Introduction of IBI & BEAM Plus Assessment in Hong Kong

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www.aiib.net
About the Institute

- AIIB is the first non-profit making organization in Asia committed to promoting public understanding and industry adoption of the principles and technologies of IBs.
- Branches have been set up in Singapore and soon in Kuala Lumpur

Owner and occupant needs

### Building Management:
- Maintenance management
- Property management
- Leasing management
- Technology management
- (information and communications)
- Energy and Efficiency Reports
- Trend analysis
- Structural Management and Maintenance
- Services Management

### Building Systems:
- Heating Ventilation and Air Conditioning
- Lighting
- Electric Power
- Telecommunication
- Information Management
- Wiring
- Controls
- Elevators
- Domestic Hot water
- Access Control
- Life Safety

### Building Services:
- Office Automation
- Voice, Data and Video Communication
- Shared Office Meeting and Computer
- Room Facilities
- Fax and Photocopying
- Moves, Adds and Changes for Customer
- Telephone and Computer equipment
- Electronic Mail and Voice Mail
- Security Management
- After hour operation
- Parking and Other Transportation
- Cleaning and Maintenance
- Building Directory
- Training
Asian Institute of Intelligent Buildings
Definition of Intelligent Buildings (since 2000)

- An Intelligent Building is designed and constructed based on an appropriate selection of Quality Environment Modules to meet the User’s Requirements by mapping with the appropriate building facilities to achieve a Long-Term Building Value.
- Intelligent buildings help to improve the occupants’ talents while the buildings themselves are not intelligent.


Ten Quality Environment Modules

- (M1) Green Index
- (M2) Space Index
- (M3) Comfort Index
- (M4) Working Efficiency Index
- (M5) Culture Index
- (M6) Technology Provision
- (M7) Safety and Structure Index
- (M8) Management Practice and Security Index
- (M9) Cost Effectiveness Index
- (M10) Health and Sanitation Index
Definition of IB by AIIB (cont’d)

• All ten modules form the first level, or the fundamental level, of the definition.

• In the second level, there are a number of facilities or key elements and more can be added from time to time.

• These are the facilities or features that the designer needs to consider when designing an intelligent building.

HKBEAM
(HK Building Environmental Assessment Method)

• HKBEAM is the initiative of The Real Estate Developers Association of Hong Kong, and the document was prepared by the Department of Building Services Engineering, Hong Kong Polytechnic University, with the assistance of the School of Architecture, University of Wales, Cardiff

• New Buildings (Version 4/04)
• Existing Buildings (Version 5/04)
• New Buildings in Chinese (Version 4/04)
• Existing Buildings in Chinese (Version 5/04)
BEAM Plus

- BEAM Plus Version 1.1 for New Buildings and Existing Buildings were launched on 1 April 2010
- They place more emphasis on the importance of the greenhouse gas emission reduction
- The latest version of BEAM assessment tools – BEAM Plus Version 1.2 for New Buildings and Existing Buildings were officially launched on 3 July 2012.
- This enhanced version addresses issues raised in the report ‘Roadmap for Green Building Labelling Systems in Hong Kong’ and the aspiration from stakeholders for passive design

Examples of BEAM+ for New Buildings V1.2

Again, one or two mandatory + either 0, 1, 2, ….up to 15 credit(s)
Examples of BEAM+ for New Buildings V1.2

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>SA</th>
<th>EU</th>
<th>IEQ</th>
<th>IA</th>
<th>(Quality)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum</td>
<td>75%</td>
<td>70%</td>
<td>70%</td>
<td>70%</td>
<td>3 credits</td>
<td>(Excellent)</td>
</tr>
<tr>
<td>Gold</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
<td>60%</td>
<td>2 credits</td>
<td>(Very Good)</td>
</tr>
<tr>
<td>Silver</td>
<td>55%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>1 credit</td>
<td>(Good)</td>
</tr>
<tr>
<td>Bronze</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>-</td>
<td>(Above Average)</td>
</tr>
</tbody>
</table>

IBI 1.0
2001

IBI 2.0
2001

IBI 3.0
2005

IBI 4.0
2010
A popular mathematical function of indifference mappings

The Cobb-Douglas Function:

\[ I(X, Y, a, b) = X^{\frac{a}{a+b}} Y^{\frac{b}{a+b}} \]

Definitions:
- \( X \) = score of variable \( X \);
- \( Y \) = score of variable \( Y \);
- \( a \) = relative weight of \( X \);
- \( b \) = relative weight of \( Y \); and
- \( I \) = the combined IBI index of \( X \) and \( Y \).

