuals" (IOM or IO&M) "specific to the project" (not generic). The IOM's along with complete, and very detailed, sequence of operations (SOO) and control drawings/documents submittal "specific to the project" (not generic) are of utmost importance to the CxA to perform the review and develop proper testing procedures. Timely delivery of these documents to the CxA is important to facilitate the CxA ample time to review, develop test, obtain reviews, and implement changes prior to scheduling of any testing.

Appointment of the Commissioning Engineer

1. The owner shall appoint directly an independent third-party "validation engineer" who will be responsible to verify the green features incorporated in the design and the finished installation as intended by the green consultant, design engineers and the design requirements (OPR) of the client.
2. The owner shall appoint the CxA at the beginning of the project after the design engineers and architects have been appointed.

3. The owner shall include the inclusion of the role of validation engineer in the main contract form so that all the parties involved in the project shall provide all data requested at various stages and shall comply with all the testing requirements of the validation engineer and all the parties shall give their full cooperation to ensure the green objectives are achieved.
4. The validation engineer shall prepare a validation plan based on the owner's project requirements (OPR) and the designed data produced by the design architects and design engineers (BOD) after the design is approved by the owner and the project construction documents. This validation plan shall be revised during the project management phase accommodating all the variations if any.
5. The validation engineer shall be invited to attend all project management meetings, design and construction meetings, factory test and site commissioning start-up tests. Manufacturers, design engineers, design architects, main contractors, sub-contractors, facility managers shall ensure that all tests criteria shall meet the requirements of the validation engineer
6. The validation engineer shall submit his report to MYCREST through the green consultant.
7. The validation engineer shall be a professional engineer registered with the Malaysian Board of Engineers or equivalent. He shall not be a party of the design team nor the main contractor nor the sub-contractor in the same project that he is validating.
8. Some features already included under the responsibility of design engineers are not repeated under the role of validation engineers to maintain the status quo of design engineers and design architects. It is not the intention of MYCREST to reduce the role of the design engineers and design architects. They shall remain as the principal party with the new validation engineer providing only a subsidiary role.

Qualifications of the Commissioning Engineer

Registered Professional Engineer must register with at least 5 years' experience in design, construction and commissioning. A professional engineer certified by the board of engineers is adequate to design mechanical systems and to sign the drawings. Therefore they should be adequate to understand testing parameters and validate the results carried out by the manufacturer's engineers.

OR

If less than 5 years, must be a member of an AFFILIATED COMMISSIONING COMPANY and must be registered with Suruhanjaya Syarikat-Syarikat Malaysia.

OR

Is currently registered as a NEBB (The National Environmental Balancing Bureau) Building Systems Commissioning Certified Firm or TABB (The Testing, Adjusting and Balancing Bureau) Commissioning Contractor who has certified at least 5 (five) buildings/industrial plants on M&E systems;

The company must have at least in their full-time employment, one professional Mechanical engineer and one professional Electrical/Electronic engineer registered with the BEM, each with at least 5 years testing & commissioning experience in Building Services. In lieu of the professional Electrical/Electronic engineer, to have a Competent Supervising Engineer or Competent Electrical Engineer registered with Suruhanjaya Tenaga, or at least two High Tension Charge men registered with Suruhanjaya Tenaga.

Approval of the applicant is based upon a comprehensive review using the specific evaluation criteria listed below:

1. Experience in successful commissioning of projects of various sizes and scope including specific activities such as
 - a. Design review and other pre-construction activities
 - b. Construction activities
 - c. Post construction warranty phase activities.
2. Extensive experience in the design / design review of HVAC systems and energy management control systems.
3. Experience in the field of operation and troubleshooting of HVAC, lighting, Renewable and energy management control systems.
4. Direct experience in monitoring and analysing system operation using energy management control system trending or stand-alone measuring and data logging equipment.
5. Knowledge in building operation and maintenance and O&M.
6. Knowledge in testing and balancing of both air and water systems. Familiarity with relevant codes /equivalent standard procedures and methods is required.
7. Verbal and written communication skills, highly organized and able to work with both management and trade contractors.
8. Experience in writing commissioning specifications.
9. Past experience of the key members of the team

The MyCREST council shall start a registry of the Commissioning Authorities after a thorough completion of the pre-qualification process. CIDB as an Authority reserves the right to approve or reject any application without assigning any reason and no claim of whatsoever nature in this regard shall be entertained.

Documentation to Be Submitted for registration of Commissioning Authorities

For New and Renewal pre-qualification applications, the documentary requirements are the following:

1. A valid trade license copy with office & Location map
2. CVs of locally available engineers/consultant
3. Copies of academic and professional qualifications / certifications
4. Project team / organization chart of the core team.
5. Quality Certification and/or Quality Manual copy where applicable
6. Approval from other relevant authorities if applicable

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7. Proven track record summary for major Green Building consultancy works undertaken. Identify certified projects.
8. Declaration regarding conflict of interest in the format provided.
9. Declaration regarding blacklisting / default / litigation with any local or international agency in the format provided.
10. Proof of payment of Pre-qualification Application Fee
12. Location map of office

Carbon Calculator

None

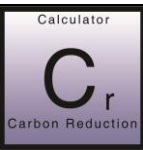
Submittals

1. Submittal listed under qualification of the Commissioning Engineer
2. Post commissioning report

References, Standards & Codes

1. International Performance Measurement & Verification Protocol (IPMVP)
2. Building Operation Optimization, Recommissioning Guide for Building Owners and Manager, 2008
3. International Performance Measurement & Verification Protocol, Concept and Options for Determining Energy and Water Savings, Volume 1, 2002

*Refer Appendix 6 for the main commissioning, improved commissioning and re-commissioning process flowchart.

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP 20	Building Energy Efficiency Performance - Verification	EP	20	Cr
	To demonstrate and calculate the energy savings and carbon reduction over its baseline model using energy modelling framework set out.	40 Points		

Aims

To assess and determine the performance of the energy efficient systems and demonstrate compliance with the committed design specifications.

CALCULATOR

EP-CAL03: VERIFICATION ENERGY PERFORMANCE

Requirements

Assess the building energy performance by comparing the baseline and the proposed figure, and to assess carbon emission from energy production through verification during commissioning.

Percentage Reduction from Baseline	Actual Point
9	4
12	6
15	8
18	10
21	12
24	14
27	16
30	18
33	20
36	22
39	24
42	26
45	28
48	30
51	32
54	34
57	36
60	38
63	40

Justification

The burning of fossil fuels is the single largest contributor to global climate change, as well as contributing to a host of toxic emissions that directly affected communities in the local and global context. Rising energy prices also impose a significant economic imperative that requires a careful examination of understanding how to best to significantly reduced energy demand. A building cannot be considered green if it is not energy efficient. The energy used by buildings is mostly generated by burning fossil fuels, which releases greenhouse gas emissions that contribute to climate change. No building should define itself as “green” unless it consumes less energy and generates fewer greenhouse gas emissions than average or conventional buildings.

Approach & Strategy

Verify 9% or more of energy savings improvement for new buildings in the proposed building performance rating compared to the baseline building performance rating by a whole building project verification

- Assess the building energy performance by comparing the baseline and proposed figure, and to assess carbon emission from energy production through simulation.
- Ensure that energy consumption in the building falls under specified range between 9% and 63% of energy savings.
- Install low-E glass and shading devices at east/west facade.
- Install efficient mechanical equipment.

Project teams must demonstrate that on completion, their predicted energy performance via Static Simulation (MyCREST 1, 2 or 3 star rating) or Dynamic Simulation (4 or 5 star rating has been calibrated and their proposed design achieve at least 6 percent savings above the baseline).

All the characteristics, requirements and parameters of the Baseline model are based on the basic characteristics derived from the MS Version 2007. The characteristics of the baseline model must follow MyCREST requirements and are as outlined in the ‘MyCREST BASELINE MODELLING GUIDE’ in Appendix 2 at the end of this guide. Among the parameters are:

A. Passive Design:

Baseline must achieve a minimum of OTTV = 50 W/m², RTTV = 25W/m² (with skylights and minimum U values for roof) as stated in MS1525.

The following of the characteristics are additional characteristics of the baseline model:

Windows

WWR = 50% and must be evenly distributed on ALL facades

B. Active Design:

Equipment

Active design shall follow the minimum requirement for OTTV, RTTV, lighting and ACMV components and equipments under item 5, 6, 7 and 8 as stated in MS 1525:2007. Details modelling guideline can be referred in the Appendix 2.

Baseline spaces by space Lighting Power Density (LPD) are as stated in EP15 Artificial Lighting.

ACMV Basis of Design must comply with ASHRAE 62.1 and ASHRAE 55.

The calculation of the project windows, skylight, glazing and wall are required to meet its respective baseline value.

Demonstrate improvement for new buildings in the proposed building performance rating compared to the baseline building performance rating by a whole building project simulation. During the Design Stage, the designer has to plan appropriately to reflect climate.

At the completion of the construction, energy consumption of the building must be audited or derived from the BMS or EMS records. Comparison must be made with the load apportioning the final prediction during the Design Stage

Calibration must be undertaken to adjust any discrepancy in occupancy schedules or occupancy density input.

Should the calibrated report and final design simulation report not match significantly (with an error of more than five percent), the project teams must propose measures to reduce energy consumption of the building until prediction matches with performance.

Carbon Calculator

Refer: Calculator ID: EP-CAL03: Verification
Energy Performance

The input for this calculator is:

1. Quantity and Load
2. Group Diversity Factor (DF)
3. Operational Hours

Submittals

For Construction Stage

The following information shall be provided to demonstrate compliance with the criteria strategy:

1. Final Energy performance report
2. EM/BMS output or overall energy audit report

For Commissioning & Verification Stage

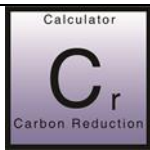
1. Confirm the projects meet the minimum requirements of MS and have achieved targeted energy savings during design stage.

References, Standard and Codes

1. MS1525:2007 - Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Building
2. ASHRAE 90.1

MYCREST EP (Energy Performance) criteria scorecard

FOR NON AIR-CONDITIONED BUILDING
(Non-air-conditioned areas minimum 80% of total
floor area excluding car parks and common area)

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP Req8	ENERGY VERIFICATION - ENERGY EFFICIENCY ASSESSMENT	EP	Req8	Cr
	Use of energy efficient equipment and submit the annual predicted performance (BEI) of energy systems in a non-air-conditioned building	Required		

Aims

To acknowledge the energy performance for non-air-conditioning building
 To achieve higher levels of building energy performance and to reduce annual energy consumption and environmental impacts associated with excessive energy use in the whole life of building.

Requirements

REQUIRED:

Use energy efficient equipment for air-conditioned space area in a non-air-conditioned building.

AND

Submit the annual energy consumption of energy systems in a non -air-conditioned building

Justification

This criterion assesses the predicted annual operating energy consumption of a non-air-conditioned building. Reducing use of non-renewable energy contributes one of the major benefits in the overall building environmental performance. In Malaysia, energy generation is primarily through the use of electricity; hence, it is essential to minimize building energy consumption in a holistic way. Meanwhile, a reduction of building energy consumption leads to a direct reduction of CO₂ emissions.

Approach & Strategy

1. Show that utilization of energy systems in a building is energy efficient equipment. The energy systems include air-conditioners, indoor lighting systems, water heaters, air-circulation devices
2. Quantify energy usage for all electrical, mechanical and thermal system. This includes energy usage for each system used in providing lighting, air-conditioning, ventilation, heating (water and air) and air-circulation to perform ventilation

Calculator

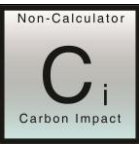
All energy calculation for this sub criterion contributes to:
 Calculator ID: EP/CAL03 Verification Energy Performance

Submittals

1. Energy Efficiency Index – Annual Energy Consumption data for the building

References, Standard and Codes

1. MS1525 - Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Building
2. ASHRAE 90.1

ENERGY PERFORMANCE IMPACTS		CONSTRUCTION		
EP21	Building Performance	EP	21	Ci
	Ventilation Simulation Methodology and Requirement	15 Points		

Aims

Enhance building design to achieve good ventilation for better indoor comfort.

Requirements

To score these criteria requires the use of ventilation simulation modelling and analysis to identify the most effective building design and layout. The simulation results and the recommendation derived are to be implemented to ensure good natural ventilation.

Justification

To demonstrate the building performance by using naturally ventilated design and complies with the committed design specifications.

Approach & Strategy

1. To perform ventilation simulation modelling and analysis based on the strategies and methodology specified during the design stage
2. To demonstrate and calculate building performance by using ventilation simulation modelling and analysis based on the most effective proposed building design and layout. The simulation results derived show the proposed building is implemented with good natural ventilation.

Carbon Calculator


None

Submittals

1. Ventilation Simulation modelling and Analysis
2. Demonstrate compliance with the committed design specifications making reference to the as-built drawings

References, Standards and Codes

1. Undang- Undang Kecil Seragam Bangunan 1984.

OCCUPANT & HEALTH		CONSTRUCTION		
OH4	Appointment of Safety, Health and Environmental Officer	OH	4	S
	Safety, Health and Environment Officer to develop and monitor construction site air pollution and dust control management plan & hygiene management plan and provide training on environment, health and hygiene on site	4 Points		

Aims

This criterion is assigned to encourage the establishment of the environmental quality and hygiene management strategy and to implement the strategy effectively.

Requirements

4 POINTS:

Appointment of Safety and Health Officer to:

Provision of personnel to manage Safety, Health and Environment whose tasks can be applied as below:

- a. To develop Construction Site Air and Water Pollution and Dust Control Management Plan **AND**
- b. To develop Safety and Health Management Plan **AND**
- c. To monitor and conduct regular inspection on the effectiveness of air pollution and dust control measures **AND**
- d. To monitor and conduct regular inspection on the effectiveness of water pollution control measures **AND**
- e. To monitor and conduct regular inspection on the site condition regularly to identify health and hygienic problem areas **AND**
- f. To provide training and information on air and water pollution control and health and hygiene issues to construction site.

Justification

Air and Water Quality

Reduce air and water quality problems resulting from the construction process in order to help sustain the comfort and well-being of construction workers and surrounding society.

Hygiene

Many construction sites are notorious for dirty toilets. This criteria aims to encourage the contractor to provide a better and more hygienic environment for site workers.

Approach & Strategy

Air and Water Quality

The dust generated by various construction site activities can contribute significantly to air pollution. Dust and outdoor air pollutants can cause respiration problems. Good construction practices involve major mitigation measures for prevention or minimization of air pollution from construction activities. This criteria aim to reduce air pollution due to on-site construction:

1. Establish of air pollutant management strategy and implement the strategy effectively.
2. Effective implementation of dust control measures in a construction site.
3. Construction works that leads to significant amount of dust generation shall be provided with proper sheltering to minimize dust spread
4. Any plan formulation or dust control measures shall be in line with the requirements as stipulated in the Air Pollution Control (Construction Dust) Local Regulation.

Hygiene

1. Contractor to formulate a hygiene management plan for the construction site. The management strategies can be in form of educational basis, instructions or guidelines for site staff and both long-term and short-term workers. In addition, the management plan shall include the identification of hygienic problems and their possible locations, methods to maintain the hygiene performance and an emergency action plan.
2. Contractors to designate a member of site staff to inspect the construction site regularly and to identify health and hygiene problem areas. A minimum inspection frequency of once a week is expected, for instance, stagnant water offers a breeding ground for mosquitoes, which may bite site workers and cause transmission of diseases. This aims to eliminate health risks, such as mosquito growth within the construction / demolition site. A designated person is required to inform the project site staff for the requirement of health risk remedial works, such as stagnant water removal.
3. To maintain and improve health and hygiene knowledge and technique to site staff through education and training that provided by the contractors. Good health and hygienic environment is best achieved by staff good habits and practice.
4. Large quantity of cleaning products is consumed during construction works. Some of the cleaning products are toxic and non-biodegradable, which will cause adverse impact to the environment. This is assigned to encourage the use of environmental-friendly cleaning materials and products.

Carbon Calculator

None

Submittals


1. Air and water pollution management strategy
2. Strategy implementation records including air and water quality testing report

References, Standard and Codes

1. Guidebook on Planning and Implementing Green Practices for Building Construction Works, published by Construction Industry Development Board, Malaysia (CIDB)



Figure 9: Poor Air Quality Due To Absence of Dust Control Measures

OCCUPANT & HEALTH			CONSTRUCTION		
OH5	Indoor Air Quality Pollutants		OH	5	S
	5.1 Low VOC Materials - for paints and coatings 5.2 Low VOC Materials - for adhesives and sealants	1 Point 1 Point	2 Points		

Aims

To reduce the quantity of indoor air contaminants that is odorous, irritating and harmful to human health.

Requirements

1 POINT:

Low VOC Materials for Paints and Coatings

1 POINT:

Low VOC Materials for adhesives and Sealants

Justification

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short and long-term adverse health effects like 'eye, nose, and throat' irritations, headaches, loss of coordination, nausea, and damage to liver, kidney, and the central nervous system. Specifying low VOC materials helps to reduce indoor air pollution at source, which is one of the effective indoor air pollution control strategies.

Approach & Strategy

Building materials such as paints, sealants, and adhesives form important finishes for the exterior and the interior surfaces. They are, however, potential contributors to poor indoor air quality and can have a bearing on an occupants' health. A wide variety of volatiles are released through oxidation by both solvent-based and water-based paints; sealants and adhesives contain toxic chemicals that are released during construction and occupancy. VOCs – especially formaldehyde, urea formaldehyde, and urethanes – and other chemical substances contained within the building materials can be injurious to health and can also be odorous. This measure aims to select materials with low to zero quantities of such chemicals in order to minimize the source of emission. In selecting low VOC materials, a practical thumb rule is to choose water-based products with low odour.

1. Use only zero/low VOC paints. All paints used in the interior of the building must be certified to contain zero-VOC or less than the limits specified as follows.

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Paint applications	VOC limits (g of VOC per litre)	
Interior coatings	Flat	<50
	Non-flat	<150
Exterior coatings	Flat	<200
	Non-flat	<100
Anti corrosive	Gloss/semi gloss/flat	<250

2. Ensure all sealants and adhesives used are water-based rather than solvent-based, or have low-solvent content. Most construction adhesives offer adequate bond strengths in water-based varieties. Acrylics, silicones, and siliconized acrylics are the safest sealants for use in the interiors and have the lowest solvent content. On the other hand, solvent-based products—like urethanes and butyls—should preferably not be used indoors. Sealants used for exterior do not pose any concern.

3. Adhesives usually have a high-VOC emission potential. Hence, use adhesives with low-VOC or no-VOC emissions such as acrylics or phenolic resins (phenol-formaldehydes indoors).

Carbon Calculator

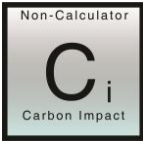
None

Submittals

1. Purchase orders/delivery orders of low-VOC paints and coatings, and/or adhesives and sealants to demonstrate compliance with the committed design specifications.
2. Extracts of the tender specification showing the requirements to use adhesive with low-VOC materials.
3. Cut sheets, specification sheets, and commercial brochures of the low-VOC emission finishes or products used.
4. A certificate from the manufacturer for each of the category as applicable to the applicant, clearly stating that the materials used have zero VOCs or low VOCs (gms/litre), as specified under limits.