The Overall IBI

\[ I = \prod_{i=1}^{10} M_i \sum W_i \text{ where } \sum W = \sum_{i=1}^{10} W_i \]

Definitions:
- \( M_i \) = score of \( i \)th Quality Environment Module,
- \( W_i \) = Relative Weight of \( i \)th Module,
- \( I \) = the overall IBI combining \( M_1, \ldots, M_{10} \).

Similarly, for each individual Module, \( M_i \), with \( n \) elements:

\[ M_i = \frac{w_1}{w_1 + \cdots + w_n} \cdots \frac{w_n}{w_1 + \cdots + w_n} \]
Certificates awarded by AIIB

<table>
<thead>
<tr>
<th>IBI V4.0 Score</th>
<th>Scoring Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not allowed</td>
</tr>
<tr>
<td>5</td>
<td>Below statutory requirements</td>
</tr>
<tr>
<td>10</td>
<td>Worst conditions or designs</td>
</tr>
<tr>
<td>40</td>
<td>Fair to bad conditions or designs</td>
</tr>
<tr>
<td>50</td>
<td>Lack of recommended items</td>
</tr>
<tr>
<td>60 (Fair)</td>
<td>Just fulfill the latest statutory requirements</td>
</tr>
<tr>
<td>70 (Credit)</td>
<td>Provide good but not substantially enough provisions</td>
</tr>
<tr>
<td>90 (Distinction)</td>
<td>Excellent and substantial provisions</td>
</tr>
</tbody>
</table>

Authorized Auditors trained by AIIB, who can carry out IB assessment. Reports of these auditors are commented by AIIB and certificates are awarded accordingly by recommendation of Authorized Assessors.

Altogether 377 elements in 10 modules

Some Distinction Buildings Assessed Before
Green Index (IBI V4.0)

- Scientific Studies on various Green Designs
- Green building materials
- Existence of green features
- Thermal comfort: OTTV
- Ventilation and air conditioning: Cool air distribution
  
  [all air system (VAV), air-water system, all water system, other central system, split unit, window unit] to (90, 60, 50, 40, 10)  \( \text{Weight} = 5 \)

Many others around 80 items in total, including special feature recommended by the auditor

Space Index (IBI V4.0)

- Area per person
- Average width of corridor
- Average usable area in percentage of total GFA
- Flexibility for installing new false ceilings and floor utilities for a totally different user
  
  [excellent, good, fair, worst] to (90, 70, 40, 10) \( \text{Weight} = 9 \)

Many others around 18 items in total including bonus items specially recommended by auditor
Safety and Structure Index (IBI V4.0)

- Structural design for natural disasters prevention / mitigation
- Non-structural building components failure prevention / mitigation measures
- Precautionary plan and audit for terrorist attack
- Time for total egress

[10 minutes or less .. 30 minutes or more] to (90 .. 10) (Weight = 7)

Many others around 32 items in total including bonus points

Global Trend of IB Development

- Go Green
- Go Automatic
- Go Healthy
- Go Human
BEAM Plus Content

1. Background of BEAM Plus Assessment
2. Background of HK Soho Holiday Inn Express
3. Introduction of BEAM Plus with HK Soho Holiday Inn Express
   - Site Aspects (SA)
   - Material Aspects (MA)
   - Energy Aspects (EU)
   - Water Aspects (WU)
   - Indoor Environmental Aspects (IEQ)
   - Innovations and Additions (IA)

Background of BEAM Plus Assessment

**BEAM** - Building Environmental Assessment Method

- Voluntary, consensus-based, and market-driven
- Covering New Buildings & Existing Buildings
- BEAM scheme was established in 1996
- Latest version BEAM Plus Version 1.2 launched in November 2012
- Divide into 2 stages: Provisional Assessment (PA) & Final Assessment (FA)

BEAM Plus assessment scheme includes 6 aspects of a project:

- **5 Environmental Categories**
  - Site Aspects (SA)
  - Material Aspects (MA)
  - Energy Aspects (EU)
  - Water Aspects (WU)
  - Indoor Environmental Aspects (IEQ)

- **1 Additional category/Bonus point**
  - Innovations and Additions (IA)