References, Standard and Codes

1. South Coast Air Quality Management District (SCAQMD) Rule #1168 (Adhesives, Sealants and Sealant Primers), Green Seal Standard for Commercial Adhesives GS-36 (Aerosol Adhesives), Green Seal Standard GS-11 (Paints), Green Seal Standard GC-03 (Anti-Corrosive Paints), South Coast Air Quality Management District (SCAQMD) Rule 1113 (Architectural Coatings)
2. Code of Practice On Indoor Air Quality : Department of Occupational Safety and Health Ministry of Human Resources Malaysia 2010

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC Req2	Recycling Facility	EC	Req2	Ci
	<p>Provide facilities to reduce construction waste and avoid landfill disposal.</p> <p>For Construction stage, allocate areas for collection and storage of non-hazardous materials. Provide recycling facilities to site office during construction period.</p>			Required

Aims

To assist in the reduction of waste as a result of occupancy and to redirect a majority of the waste from landfills into the recycling facility.

Requirement

REQUIRED:

Implement accessible specified area(s) for the collection and storage of recycled waste for the entire building. Materials include at least: paper, glass, plastics and metals.

Justifications

Building constructions produce a lot of waste, which needs to be managed properly. By having a proper waste management, waste can be diverted from entering the landfills. Therefore, a construction site needs to be equipped with a proper collection and storage apparatuses.

Approach & Strategy

Allocate an area that is adequately sized for collection and storage; locate it at an accessible area.

Identify valid local waste contractors for timbers, metals, glasses, plastics, office papers, newspapers, and cardboards. Educate occupants on recycling measures.

Carbon Calculator

None

Submittals

1. Site Plan displays the location and size of the recycling collection area.

References, Standards and Codes

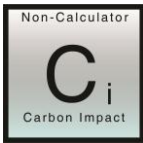
1. Akta Pengurusan Sisa Pepejal dan Pembersihan Awam 2007 (Akta 672)



Figure 10: Provide Segregation Bin Construction Waste



Figure 11: Recycle Bin at Site Office

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC Req3	Life Cycle Analysis	EC	Req3	Ci
	Provide calculation of embodied carbon on at least 3 construction component assembly materials from gate to site (excluding all structural elements listed in EC 13)	Required		

Aims

To evaluate the relevant energy and materials consumed, and environmental emissions associated with the gate to site life-cycle of selected building materials.

Requirements

To verify the relevant carbon emission released during the harvesting, extraction and manufacturing of materials, and the environmental emissions associated with the gate to site life-cycle of the selected building materials by:

Providing the calculation of embodied carbon on at least 3 construction components from assembly materials from gate to site, **excluding** the following:

1. Concrete
2. Steel bar / BRC
3. Formwork
4. Roof trusses
5. Roof covering
6. Brick
7. Glazing
8. Window frame
9. Steel structure

*Assembly materials consist of all parts of each building element. For Example: **Ceiling** finishes is composed of parts such as boards and tee joints. The total value of embodied carbon calculated for ceiling finishes is inclusive of every single one of these parts.

Justification

The evaluation of embodied carbon can define more environmentally production of materials. The goal of the LCA credit is to take the first step in an iterative process for developing a tool that allows for more holistic approaches and considerations for the major assemblies and structural materials in buildings. It is the start of a publicly available resource that uses a life-cycle approach to measure the impacts of building assemblies.

With further research and data, new strategies will emerge for better target reductions in the major environmental impact categories.

Approach & Strategy

Request carbon emission data from several manufacturers and compare which produces less emission impact.

Carbon Calculator

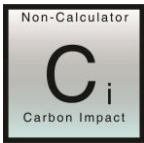
This sub criterion is intended for material database that will support the MYCREST LCA Calculator in future.

Submittals

1. Value of tCO₂e from gate to site of at least 3 assembly materials
2. Product brochure including manufacturer details

References, Standards and Codes

1. Guidelines for Social Life Cycle Assessment of Products, United Nations Environment Programme, 2009
2. "PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services". BSI. Retrieved on: 25 April 2013
3. ISO 14040 (2006): Environmental management – Life cycle assessment – Principles and framework, International Organisation for Standardisation (ISO), Geneva

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC8	Green Products	EC	8	Ci
	Green Products:	2 Points		
	1 POINT: Green Products Scoring System 40% - 49% 2 POINT: Green Products Scoring System 50% - 59%			

Aims

To encourage the usage of green products in the construction industry.

Requirements

1 POINT:

Achieve Green Products Scoring System (GPSS) of 40 – 49%

2 POINTS:

Achieve Green Products Scoring System (GPSS) of 50 – 59%

Justification

The application of the Green Product Scoring System (GPSS) is to encourage a project team to specify green products to be used in their projects. It is also to educate and create awareness among the stake-holders on the environmental-friendly product and services and to encourage manufacturers to apply for green certification for their products.

Approach & Strategy

Identify green products available in the market by considering the major product components listed in the Green Product Scoring System Manual (GPSS). The product shall have any of the following criteria:

- Durable product
- Environmental protection
- Renewable Energy
- Recycle content
- Local product
- Recyclable materials
- Improved water quality/efficiency
- Energy efficiency
- Improved indoor air quality (IAQ)

The GPSS calculation for building considers only the superstructure elements and M&E systems. Substructure components for the building and all temporary works shall be removed from the GPSS calculation. The GPSS calculation for road excludes electrical works, mechanical works and road furniture.

Scoring calculation method is based on point scale as specified in GPSS manual:

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SCORE	DESCRIPTION
0	The product used is not considered Green or do not have any form of certification
1	Product self-declared Green by the manufacturer with certification from independent body; e.g.: compliance to ISO 14000 OR *Type II: Self-declarations or claims made by manufacturer; Any certificate or accreditation from any green/eco-friendly organization from all over the world
2	*Type I: Based on multiple criteria and life-cycle considerations; e.g.: product or materials that have eco-label OR Certificate from any members of Global Eco-Label Network (GEN)

Carbon Calculator

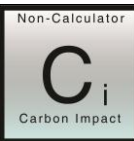
None

Submittals

1. Product Certification and brochure
2. Specification of the products use
3. Pictures of the installed materials

References, Standards & Codes

1. Green Product Scoring System Manual.
2. Global Eco-Label Network (GEN) <http://www.globalecolabelling.net/>

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC9	Industrialised Building System (IBS)	EC	9	Ci
	Construction with a CIDB IBS score > 50%	3 Points		
	Construction with a CIDB IBS score > 70%			

Aims

To reduce wastage of construction materials and reduce wastage going to landfill. It is possible to reduce materials carbon emission by reducing wastage without compromising building quality.

Requirements

2 POINTS:

Verify a minimum score of 50% for IBS is achieved.

3 POINTS:

Verify a minimum score of 70% for IBS is achieved.

Justification

The Industrialised Building System is known to be a construction technique where the materials used are precast or manufactured in a factory. Apart from improving construction productivity and quality, the IBS also reduces construction waste onsite and at the same time, reduces the transportation waste sent to landfill.

Approach & Strategy

The use of IBS component with a minimum score of 70% in a government project is to be made compulsory. Government project will automatically achieve 2 points under this sub criterion. The private sector is encouraged to use the IBS in their projects. Target which elements to be used for IBS in design stage. Six components commonly used in Malaysia are:

- Pre-cast Concrete Framing, Panel & Box System
- Steel Framing Systems
- Prefabricated Timber Framing Systems
- Steel Formwork Systems
- Block Work Systems

Carbon Calculator

None

Submittals

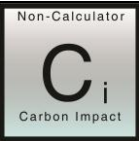
1. Verified IBS Calculation.
2. Brochure of the IBS product and picture of the element that use IBS.



Figure 12: Precast walls – waste minimization via industrialized building system (IBS)

References, Standards & Codes

1. CIS 3:2005 (National housing standard for medium-low cost houses besides flats),
2. CIS 4: 2005 (National housing standard for medium-low cost flats),
3. CIS 6: 2005 (Quality assurance for treatment of timber roof trusses with copper-chrome-arsenic preservatives),
4. IBS Catalogue Precast Concrete Component for Building Work 2004/2005,
5. IBS Catalogue Precast Concrete Building Component for Building Work 2004/2005,
6. IBS Catalogue Prefabricated Timber Component for Building Work 2004/2005,
7. IBS Sizing Guide Precast Concrete Component for Housing Building

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC10	Building Quality Assessment (QLASSIC)	EC	10	Ci
	3 Points: QLASSIC score of $\geq 70\%$	5 Points		
	4 Points: QLASSIC score of $\geq 80\%$			
	5 Points: QLASSIC score of $\geq 90\%$			

Aims

To ensure the quality of the building.

Requirements

3 Point: QLASSIC score of $\geq 70\%$

4 Points: QLASSIC score of $\geq 80\%$

5 Points: QLASSIC score of $\geq 90\%$

Justification

The adaptation of QLASSIC ensures the quality of the building workmanship is up to the standard.

Approach & Strategy

The quality assessment on the workmanship and finishes of the construction work is based on these standards and points are awarded if the workmanship and finishes comply with the standards. These points are then summed up to give a total quality score called the QLASSIC Score (%) for a project. The contractor has to ensure their workmanship follow the acceptable quality mention in QLASSIC guideline.

Carbon Calculator

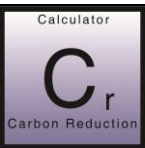
None

Submittals

1. QLASSIC certification

References, Standard and Codes

1. Construction Industry Standard (CIS 7:2006) on Quality Assessment System for Building Construction Work

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC11	Construction Waste Management	EC	11	Cr
	Produce and execute a construction waste management plan which recycles or salvages 50 - 75% of non-hazardous construction debris, and avoids landfill disposal.	2 Points		

Aims

To decrease and recycle construction waste materials and redirect to landfills.

CALCULATOR

WM-CAL01: CONSTRUCTION WASTE MANAGEMENT

Requirements

1 POINT:

Prepare Construction Waste Management Plan

1 POINT:

Recycle and/or salvage 50% volume of non-hazardous construction debris.

Justifications

Building construction produces lots of waste, which needs to be managed properly. By managing a proper waste management, waste can be diverted from entering the landfills. Through this sub-criterion, the aim is to recycle either 50% or 70% of non-hazardous construction waste.

Approach & Strategy

Develop a waste management plan and identify types of construction waste. Excavated soil is not included in the calculation.

Identify contractors to handle the recycled/salvaged construction waste and ensure documentation to verify that the materials diverted have been recycled/ salvaged.

Carbon Calculator

Refer: Calculator ID: WM-CAL01:
Construction Waste Management

The input for this calculator is:

1. Waste (Tonne)
2. tCO₂e/t Waste
3. Distance site to approved disposal destination (km)

Submittals

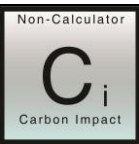
1. Construction Waste Management Plan which include the site plan.
2. Documentation of possible recycled/salvaged construction waste and the quantity.
3. Receipt of recycling activities verified by contractor.

References, Standards and Codes

1. Akta Pengurusan Sisa Pepejal dan Pembersihan Awam 2007 (Akta 672)



Figure 13: Concrete and Steel Bars from Demolition Works Are To Be Segregated For Recycling

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC12	Life Cycle Analysis	EC	12	Ci
	Provide calculation of embodied carbon for construction component assembly materials from cradle to gate (up to 5 materials)	5 Points		

Aims

To evaluate the relevant energy and materials consumed, and environmental emissions associated with the cradle to gate life-cycle of selected building materials.

Requirements

To verify the relevant carbon emission released during the harvested, extraction, manufactured of the materials, and environmental emissions associated with the cradle to gate life-cycle of the selected building materials by:

Providing a calculation of embodied carbon for construction component assembly materials from cradle to gate (up to 5 materials).

1POINT per material assembly.

*Assembly considered all part of each element

Example: Total value of embodied carbon for ceiling finishes including boards, tee joint

Justification

The evaluation of embodied carbon can define more environmentally production of materials. The goal of the LCA credit is to take the first step in an iterative process for developing a tool that allows for more holistic approaches and consideration for the major assemblies and structural materials in buildings. It is the start of a publicly available resource that uses a life-cycle approach to measure the impacts of building assemblies.

With further research and data, new strategies will emerge to better target reductions in the major environmental impact categories.

Approach & Strategy

Request carbon emission data from several manufacturers and compare which produces less emission impact.

Carbon Calculator

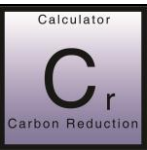
This sub criteria is intended for material database that will support MYCREST LCA Calculator in future

Submittals

1. Value of tCO₂e of 1 assembly
2. Product brochure including manufacturer details

References, Standards & Codes

1. Guidelines for Social Life Cycle Assessment of Products, United Nations Environment Programme, 2009
2. "PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services". BSI. Retrieved on: 25 April 2013.
3. ISO 14040 (2006): Environmental management – Life cycle assessment – Principles and framework, International Organisation for Standardisation (ISO), Genève

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC13	Life Cycle Analysis (LCA)- Structural Elements	EC	13	Cr
	To verify the relevant energy and materials consumed, and environmental emissions associated with the cradle to gate life cycle of selected building material is below the stated baseline.	4 Points		

Aims

To encourage construction team in selection of low carbon emission building materials.

CALCULATOR

EC-CAL02: CONSTRUCTION LCA

Requirements

To verify the relevant energy and materials consumed, and environmental emissions associated with the cradle to gate life-cycle of selected building material is below the stated baseline:

2 POINTS:

Reduction of 10% of the carbon emission from baseline

3 POINTS:

Reduction of 15 % of the carbon emission from the baseline level

4 POINTS:

Reduction of 20% of the carbon emission from baseline

Justification

Using low embodied carbon materials reduce the carbon emission release to environment.

Approach & Strategy

Design team to choose low carbon emission materials with the selection of materials that are made with less extraction process that require less energy usage.

Use materials that are made of recycled content, which are known to be less in carbon emission rather than using new raw materials-based.

Request carbon emission data from several manufacturers and compare which produce less emission impact.

Carbon Calculator

Refer: Calculator ID: EC-CAL02:
Construction LCA

The input for this calculator is:

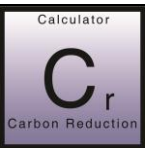
1. Type of materials
2. Quantity
3. tCO₂e of the materials.

Submittals

1. Calculation of reduction of tCO₂e
2. List of materials included in the calculation

References, Standards & Codes

1. Guidelines for Social Life Cycle Assessment of Products, United Nations Environment Programme, 2009
2. "PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services". BSI. Retrieved on: 25 April 2013
3. ISO 14040 (2006): Environmental management – Life cycle assessment – Principles and framework, International Organisation for Standardisation (ISO), Geneva

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC14	Construction Materials Transportations	EC	14	Cr
	To verify the carbon emission release during the transportation of material from factory to site.	5 Points		

Aims

To urge the use of permanent local construction materials in a project and selection of low carbon emission building materials. The use of permanent local construction materials will be able to reduce the environmental impact of transportation.

CALCULATOR

EC-CAL03: CONSTRUCTION
MATERIALS TRANSPORTATION

Requirements

To verify the carbon emission release during the transportation of material from factory to site:

3 POINTS:

Reduction of 20% of the carbon emission from baseline

4 POINTS:

Reduction of 30% of the carbon emission from baseline

5 POINTS:

Reduction of 40% of the carbon emission from baseline

Justification

Transportation is one of the main carbon emission sources. By selecting materials which are locally made and near to site can reduce carbon emission caused by transportation.

Approach & Strategy

Prioritize the choice of local materials by selecting locally sourced, salvaged and produced materials. Ensuring the construction materials used is locally-made and is easily accessed. The materials calculated in this credit are structural elements consisting of:

1. Concrete
2. Steel bar / BRC
3. Formwork
4. Roof trusses
5. Roof covering
6. Brick
7. Glazing
8. Window frame
9. Steel structure

The aim to use local construction material must be considered at the design stage and the use of local materials must be reflected in the tender stage.

The list of local materials can be referred at but not limited to:

- MITI (List of local manufacturers)
- Treasury listing under SIRIM QAS <http://www.malaysiancertified.com.my>
- List of local construction materials by IKRAM QA

Carbon Calculator

Refer: Calculator ID: EC-CAL03:
Construction Materials Transportation

The input for this calculator is:

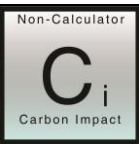
1. List of materials
2. Distance and number of trip
3. Type of fuel use

Submittals

1. Calculation of carbon emission release for material transport
2. Manufacturer details (address)

References, Standards & Codes

1. Guidelines for Company Reporting on Greenhouse Gas Emissions, Annex 1 Fuel conversion factors and Annex 6 Transport conversion tables, DEFRA 2002
2. The Construction Industry Mass Balance. Viridis 2002.

LOWERING THE EMBODIED CARBON		CONSTRUCTION		
EC15	Salvaged and Reused Materials	EC	15	Ci
	Use salvage or reuse construction materials of 2% from total material cost.	1 Point		

Aims

To reuse building materials and products to reduce the demand for virgin materials and reduce waste, thereby, lessening the impacts associated with extraction and processing of virgin resources.

Requirement

1 POINT:

The uses salvage or reuse construction materials for 2% of building materials based on total material cost.

Justification

Reusing the materials found on-site or off-site diverts materials from the construction waste stream; this reduces the need of landfill space and environmental impact from associated water and air contamination. It also helps to reduce the production of new materials.

Approach & Strategy

Reuse item can be found onsite or offsite. Identify opportunities to incorporate salvage materials into building design and research potential reused material suppliers. One example of reusing an item on-site is by reusing concrete as road base. The project team shall consider materials permanently installed in the project. Mechanical, electrical and plumbing assemblies are excluded from calculation.

Carbon Calculator

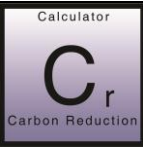
None

Submittals

1. List of propose salvage material.
2. Calculation of the value of reused materials against the estimated total value of the materials for the project.
3. Pictures of the installed reused material at site.

References, Standards & Codes

1. Material Reuse, 21 July 2014, <http://www.leeduser.com/credit/NC-v2.2/MRc3>

WATER EFFICIENCY FACTORS		CONSTRUCTION		
WE Req2	Efficient Water Use During Construction	WE	Req2	CR
	Minimize use of potable water during construction activity			Required

Aims

To minimize the use of potable water during construction activity

Requirements

REQUIRED:

Reduce 20% of potable water used during construction activity

Justification

The efficient usage of water can be encouraged by using rainwater harvesting or recycled storm water and efficient water fitting at the site. Saving water will reduce the cost of both the main water supply and waste water disposal (i.e. potable water and trade waste), as less water will enter and leave the site.

Rainwater harvesting activities must be accompanied by water meter to record the usage of water from RWH source.

Saving water can also provide opportunities for developing efficiencies in other areas. For example, using less water may mean that pumping water around the site is reduced, leading to savings in energy costs and greenhouse emissions. It can also reduce the risk of environmental contamination or pollution, as water efficiency initiatives will lead to less wastewater.