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Overall</th>
<th>SA</th>
<th>EU</th>
<th>IEQ</th>
<th>IA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum</td>
<td>75%</td>
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<td>50%</td>
<td>50%</td>
<td>1 Credit</td>
</tr>
<tr>
<td>Bronze</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>--</td>
</tr>
<tr>
<td>Unclassified</td>
<td>Only prerequisite credits are considered</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Award Level Overall SA EU IEQ IA
**Background of HK Soho Holiday Inn Express**

**An Intelligent Green Hotel: HK Soho Holiday Inn Express**

<table>
<thead>
<tr>
<th>Location</th>
<th>At Hong Kong Island Jervois Street and Cleverly Street junction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Type</td>
<td>36 -Storey hotel building</td>
</tr>
<tr>
<td>Site Area</td>
<td>About 612.4 m²</td>
</tr>
<tr>
<td>Total Construction Area</td>
<td>approximately 9,162.9 m²</td>
</tr>
<tr>
<td>Function Areas</td>
<td>- shops, restaurants, function rooms, gym and rooftop garden</td>
</tr>
<tr>
<td></td>
<td>- 274 guestrooms, incl. 162 single bedrooms, 106 of twin rooms, 6 rooms for people with disabilities</td>
</tr>
<tr>
<td>Construction Period</td>
<td>Began in June 2009 and delivered in June 2012</td>
</tr>
<tr>
<td>Awards</td>
<td>Highest grade in LEED, HK BEAM+, Green Mark, IBI and 3-Star</td>
</tr>
<tr>
<td>Green Features</td>
<td>Innovative green and energy-saving facilities, incl.</td>
</tr>
<tr>
<td></td>
<td>- Use of high efficiency fan coil units</td>
</tr>
<tr>
<td></td>
<td>- Saving pattern recognition system</td>
</tr>
<tr>
<td></td>
<td>- Optimized for heavy lifts</td>
</tr>
<tr>
<td></td>
<td>- Additional bedside cold plate</td>
</tr>
</tbody>
</table>

### Site Aspects - Soho Assessment Results

<table>
<thead>
<tr>
<th>Credits</th>
<th>Credit Description</th>
<th>Credits Status in Soho</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA 1 P1 MINIMUM LANDSCAPE AREA</td>
<td>Provision of at least 20% of the site area</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>SA 1 Contaminated Land</td>
<td>Conducting a site contamination assessment and implementing measures for rehabilitation</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 2 (a) CAR PARK PROVISION</td>
<td>Parking capacity must be set to exceed minimum requirement from government</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 2 (b) PUBLIC TRANSPORT</td>
<td>No car parking is provided other than for use by disabled persons and/or shuttle service vehicles</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 3 (a) BASIC SERVICES</td>
<td>At least 10 different basic services located within 500m from the Site</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 3 (b) RECREATIONAL FACILITIES</td>
<td>At least 2 different recreation facilities located within 500m from the Site</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 3 (c) Provided (a) &amp; (b)</td>
<td>At least 1 different recreational facilities/5 different basic services located within the Site and available for public use</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 4 SITE DESIGN APPRAISAL</td>
<td>At least 50% of relevant sub-items of the Urban Design Guidelines are achieved</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 5 ECOLOGICAL IMPACT</td>
<td>Less than 30% &amp; 20% of score in Habitat Section &amp; Biodiversity Section of Nature Outlook correspondingly</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>SA 6 CULTURAL HERITAGE</td>
<td>Development does not have a negative impact on sites of cultural heritage</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>SA 7 (a) HARD LANDSCAPING</td>
<td>Using pervious materials for a minimum of 50% of hard landscaped areas</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 7 (b) SOFT LANDSCAPING</td>
<td>Provision of appropriate planting on site equivalent to at least 30% or 40% of the site area</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 8 (a) WIND AMPLIFICATION</td>
<td>Conducting AVA demonstrating no pedestrian areas subject to excessive wind velocities due to building design</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>SA 8 (b) ELEVATED TEMPERATURE</td>
<td>Provision of shade on at least 50% of non-roof impervious surfaces using light coloured high-albedo materials</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 8 (c) AIR VENTILATION ASSESSMENT</td>
<td>Conducting AVA demonstrating the best building design option adopted in comparing with different options</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 9 NEIGHBOURHOOD DAYLIGHT ACCESS</td>
<td>Designs for the access to daylight of neighbouring sensitive buildings maintained to the prescribed level</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>SA 10 ENVIRONMENTAL MANAGEMENT PLAN</td>
<td>Environmental Management Plan including that Environmental Monitoring and Auditing has been implemented</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 11 AIR POLLUTION DURING CONSTRUCTION</td>
<td>Undertaking adequate measures to reduce air pollution during construction</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 12 NOISE DURING CONSTRUCTION</td>
<td>Undertaking adequate measures to reduce noise pollution during construction</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 13 WATER POLLUTION DURING CONSTRUCTION</td>
<td>Undertaking adequate measures to reduce water pollution during construction</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 14 NOISE FROM BUILDING EQUIPMENT</td>
<td>Noise at facade of potential noise sensitive receivers in compliance with the prescribed level</td>
<td>Achieved</td>
</tr>
<tr>
<td>SA 15 LIGHT POLLUTION</td>
<td>Obstructive light from exterior lighting in compliance with the prescribed level</td>
<td>Not Achieved</td>
</tr>
</tbody>
</table>
Examples of Achieved Credits in SA Section

SA P1 Minimum Landscape Area/ SA 7 Soft landscaping
- Provision of at least 40% of the site area
Total area of landscaping area is 291m² (47.5% of site area) comprising of:
  - Horizontal Greening: 165m² (26.9% of site area)
  - Vertical Greening: 126m² (20.6% of site area)

SA 3 (b) Public Transport
- Public transport within 500m walking distance

Macau Ferry Pier
Tram Station
MTR Station
Bus Terminus
Bus Station

Examples of Achieved Credits in SA Section

SA 3 (a) Basic Services & (b) Recreational facilities
- At least 10 basic services/2 different recreational facilities located within 500m from the Site

Basic Services within 800km of the Site
- Restaurants
- Medical Facilities
- Bank
- Convenience Store
- School
- Retail Shop
- Library
- Place of worship
- Supermarket
- Community Centre

Recreational Facilities within 800km of the Site
- Parks with Sitting Facilities
- Public Swimming
- Public Indoor Sports Hall

SA 8 (a) Wind Amplification
- AVA assessment showing wind velocity < 4m/s

Direction | Wind Velocity (m/s) |
--- | --- |
NNE | 0.802 |
NE | 0.783 |
ENE | 0.886 |
E | 0.778 |
ESE | 0.626 |
SE | 0.577 |
SSW | 0.561 |
SW | 0.531 |
< 4m/s |
<table>
<thead>
<tr>
<th>Credits</th>
<th>Credit Description</th>
<th>Credits Status in Soho</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 1 TIMBER USED FOR TEMPORARY WORKS</td>
<td>Virgin forest products are not used for temporary works during construction.</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>MA 2 USE OF NON-CFC BASED REFRIGERANTS</td>
<td>Using no chlorofluorocarbon (CFC)-based refrigerants in HVAC&amp;R systems</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>MA 3 CONSTRUCTION WASTE MANAGEMENT PLAN</td>
<td>Implementation of proper waste management system of construction / demolition materials during construction</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>MA 4 WASTE RECYCLING FACILITIES</td>
<td>Provision of facilities for the collection, sorting, storage and disposal of waste and recovered materials.</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>MA 5 BUILDING REUSE</td>
<td>Reuse of 30%/60% of existing sub-structure or shell</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 6 MODULAR AND STANDARDISED DESIGN</td>
<td>Demonstrating the application of modular and standardized design</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 7 PREFABRICATION</td>
<td>Manufacture of 20%/40% of listed prefabricated building elements has been off-site</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 8 SPATIAL ADAPTABILITY</td>
<td>Spatial flexibility design for different uses and expansion to permit additional spatial requirements</td>
<td>Achieved</td>
</tr>
<tr>
<td>MA 9 FLEXIBLE ENGINEERING SERVICES</td>
<td>Flexible design of services that can adapt to changes of layout and use.</td>
<td>Achieved</td>
</tr>
<tr>
<td>MA 10 STRUCTURAL ADAPTABILITY</td>
<td>Structural flexibility design for change in future use with interior planning modules.</td>
<td>Achieved</td>
</tr>
<tr>
<td>MA 11 RAPIDLY RENEWABLE MATERIALS</td>
<td>At least 2.5%/5% of all building materials/ products used in the project is rapidly renewable materials.</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 12 SUSTAINABLE FOREST PRODUCTS</td>
<td>At least 50% of all timber and composite timber products are from sustainable source/ recycled timber</td>
<td>Achieved</td>
</tr>
<tr>
<td>MA 13 OUTSIDE SURFACE WORKS AND STRUCTURES BUILDING STRUCTURE</td>
<td>At least 10% of all materials used in site exterior surfacing work, structures and features are recycled materials</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 14 INTERIOR BUILDING COMPONENTS</td>
<td>At least 10% of all building materials used for nonstructural components are recycled materials</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 15 REFRIGERANTS</td>
<td>Using refrigerants with low ozone depletion and global warming potentials</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 16 OZONE DEPLETING MATERIALS</td>
<td>Using building fabric and services without ozone depleting substances in their manufacture, composition or use</td>
<td>Achieved</td>
</tr>
<tr>
<td>MA 17 REGIONAL MANUFACTURED MATERIALS</td>
<td>At least 10%/20% of all building materials extracted/ harvested/ manufactured locally within 800km</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 18 DEMOLITION WASTE REDUCTION</td>
<td>At least 30%/60% of demolition waste is recycled.</td>
<td>Not Achieved</td>
</tr>
<tr>
<td>MA 19 CONSTRUCTION WASTE REDUCTION</td>
<td>At least 30%/60% of construction waste is recycled.</td>
<td>Not Achieved</td>
</tr>
</tbody>
</table>