Approach & Strategy

Collect rainwater to replace the water usage of non-critical activity. Install effective water fitting at worker facilities including at toilets and canteens.

Carbon Calculator

All water calculation for these sub criteria contributes to:
 Calculator ID: WE-CAL02 Construction Water Efficiency Factors

The input for this calculator is:

Stage 1

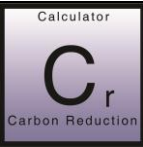
1. Daily Uses
2. Occupants

Submittals

1. Photograph showing the strategies apply.
2. Calculation of reduction of potable water usage.
3. Site diary to acquire the number of workers during the construction period

References, Standards and Codes

1. Guidelines For Voluntary Water Efficient Products Labelling Scheme (WEPLS)
Standard By Span

WATER EFFICIENCY FACTORS		CONSTRUCTION		
WE Req3	Reduce Potable Water By 20% Reduction - Verification	WE	Req3	CR
	Verification On The 20% Reduction On The Potable Water	Required		

Aims

To minimize the use of potable water during construction activity

Requirements

REQUIRED:

Verify to reduce 20% of potable water

Justification

The efficient usage of water can be encouraged by using rainwater harvesting or recycled storm water and efficient water fitting at the site. Saving water will reduce the cost of both the main water supply and waste water disposal (i.e. potable water and trade waste), as less water will enter and leave the site.

Rainwater harvesting activities must be accompanied by water meter to record the usage of water from RWH source.

Saving water can also provide opportunities for developing efficiencies in other areas. For example, using less water may mean that pumping water around the site is reduced, leading to savings in energy costs and greenhouse emissions. It can also reduce the risk of environmental contamination or pollution, as water efficiency initiatives will lead to less wastewater.

Approach & Strategy

Collect rainwater to replace the water usage of non-critical activity. Install effective water fitting at worker facilities including at toilets and canteens.

Carbon Calculator

All water calculation for these sub criteria contributes to:
 Calculator ID: WE-CAL03 Verification Water Efficiency Factors

The input for this calculator is:

Stage 1

3. Daily Uses
4. Occupants

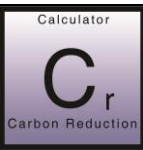
Submittals

1. Photograph showing the strategies apply.

2. Calculation of reduction of potable water usage.
3. Site diary to acquire the number of workers during the construction period

References, Standards and Codes

1. Guidelines For Voluntary Water Efficient Products Labelling Scheme (WEPLS)
Standard By Span

WATER EFFICIENCY FACTORS		CONSTRUCTION		
WE5	Water Conservation Strategies On Site	WE	5	Cr
	Use of Low-Flow Fixtures in Construction Site Office/Show Room	2 Points		

Aims

To reduce potable water use during construction Period.

Requirements

1 POINT:

Use of low-flow flushing system in construction site office/show room

1 POINT:

Use of efficient fitting tap in construction site office/show room

Justification

The efficient usage of water can be encouraged by using rainwater harvesting or recycled storm water and efficient water fitting at the site. Saving water will reduce the cost of both the main water supply and waste water disposal (i.e. potable water and trade waste), as less water will enter and leave the site.

Saving water can also provide opportunities for developing efficiencies in other areas. For example, using less water may mean that pumping water around the site is reduced, leading to savings in energy costs and greenhouse emissions. It can also reduce the risk of environmental contamination or pollution, as water efficiency initiatives will lead to less wastewater.

Approach & Strategy

Contractor is encouraged to attain exposure towards technological advancements in the market related to water efficiency products. They can install the low-flow water closet use of automatic/manual flow control faucet and control valve for urinal in site office. Install low-flow taps and shower fittings at toilets, canteens and workers' accommodations.

Baseline

Water efficient fitting is measured based on water flow rate. From the baseline given below, the team must calculate the reduction of their proposed water fitting from the baseline. Water efficient baseline is shown as below:

Flush Fixture	Flow rate (LPF)
Conventional Water Closet (Male)	6.00
Conventional Water Closet	6.00

MYCREST
Malaysian Carbon Reduction and Environmental Sustainability Tool

(Female)	
Conventional Urinal (Male)	2.50
Flow Fixture	Flow rate (LPM)
Conventional Lavatory	8.00
Kitchen Sink	8.33
Bidet	8.00
Ablution Tap	8.00
Shower	10.00

The carbon emission factor for processed water is 0.419 kg CO₂e/ m³

Proposed Design

The estimated water consumption based to the proposed to the proposed fitting and flow rate. The requirement for this criterion is that the calculation must show the efficiency of the water fitting during the construction stage.

Carbon Calculator

Refer: Calculator ID: WE-CAL02:
 Construction Water Efficiency Factors

The input for this calculator is:

Stage 1

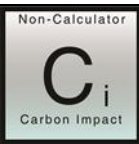
1. Daily Uses
2. Occupants

Submittals

1. Photograph showing the water fitting installed at toilet site.
2. Calculation of reduction of potable water usage

References, Standards and Codes

1. Guidelines For Voluntary Water Efficient Products Labelling Scheme (WEPLS)
 Standard By Span

WATER EFFICIENCY FACTORS		CONSTRUCTION		
WE6	Rainwater Harvesting System Within Construction	WE	6	Ci
	Reduction of potable water use	2 Points		

Aims

To reduce the potable water used for lorry cleaning and toilet site.

Requirements

2 POINTS:

50% reduction of potable water use for lorry cleaning and toilet.

Justification

Saving water will reduce the cost of both the main water supply and wastewater disposal (i.e. potable water and trade waste), as less water will enter and leave the site.

Saving water can also provide opportunities for developing efficiencies in other areas. For example, using less water may mean that pumping water around the site is reduced, leading to savings in energy costs and greenhouse emissions. It is also can reduce the risk of environmental contamination or pollution, as water efficiency initiatives will lead to less wastewater.

Approach & Strategy

Use of rainwater harvesting or recycle waste water

Carbon Calculator

None

The input for this calculator is:

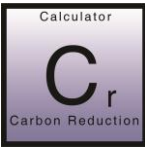
1. Daily Uses
2. Occupants

Submittals

1. Calculation showing the potable water reduction.
2. Strategies to achieve this sub criteria.
3. Details on the Rain water harvesting/ waste water recycling system

References, Standard and Codes

1. NAHRIM

WATER EFFICIENCY FACTORS		DESIGN		
WE7	Water Conservation Strategies - Verification	WE	7	Cr
	1.1 30% carbon emission reduction compare to WEPLS standard by SPAN) : 1 Point	2 Points		
	1.2 50% carbon emission reduction compare to WEPLS standard by SPA: 2 Points			

Aims

To use water efficiently

CALCULATOR

WE-CAL03: VERIFICATION WATER
EFFICIENCY FACTORS

Requirements

1 POINT:

Verify that 30% carbon emission reduction is achieve compare to WEPLS standard by SPAN

2 POINTS:

Verify that 50% carbon emission reduction is achieve compare to WEPLS standard by SPAN

Justification

To encourage and promote the usage of water efficiently by using a better type of water fittings system and flow rates.

Approach & Strategy

Designers are encouraged to attain exposure towards technological advancements in the market related to water efficiency products.

The proposed MyCREST rating system awards water efficiency performance points on the basis of predicted building water consumption of Proposed Building compared to a modelled Baseline Building.

Below are the list of percentage water saving and point award.

WE1 WATER CONSERVATION STRATEGIES	WE-CAL01
a. 30% carbon emission reduction compare to WEPLS standard by SPAN	
b. 50% carbon emission reduction compare to WEPLS standard by SPAN	

Baseline Building

The baseline is generated based on the minimum flow rate / water consumption for 1 Star rated in Guidelines for Voluntary Water Efficient Products Labelling Scheme (WEPLS) by SPAN. The building occupancy must be same as Proposed Building.



Below is the baseline water consumption:

Flush Fixture	Flow rate (LPF)
Conventional Water Closet (Male)	6.00
Conventional Water Closet (Female)	6.00
Conventional Urinal (Male)	2.50
Flow Fixture	Flow rate (LPM)
Conventional Lavatory	8.00
Kitchen Sink	8.33
Bidet	8.00
Ablution Tap	8.00
Shower	10.00

Proposed Building

The Proposed Building Water Consumption is generated using the actual design based on the type of fittings, flow rates and building occupancy.

Carbon Calculator

Refer: Calculator ID: WE-CAL03:
 Verification Water Efficiency Factors

The input for this calculator is:


1. Daily Uses
2. Occupants
3. Water fitting flow rate

Submittals

1. Water fitting specification with flow rate
2. Water Verification audit report.

References, Standards and Codes

1. Guidelines For Voluntary Water Efficient Products Labelling Scheme (WEPLS) Standard By Span
2. 2011 Guidelines to Defra/ DECC's GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors

SOCIAL AND CULTURAL SUSTAINABILITY		CONSTRUCTION		
SC5	SHASSIC / OSHA	SC	5	S
	1 point: SHASSIC Score 55% - 69% / OSHA act compliance	3 Points		
	2 points: SHASSIC Score 70% - 84%			
	3 points: SHASSIC Score 85% - 100%			

Aims

To improve the health and safety on site

Requirements

1 POINT:

SHASSIC Score 55% - 69%

Potential and significant workplace of high risks/ hazards are managed and documented but there are few medium risks work activities that are neglected
OR

Project is compliant with the OSHA Act.

2 POINTS:

SHASSIC Score 70% - 84%

Potential and significant workplace of high risks/ hazards are managed and documented but there are few low-risks activities that are neglected.

3 POINTS:

SHASSIC Score 85% - 100%

Potential and significant workplace of high risks/ hazards are managed and documented.

Justification

The SHASSIC was originally developed to complement the normal contractual requirements and specifications in a project. The rating system in the SHASSIC is meant to give a project the recognition for their efforts to ensure the safety and health at the work site. The SHASSIC is preferably conducted during construction in order to include the different workers and trades involved in the site. The SHASSIC is recommended when the actual physical work progress is between 25% and 75%.

Project developers should not use the SHASSIC independently as working requirements and specifications. Unless specified in the project contract, a safety and health designated person should not use the SHASSIC to decide if the project site or parts of the project site is in accordance to the requirements of the relevant Acts and Regulations or the OSH Management System. Project developers are still obligated to the local legislations requirements, approved standards, code of practices, guidelines, specifications and contractual requirements.

Approach & Strategy

Industrial accidents are among the major concerns during construction. They are resulted from reasons such as:

- workers' negligence
- failure of workers to obey work procedures
- working at high elevation
- operating equipment without safety devices
- poor site management
- harsh work operation
- low knowledge and skill level of workers
- failure to use personal protective equipment
- Poor workers attitude about safety

Hence, assessment using the SHASSIC system sets out the safety and health management and practices of the contractor for various aspects of the construction activities. The SHASSIC covers 3 (three) main components of assessments such as document check, workplace inspection and employees interview. It also covers components such as OSH policy, OSH organization, HIRARC, OSH training and promotion, machinery and equipment management, materials management, emergency preparedness, accident investigation and reporting and records management and performance monitoring.

Carbon Calculator

None

Submittals


1. SHASSIC certification

References, Standards and Codes

1. Safety and health Assessment System in Construction, CIS 10:2008, Construction Industry Development Board Malaysia (CIDB).



Figure 14: Provide Safety Signage at Scheduled Waste Storage Area and At Entrance of Project Site

SOCIAL AND CULTURAL SUSTAINABILITY		CONSTRUCTION		
SC6	Workforce Facilities	SC	6	S
	Minimum level of sanitation/safety facilities for construction workers	1 Point		

Aims

To ensure the health and safety of workers during construction, with effective provisions for the basic facilities such as sanitation and drinking water, and safety equipment or machinery.

Requirement

1 POINT:

To provide at least minimum level of sanitation/safety facilities for construction workers

Justification

Many local authorities and laws require employers to provide a safe working environment for their workers as long as it is reasonably practicable. This constitutes to the welfare and personal hygiene needs of the employees. This ensures that the workers are not exposed to risks as a result of the project construction, such as preventing the spread of germs and disease, preventing ill health from exposure to contamination and meeting the basic human needs of employees.

Approach & Strategy

1. Ensure cleanliness of workplace with regards to the disposal of waste and effluent. Provide clean drinking water and latrines and urinals as per applicable standard.
2. Provide adequate number of decentralized latrines and urinals to construction workers.

Plan which aims to achieve the following objectives:

- Appropriate lodging for construction workers at the site or at temporary rented lodging nearby.
- Avert pollution of storm sewer or receiving stream by having proper septic tank.
- Avert polluting the surrounding area from open burning and proper disposal of domestic waste.
- Supply adequate health and hygiene facilities for workers on site.

Carbon Calculator

None

Submittals


1. A signed letter by a competent authority (architect/contractor) to demonstrate compliance.
2. Proof in the form of relevant sections of tender document to show that the safety norms and procedures as committed to be complied with are included in the scope of work of the contractor.
3. Site photographs to demonstrate compliance by the contractor.
4. Detailed narrative on provision for safe drinking water and sanitation facility for construction workers and site personnel.

References, Standards and Codes

1. HSE, Provision of welfare facilities during construction work:
<http://www.hse.gov.uk/pubns/cis59.pdf>



Figure 15: Open burning of construction waste at site is prohibited

SOCIAL AND CULTURAL SUSTAINABILITY		CONSTRUCTION		
SC7	Construction IAQ Management	SC	7	S
	Construction IAQ Management	1 Point		

Aims

To reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants

Requirements

1 POINT:

Develop and implement an IAQ management plan for the construction and preoccupancy phases of the building as follows:

- During construction, meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).
- Protect stored on-site and installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2- 1999 (with errata but without addenda1). Replace all filtration media immediately prior to occupancy.

Justification

Indoor Air Quality (IAQ) Plan is to prevent indoor air quality problems resulting from the construction / renovation process in order to help sustain the comfort and well-being of construction workers during the construction process, and also to protect the building's occupants after construction is complete and people move into the building.

Approach & Strategy

Adopt an IAQ management plan to protect the heating, ventilating and air conditioning (HVAC) system during construction, control pollutant sources and interrupt contamination pathways. Sequence the installation of materials to avoid contamination of absorptive materials, such as insulation, carpeting, and ceiling tile and gypsum wallboard.

If possible, avoid using permanently installed air handlers for temporary heating/cooling during construction.

Carbon Calculator

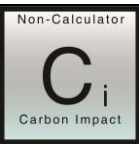
None

Submittals

1. IAQ management plan during construction
2. Report on the implementation of the IAQ plan on site including photographic evidence.

References, Standards & Codes

1. American Society of Heating Refrigerating, and Air Conditioning Engineers (ASHRAE). 1992. ASHRAE Standard 62: Ventilation for Acceptable Indoor Air Quality. Atlanta, GA.
2. ASTM Standard D-6245 – 98 Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
3. IAQ Diagnostics Reference Manual: Hands-On Assessment of Building Ventilation and Pollutant Transport. University of Tulsa, College of Engineering and Applied Sciences, Department of Chemical Engineering

DEMOLITION & DISPOSAL FACTORS		CONSTRUCTION		
DP4	Responsible Sourcing Of Materials	DP	4	Ci
	Provide at least 3 product agreement of any building component/assemblies that sourcing from manufacturer or supplier can collect or has a buyback programme within the life cycle or at the end of materials life for recycling or reuse purposes	1 Point		

Aims

To encourage supplier to collect back their end product wastes and reduce the waste sent to the landfill

Requirement

1 POINT:

Provide at least 3 product agreement of any building component/assemblies that source from a manufacturer or a supplier who can collect or has a buyback programme within the life-cycle or at the end of the materials' life for recycling or reuse purposes.

Justification

The business now becomes more sophisticated and everyone understands how important it is to save the earth. Manufacturers and suppliers are now willing to collect back old/used products for them to reprocess and at the same time, reduce virgin materials from being harvested.

Approach & Strategy

Research on the suppliers who offer the services of collecting back their products.

Carbon Calculator

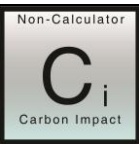
None

Submittals

1. List of the materials targeted to achieved this point and
2. A certificate from the supplier/manufacturer as proof that they will collect back the products supplied.

References, Standards Codes

1. BES 6001 Framework Standard for the Responsible Sourcing of Construction, Bre Global, Products David Gall & Nicki Ledger,
2. Responsible Sourcing Scheme for Concrete, National Ready Mixed Concrete Association
3. The BES 6001 Framework Standard for the Responsible Sourcing of Construction Products, Bre Global, Derek Hughes, 2011
4. The Seafish Guide to Responsible Sourcing, Seafish, 2011

DEMOLITION & DISPOSAL FACTORS		CONSTRUCTION		
DP5	Design For Dis-assembly	DP	5	Ci
	Provide more than 3% base on cost any building component/assemblies that can be disassembled for future reuse or recycling.	1 Point		

Aims

To reduce the waste to be sent to the landfill.

Requirement

1 POINT:

Provide more than 3% base on cost any building component/assemblies that can be disassembled for future reuse or recycling AND

Provide the building owner on the disassembly materials records and plan of major disassembly materials installed in the building.

Justification

During the design, the designer must look to introduce the building component/assemblies that can be easily dis-assembled for future use. This will open the path to increase products that can be recycled.

Approach & Strategy

Specify materials that are easily dissembled e.g. interlocking brick wall, precast block. Use of products that have an eco-label indicating that the products can be dis-assembled is one good approach.

The disassembly plan should include:

- An explanation of reusable, recyclable and durable component and materials selection
- A plan for major components repairs and replacement, potential conversions and end-of-life disassembly.

Carbon Calculator

None

Design Assessment Submittals

1. List of materials specification/manufacture data sheet
2. Product brochure
3. Calculation to prove the requirement is achieve

References, Standards & References

Other References Related

AVOIDING CARBON EMISSION- DEMOLITION & DISPOSAL FACTORS			CONSTRUCTION		
DP6	Demolition Waste Recycling	DP	6	Ci	
<div><div>Non-Calculator</div><div>Ci</div><div>Carbon Impact</div></div>	Produce and execute a construction waste management plan which recycles or salvages 50 - 75% of non-hazardous demolition debris, and reduce landfill disposal.	1 Point			

Aims

To decrease and recycle construction waste materials and redirect to landfills.

Requirement

1 POINT:

Recycle and/or salvage 50% volume of non-hazardous demolition waste

Justification

The contractor must have a good plan to manage the construction waste. Segregation of materials that can be recycled at a proper location and a bin is a must before sending to a recycler for reprocessing into a new product.

Approach & Strategy

Develop a waste management plan and identify types of construction waste. Excavated soil is not included in the calculation.

Identify contractors to handle the recycled/salvaged construction waste and ensure documentation to verify that the materials diverted have been recycled/salvaged.

Carbon Calculator

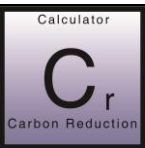
None

Submittals

1. Documentation of possible recycled/salvaged construction waste and the quantity
2. Receipt of recycling activities verified by contractor

References, Standards and Codes

Other related references

DEMOLITION & DISPOSAL FACTORS		CONSTRUCTION		
DP7	Existing Structural and Non-Structural Material Reused	DP	7	Cr
	Maintain Existing Walls, Floors and Roof	1 Point		

Aims

To encourage the use of present building structure materials

To decrease waste and to decrease carbon impact from manufacturing and transportation

Requirement

1 POINT:

Maintain $\geq 30\%$ of the existing area of any two of the following structures:

1. Wall
2. Floor
3. Roof structure and finishes

This point is eligible for ONE (1) exceptional score if the project succeeds to maintain $>50\%$ of the existing area of two of the above structures.