### Examples of Achieved Credits in MA Section

**MA P1 Timbers used for temporary**
- Virgin forest products not used for temporary works
- At least 50% of all timber are from sustainable source timber

**MA 6 Sustainable forest timber**

**MA P4 Waste Recycling Facilities**
- Provision of waste recycling facilities

Facilities or recycling bins are provided for collection and storage.
# Energy Aspects - Soho Assessment Results

<table>
<thead>
<tr>
<th>Code</th>
<th>Credit Description</th>
<th>Credits Status in Soho</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU 1</td>
<td>Annual Energy Use</td>
<td>1-15 Credits for reduction of CO2 emissions or annual energy consumption by 4% - 20%</td>
</tr>
<tr>
<td>EU 2</td>
<td>Peak Electricity Demand Reduction</td>
<td>1-1 Credits for reduction in maximum electricity demand by 8% - 15%</td>
</tr>
<tr>
<td>EU 3</td>
<td>Embedded Energy in Building Structural Elements</td>
<td>Studying embodied energy in the major elements of the building structure through a Life Cycle Assessment (LCA)</td>
</tr>
<tr>
<td>EU 4</td>
<td>Ventilation System in Carpark</td>
<td>Ventilation systems at carpark consume less electricity than the baseline requirement by at least 20% /25%</td>
</tr>
<tr>
<td>EU 5</td>
<td>Lighting System in Carpark</td>
<td>Lighting systems at carpark consume less electricity than the baseline requirement by at least 20% /25%</td>
</tr>
<tr>
<td>EU 6</td>
<td>Renewable Energy Systems</td>
<td>1-5 Credits for 0.5% - 2.5% of building energy consumption from renewable energy source respectively</td>
</tr>
<tr>
<td>EU 7</td>
<td>Air-Conditioning Units</td>
<td>Complied with the installation positions for internal &amp; external spaces and items listed in the assessment check-lists</td>
</tr>
<tr>
<td>EU 8</td>
<td>Clothes Drying Facilities</td>
<td>Provision of clothes drying facilities utilizing the natural environment at residential units</td>
</tr>
<tr>
<td>EU 9</td>
<td>Energy Efficient Appliances</td>
<td>At least 60% / 80% of total rated power of appliances and equipment are certified energy efficient appliances</td>
</tr>
<tr>
<td>EU 10</td>
<td>Commissioning Specifications</td>
<td>Provision of contract documents detailing the commissioning requirements for all systems for energy use &amp; IEQ</td>
</tr>
<tr>
<td>EU 11</td>
<td>Operation &amp; Maintenance Manual</td>
<td>Provision of a fully documented operations and maintenance manual</td>
</tr>
<tr>
<td>EU 12</td>
<td>Metering and Monitoring</td>
<td>Installation of metering allowing separate monitoring of electricity use of main systems and landlord in common areas</td>
</tr>
<tr>
<td>EU 13</td>
<td>Energy Efficiency Building Layout</td>
<td>Consideration of energy efficiency building layouts, e.g. built form/building orientation; Horizontal/ vertical external shading device</td>
</tr>
</tbody>
</table>