Justification

Existing walls, floor and roof can be maintained by having a good planning and method of demolish. This can reduce the waste as well as reduce the construction cost for new building.

Approach & Strategy

Identify possible existing structure features that can be reclaimed before construction.

Conserve the present building structure (structural floor and roof decking) and envelope (the exterior skin and framing, not including window assemblies and non-structural roofing material).

Potentially unsafe materials that are reused are not included from calculation of the percentage.

Example of a calculation of a project that successfully maintained $\geq 30\%$ of the existing wall and floor structures:

No.	Item	Original area size	Maintained area size
1.	Existing wall area	1,000m ²	350m ²
2.	Existing floor area	600m ²	180m ²
	TOTAL		530m ²

Carbon Calculator

None

Submittals

1. Calculation of shell and structure reuse
2. Calculation of the reused content value of each material must be provided.
3. Calculation of the value of reused materials against the estimated total value of the materials for the project.

References, Standards and Codes

1. Guidebook on Planning and Implementing Green Practices for Building Construction Works – CIDB Malaysia.

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN1	Sustainable & Low Carbon Initiatives	IN	1	S
	Certified MYCREST Qualified Professional	1 Point		

Aims

To aid and assist the design stage

To enhance the application and certification process.

Requirement

1 POINT:

A minimum of 1 key member of the project team will be a Certified MYCREST Qualified Professional

Approach and Strategy

Appoint a certified MYCREST Qualified Professional from the pre-design stage to guide the project team members about green building design and construction, especially with regards to the Sustainable and Carbon Initiatives, the authority or international guidelines and application process early in the early stages of the project.

Submittals

1. Proof of appointment of the named Certified MYCREST Qualified Professional.

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN2&3	Sustainable & Low Carbon Initiatives	IN	2&3	-
	1 Point awarded to each innovation applied up to a maximum of 6 points	Max 6 Points		

Aims

The significance of Sustainable & Low Carbon Initiatives is the recognition of additional or outstanding efforts taken by a project applicant who goes beyond the guidelines and requirements laid out by MYCREST. In addition to this are the creative and innovative initiatives undertaken that are not specified in MyCREST guidelines, which aims to contribute to the reduction of carbon emission.

Requirements

1 point awarded based on the innovation strategies, with a maximum of 6 points. All Sustainable & Low Carbon Initiatives are required to reduce carbon emission and/or contribute to sustainability, which **complies with at least one of following three mandatory criteria**:

1. Carbon Sequestration

Any effort to capture and store carbon through bio-sequestration, principally tree-planting, preservation, relocation etc.

2. Carbon Reduction under Scope 3 of GHG Emissions

Scope 3 emissions, or 'value chain emissions', are defined as all the indirect impacts upstream and downstream of an organization, which are not already defined by the GHG Scope 1 and 2. Normally, Scope 3 emission smoke up the majority source of greenhouse gas emissions.

The Scope 3 emissions comprise of regular business activities as common such as purchased goods and services, business travel and employee commuting, also including activities such as leased assets, upstream and downstream transport and distribution, the use and disposal of solid products and the impact of any investments.

Source: The Carbon Trust

3. Technological Advancements to Improve Building Performance

Implement technological advancements to heighten building performance in energy efficiency, water efficiency and embodied carbon reduction. Strategies include waterless technologies, electrochromic glass, high energy performance sliding doors and windows, intelligent variable speed pumps, custom vent design and other similar technologies.

Only **six (6) Sustainable & Low Carbon Initiatives are allowed in a single certification while one (1) point is allocated to Certified MyCREST Qualified Professional.** These initiatives are available, but not limited to, in the list below from MyCREST with priority given to carbon sequestration, Carbon Reduction (CR) and Carbon Impact (CI) Initiatives as a means to decrease the carbon emissions of the building.

Achieving the Exceptional Score

Under the Innovation category, Exceptional Score can be awarded for a maximum of 2 (TWO) points out of the maximum 6 points possible.

Exceptional scores are points achieved by any project which score ABOVE the maximum performance threshold in the MyCREST Scorecard.

Each threshold jump above the maximum performance in the MyCREST Scorecard is given 1 point, as shown in the table below.

Only a maximum of 2 (TWO) points can be achieved from the Exceptional Score list.

No.	Credit no.	Credit	Stage	Maximum Points	Exceptional Score (s)	Remarks
1	IS2.2	Carbon Sequestration - Restoration (New/Planting)	Design	5	1-2	<p>EXCEPTIONAL SCORE (1 POINT): Plant new vegetation on 40% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.</p> <p>EXCEPTIONAL SCORE (2 POINTS): Plant new vegetation on 45% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.</p>
2	IS9.3	Carbon Sequestration - Restoration (New/Planting)	Construction	5	1-2	<p>EXCEPTIONAL SCORE (1 POINT): Plant new vegetation on 40% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.</p> <p>EXCEPTIONAL SCORE (2 POINTS): Plant new vegetation on 45% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.</p>

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3	EP1	Building Envelope Performance - Thermal Performance	Design	5	3	EXCEPTIONAL SCORE (1 POINT): Reduction of 12 W/m2 in OTTV from the baseline
4	EP3.2	Admission of Day lit Zone and provision of automatic controls 3.2 Natural Lighting	Design	3	1	EXCEPTIONAL SCORE (1 POINT): Design that $\geq 40\%$ of all occupied building spaces have achieved daylight luminance with an average of 250 lux to 500lux as measured at the working plane, 800mm from floor level. Design $\geq 50\%$ of transitional spaces (enclosed or perimeter circulation spaces) to achieve daylight of 50-100lux.
5	EP14.2	Admission of Day lit Zone and provision of automatic controls 14.2 Natural Lighting	Construction	3	1	EXCEPTIONAL SCORE (1 POINT): Design that $\geq 40\%$ of all occupied building spaces have achieved daylight luminance with an average of 250 lux to 500lux as measured at the working plane, 800mm from floor level. Design $\geq 50\%$ of transitional spaces (enclosed or perimeter circulation spaces) to achieve daylight of 50-100lux.
6	EP4.1	Design Lighting Power Density (LPD)	Design	7	1	EXCEPTIONAL SCORE (1 POINT): $\geq 45\%$ improvement in Lighting Power Density (LPD) from baseline
7	EP15	Design Lighting Power Density (LPD)	Construction	7	1	EXCEPTIONAL SCORE (1 POINT): $\geq 45\%$ improvement in Lighting Power Density (LPD) from baseline
8	EP6	Renewable Energy	Design	4	1	EXCEPTIONAL SCORE (1 POINT): Provide renewable energy of 4% from total building electrical consumption
9	EP16	Renewable Energy	Construction	4	1	EXCEPTIONAL SCORE (1 POINT): Provide renewable energy of 4% from total building electrical consumption
10	EP11	Building Energy Efficiency Performance	Design	40	1	Percentage Reduction from Baseline: 66% = 1 point
11	EP19	Building Energy Efficiency Performance-Verification	Construction	40	1	Percentage Reduction from Baseline: 66% = 1 point
12	EC2.2	Sustainably Sourced Materials and Products 2.2 Local materials	Design	1	1	EXCEPTIONAL SCORE (1 POINT): Use at least 30% of the total construction material cost in a project on permanent local construction material. The

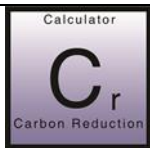
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						distance between the material manufacturing/processing site and the project site must not exceed 500km.
13	EC6	Life Cycle Analysis (LCA) - Structural Elements	Design	10	1	EXCEPTIONAL SCORE (1 POINT): Reduction of 30% and above of the carbon emission from baseline
14	EC14	Life Cycle Analysis (LCA) - Structural Elements	Construction	10	1	EXCEPTIONAL SCORE (1 POINT): Reduction of 30% and above of the carbon emission from baseline
15	EC11	Construction Waste Management	Construction	2	1	EXCEPTIONAL SCORE (1 POINT): Recycle and/or salvage 75% volume of non-hazardous construction debris.
16	WE1	Water Conservation Strategies	Design	2	1	EXCEPTIONAL SCORE (1 POINT): 70% carbon emission reduction compare to WEPLS standard by SPAN
17	WE5	Water Conservation Strategies	Construction	2	1	EXCEPTIONAL SCORE (1 POINT): 70% carbon emission reduction compare to WEPLS standard by SPAN

Justification

MYCREST Sustainable & Low Carbon Initiatives are evaluated for each project while keeping in mind that implementation of any single initiative does not automatically approve a similar initiative in other projects or in future developments.

MyCREST Sustainable & Low Carbon Initiatives allow developers to pursue their own innovative strategies provided the strategy is supported with proper documentation, which are: **detailed narrative proposing the strategy, detailed list of the requirements to fulfil the credit, detailed list of submittals to fulfil this credit and the possible design approaches to achieve this strategy.**

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN	Sustainable& Low Carbon Initiatives	IN	a	Cr
	a. Tree Relocation	1 Point		

Aims

Salvage native and adapted trees and plants preceding construction work and relocate the off site.

Requirement

1 POINT:

Proper relocation or transplanting of trees by authorised contractors off the site development.

Approach and Strategy

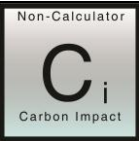
The point above differs from the point 'SE2a: Site Planning and Carbon Accounting on Site (For Greenfield or Graded Land)' as this points requires tree relocation or tree transplanting on an area outside of the project site.

Submittals

- Photographic records of current trees
- Narrative on tree mitigation plan detailing issues and proposals for relocation including inventory and location, as well as and community participation
- Arborist/botanist/horticulturalist analysis report
- Summation of process costs and results.

References

1. For further information, seek consultation from the Forest Research Institute Malaysia (FRIM)

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN	Sustainable& Low Carbon Initiatives	IN	b	Ci
	b. Energy efficient site accommodation	1 Point		

Aims

To improve energy efficiency in worker's accommodation on-site during construction.

Requirement

1 POINT:

Efficient implementation of the following specifications: insulation and glazing, efficient heating and lighting systems, motion sensors, metering of electricity, master switch to turn off all appliances (e.g. computers), occupant awareness and behaviour change.

Approach and Strategy

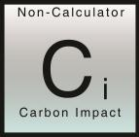
Temporary offices on construction sites are often poorly insulated and do not have the same building management controls as permanent buildings. Well-designed and managed cabins have been shown to achieve the same energy efficiency standards as permanent commercial buildings. These 'green' cabins can reduce carbon dioxide emissions by 50% or more compared to traditional accommodations. This action proposes both the use of new energy efficient site cabins and the retrofitting of existing cabin stock before cabins are deployed again on a project site. As a first step, the industry would agree on specifications for new and retrofitted cabins.

Submittals

Relevant documentation and verification of the implemented energy efficient strategies.

References

Other Related References

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN	Sustainable& Low Carbon Initiatives	IN	c	Ci
	c. Good practice energy management on site	1 Point		

Aims

To encourage better practices and behaviour among workers on energy consumption on site.

Requirement

1 POINT:

Implement strategies among workers to improve energy efficiency on site

Approach and Strategy

Good practice energy efficiency on a construction site includes:

- Controlling generators to meet only current electricity needs
- Avoiding unnecessary night time site and accommodation lighting
- Installing energy efficient security and task lighting such as fluorescent, LED and metal halide lamps
- Effective server management for computers
- Well insulated site accommodation
- Efficient use of plant
- Metering, data collection, communication and reporting

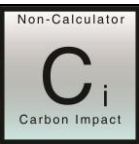
There is a need to develop a good practice toolkit that provides clients and contractors guidance on managing energy on site.

Submittals

Relevant documentation and verification of strategies taken to improve better practices and behaviour among workers.

References

Other Related References

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN	Sustainable& Low Carbon Initiatives	IN	d	Ci
	d. Alternative sustainable fuels	1 Point		

Aims

To divert from the increasing use of fossil fuels by using alternative fuels in generators and mobile plant.

Requirement

1 POINT:

Implement the use of alternative fuels in generators and mobile plant on-site

Approach and Strategy

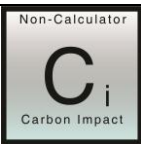
Generators and equipment are most commonly fuelled by diesel (red diesel, also known as gas oil). A number of contractors have tested gas-powered and biodiesel generators, which may be less carbon intensive, depending on how they are processed and the amount of power required. There is strong interest within the industry to share initial experiences in biodiesel in traditional generators or purpose-built biodiesel generators. This discussion is particularly relevant to smaller construction projects, which may run in their entirety on electricity from generators rather than connecting to the electricity national grid. This action focuses on establishing the means for contractors to share experiences and knowledge about using alternative fuels on site.

Submittals

Relevant documentation in accordance with the approach and strategy.

References

Other Related References

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN1	Sustainable& Low Carbon Initiatives	IN	e	Ci
	e. Low carbon potable construction site facilities	1 Point		

Aims

To encourage the usage of green materials on construction site facilities

Requirement

1 POINT:

Use modular site facilities i.e. site cabin, toilet, worker accommodation and canteen.

Approach and Strategy

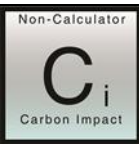
Use modular site facilities can reduce the construction waste at the end of the construction activities. It also reduces the usage of new resources as the contractor can reuse for other project.

Submittals

Relevant documentation in accordance with the approach and strategy.

References

Other Related References

SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN	Sustainable & Low Carbon Initiatives	IN	f	Ci
	f. Exceptional Score (CR points only)	Max 3 Points		

Aims

To encourage developers to pursue and achieve the above requirement of any credit stated in the MyCREST.

Requirements

1 POINT:

Achieve beyond performance for a maximum of TWO (2) credits in either the MyCREST New Construction or the Existing Building respectively.

Approach and Strategy

Exceptional Score are points that are awarded to projects which achieve the next threshold of a requirement in selected criteria. Exceptional scores given for any credit in the Design scorecard is applicable to the Construction and O&M scorecard as well. Only a maximum of 2 (TWO) Exceptional scores can be awarded under the Innovation Category and all Exceptional Scores are awarded to CR points only.

Table 1: List of Criteria Eligible for Exceptional Score

No.	Credit no.	Credit	Stage	Maximum Points	Exceptional Score(s)	Remarks
1	IS2.2	Carbon Sequestration - Restoration (New/Planting)	Design	5	1-2	<p>EXCEPTIONAL SCORE (1 POINT): Plant new vegetation on 40% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.</p> <p>EXCEPTIONAL SCORE (2 POINTS): Plant new vegetation on 45% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.</p>
2	IS9.3	Carbon Sequestration - Restoration (New/Planting)	Construction	5	1-2	<p>EXCEPTIONAL SCORE (1 POINT): Plant new vegetation on 40% of site area including building foot print, with at least 10% of the trees measuring more than 28cm</p>

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						in diameter when fully mature. EXCEPTIONAL SCORE (2 POINTS): Plant new vegetation on 45% of site area including building foot print, with at least 10% of the trees measuring more than 28cm in diameter when fully mature.
3	EP1	Building Envelope Performance - Thermal Performance	Design	5	3	EXCEPTIONAL SCORE (1 POINT): Reduction of 12 W/m2 in OTTV from the baseline
4	EP3.2	Admission of Daylight Zone and provision of automatic controls 3.2 Natural Lighting	Design	3	1	EXCEPTIONAL SCORE (1 POINT): Design that ≥ 40% of all occupied building spaces have achieved daylight luminance with an average of 250 lux to 500lux as measured at the working plane, 800mm from floor level. Design ≥ 50% of transitional spaces (enclosed or perimeter circulation spaces) to achieve daylight of 50-100lux.
5	EP14.2	Admission of Daylit Zone and provision of automatic controls 14.2 Natural Lighting	Construction	3	1	EXCEPTIONAL SCORE (1 POINT): Design that ≥ 40% of all occupied building spaces have achieved daylight luminance with an average of 250 lux to 500lux as measured at the working plane, 800mm from floor level. Design ≥ 50% of transitional spaces (enclosed or perimeter circulation spaces) to achieve daylight of 50-100lux.
6	EP4.1	Design Lighting Power Density (LPD)	Design	7	1	EXCEPTIONAL SCORE (1 POINT): ≥45% improvement in Lighting Power Density (LPD) from baseline
7	EP15	Design Lighting Power Density (LPD)	Construction	7	1	EXCEPTIONAL SCORE (1 POINT): ≥45% improvement in Lighting Power Density (LPD) from baseline
8	EP6	Renewable Energy	Design	4	1	EXCEPTIONAL SCORE (1 POINT): Provide renewable energy of 4% from total building electrical consumption
9	EP16	Renewable Energy	Construction	4	1	EXCEPTIONAL SCORE (1 POINT): Provide renewable energy of 4% from total building electrical consumption
10	EP11	Building Energy Efficiency Performance	Design	40	1	Percentage Reduction from Baseline: 66% = 1 point
11	EP19	Building Energy	Construction	40	1	Percentage Reduction from

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		Efficiency Performance- Verification	uction			Baseline: 66% = 1 point
12	EC2.2	Sustainably Sourced Materials and Products 2.3 Local materials	Design	1	1	EXCEPTIONAL SCORE (1 POINT): Use at least 30% of the total construction material cost in a project on permanent local construction material. The distance between the material manufacturing/processing site and the project site must not exceed 500km.
13	EC6	Life Cycle Analysis (LCA) - Structural Elements	Design	10	1	EXCEPTIONAL SCORE (1 POINT): Reduction of 30% and above of the carbon emission from baseline
14	EC14	Life Cycle Analysis (LCA) - Structural Elements	Constr uction	10	1	EXCEPTIONAL SCORE (1 POINT): Reduction of 30% and above of the carbon emission from baseline
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16	WE1	Water Conservation Strategies	Design	2	1	EXCEPTIONAL SCORE (1 POINT): 70% carbon emission reduction compare to WEPLS standard by SPAN
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SUSTAINABLE & CARBON INITIATIVES		CONSTRUCTION		
IN	Sustainable& Low Carbon Initiatives	IN	g	-
	g. Other strategies based on developers proposal	1 Point		

Aims

To provide teams the opportunity to achieve exceptional performance above the requirements set through their own creative, innovative and practical strategies.

Requirement

1 POINT:

One point is awarded for each innovation achieved with the submittal of the intent, proposed requirement, and document submittals, design approach of the proposed innovation credit and carbon calculation, as well as the fulfilment of the initiative.

Approach and Strategy

Achieve the credit through measurable environmental performance using a strategy not addressed in the MyCREST New Construction or Existing Building, including Elective Points or this Sustainable and Carbon Initiatives sub-criteria. The credit proposed by developers is recommended to be quantifiable credits, that is, equivalent to CR points as per the MyCREST Scorecard. A carbon calculation is expected if the credit is regarded 'Carbon Reduction'.

Submittals

1. Proof and documentation of the intent, proposed requirement, document submittals and design approach of the proposed credit and the carbon calculation.

References

Other Related References