### Examples of Achieved Credits in EU Section

#### EU 1 Annual Energy Use
- 1-15 Credits for reduction of CO2 emissions or annual energy consumption by 4% - 20%

In Soho Project: **15 credits** achieved with **70.74%** CO2 reduction predicted due to the below enhancements:

- **Enhancement in Building Envelope Design**
  - Low U value (0.459W/m²K)
  - Application of low-e glass
  - Better Thermal Insulation
  - Green Wall
  - No West Facing Facade

- **Enhancement in HVAC System**
  - Project’s Chiller Plant Efficiency = 0.66kW/RT
  - Use of high CoP (5.48) variable speed primary pump for water cooled chiller
  - Heat Pump and Optimization for HVAC system were included in the calculation
Examples of Achieved Credits in EU Section

EU 1 Annual Energy Use
- 1-15 Credits for reduction of CO₂ emissions or annual energy consumption by 4% - 20%
  In Soho Project: **15 credits** achieved with **70.74%** CO₂ reduction predicted due to the below enhancement:

**Enhancement in Lighting System**
- Use of LED Lighting (Architectural Application)
- Use of T5 tubes with electronic ballast
- Distributive Intelligent Lighting System
- **38.54%** improvement in lighting power consumption calculation

**Use of Renewable Energy**
Energy Saving for Renewable Energy: **23,830.33 kWh**

Water Aspects - Soho Assessment Results

<table>
<thead>
<tr>
<th>Credits</th>
<th>Credit Description</th>
<th>Credits Status in Soho</th>
</tr>
</thead>
<tbody>
<tr>
<td>WU P1 WATER QUALITY SURVEY</td>
<td>The quality of potable water meets the drinking water quality standards at all points of use</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>WU P2 MINIMUM WATER SAVING PERFORMANCE</td>
<td>Use of water efficient devices leads to annual saving of 10%</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>WU 1 ANNUAL WATER USE</td>
<td>1-3 Credits for use of water efficient devices leads to annual saving of 10% 20%/25%/30% respectively</td>
<td>Achieved</td>
</tr>
<tr>
<td>WU 2 MONITORING AND CONTROL</td>
<td>Installations of devices to monitor water leakage within the fresh water distribution system</td>
<td>Achieved</td>
</tr>
<tr>
<td>WU 3 WATER EFFICIENT IRRIGATION</td>
<td>Use of irrigation system not required the use of municipal fresh water after completion of establishment</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>WU 4 WATER HARVESTED RAINWATER RECYCLING</td>
<td>Use of harvesting of rainwater lead to a reduction of at least 5% in the consumption of fresh water.</td>
<td>Achieved</td>
</tr>
<tr>
<td>WU 5 WATER EFFICIENT APPLIANCES</td>
<td>Installing water efficiency appliances with water efficiency labelling scheme grade 2 or above</td>
<td>Achieved</td>
</tr>
<tr>
<td>WU 6 EFFLUENT DISCHARGE TO FOUL SEWERS</td>
<td>Use of water efficient devices leads to a reduction in annual sewage volumes by 20% or more</td>
<td>Achieved</td>
</tr>
</tbody>
</table>

### Examples of Achieved Credits in WU Section

#### WU P2 Minimum Water Saving Performance
- Use of water efficient devices for annual saving to 30%

**Water saving of 47.8% due to**

- Dual flush water closets
- Single lever basin mixer
- Sensor urinals
- 3 Function urinal Shower Set with regulator

#### WU 4 Water Recycling - Harvested Rainwater
- Use of harvesting of rainwater to reduce 5% fresh water consumption

**5.7% fresh water saving due to use of non-potable water (rainwater) for landscape irrigation**

- 3 nos. of rainwater recycle storage tanks are installed to collect the water and condensed water from fan coil units for reuse
- Neutralization process will be adopted after collecting recycled water

### Indoor Environmental Quantity - Soho Assessment

<table>
<thead>
<tr>
<th>Credits</th>
<th>Credit Description</th>
<th>Credits Status in Soho</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEQ 1</td>
<td>Minimum Ventilation Performance</td>
<td>Compliance with minimum requirements of ASHRAE 62.1-2007 in Outdoor Air Quality &amp; Minimum Ventilation Rate</td>
</tr>
<tr>
<td>IEQ 2</td>
<td>Security</td>
<td>Applicable security measures and facilities for the building as listed in template</td>
</tr>
<tr>
<td>IEQ 3</td>
<td>Plumbing and Drainage</td>
<td>Designs to reduce the potential for transmission of harmful bacteria viruses &amp; odours at plumbing and drainage system</td>
</tr>
<tr>
<td>IEQ 4</td>
<td>Waste Disposal Facilities</td>
<td>Provision of a hygienic refuse collection system</td>
</tr>
<tr>
<td>IEQ 5</td>
<td>Construction Iaq Management</td>
<td>Implementation of Construction Iaq Management Plan and provision of building &quot;flush out&quot; &quot;bake out&quot; and replacement of all filters prior to occupancy</td>
</tr>
<tr>
<td>IEQ 6</td>
<td>Outdoor Sources of Air Pollution</td>
<td>Compliance with the appropriate criteria for CO, NO2, and Respirable Suspended Particles</td>
</tr>
<tr>
<td>IEQ 7</td>
<td>Indoor Sources of Air Pollution</td>
<td>Compliance with the appropriate criteria for VOCs, formaldehyde and radon</td>
</tr>
<tr>
<td>IEQ 8</td>
<td>IAQ in Car Parks</td>
<td>Compliance with the design requirements specified in ProPECc PH 2/96 regarding IAQ at carpark</td>
</tr>
<tr>
<td>IEQ 9</td>
<td>Increased Ventilation</td>
<td>Demonstrate an outdoor ventilation rate that exceeds ASHRAE 62.1-2007 requirements by at least 30%</td>
</tr>
<tr>
<td>IEQ 10</td>
<td>Background Ventilation</td>
<td>Demonstrate that adequacy of ventilation can be achieved by natural means</td>
</tr>
<tr>
<td>IEQ 11</td>
<td>Localised Ventilation</td>
<td>Provision of an adequate ventilation system for rooms/areas where significant Indoor pollution sources are generated and provision of a general exhaust system for future tenants</td>
</tr>
<tr>
<td>IEQ 12</td>
<td>Ventilation in Common Areas</td>
<td>Demonstrate that all enclosed common areas in a building are provided with adequate ventilation</td>
</tr>
<tr>
<td>IEQ 13</td>
<td>Thermal Comfort in Air-conditioned Premises</td>
<td>Sustaining the air temperature at the design value within ±1°C under conditions of zero occupancy and the room air diffusers satisfy the Air Diffusion Performance Index</td>
</tr>
<tr>
<td>IEQ 14</td>
<td>Thermal Comfort in Naturally Ventilated Premises</td>
<td>Demonstrate indoor operative temperatures in occupied rooms meet the 80% acceptability limits and sustaining the air temperature at the design value within ±1.5°C under normal occupied periods</td>
</tr>
<tr>
<td>IEQ 15</td>
<td>Natural Lighting</td>
<td>At least 80% of floor area in all normally occupied spaces with an average daylight factor of 3% and provision of suitable daylight glare control and maintaining the average daylight factor of 2%</td>
</tr>
<tr>
<td>IEQ 16</td>
<td>Interior Lighting in Normally Occupied Areas</td>
<td>Achieve the prescribed lighting performance in each type of premises in respect of illuminance and lighting quality</td>
</tr>
<tr>
<td>IEQ 17</td>
<td>Interior Lighting in Areas Not Normally Occupied</td>
<td>Achieve the prescribed lighting performance in each type of common space in respect of illuminance and lighting quality</td>
</tr>
<tr>
<td>IEQ 18</td>
<td>Room Acoustics</td>
<td>Noise levels and the mid-frequency reverberation time in applicable rooms meets the prescribed criteria</td>
</tr>
<tr>
<td>IEQ 19</td>
<td>Noise Isolation</td>
<td>Airborne noise isolation between rooms, spaces and premises meets the prescribed criteria</td>
</tr>
<tr>
<td>IEQ 20</td>
<td>Background Noise</td>
<td>Background noise levels are within the prescribed criteria</td>
</tr>
<tr>
<td>IEQ 21</td>
<td>Indoor Vibration</td>
<td>Vibration levels shall not exceed the prescribed criteria given in ISO 2631-2</td>
</tr>
<tr>
<td>IEQ 22</td>
<td>Access for Persons with Disability</td>
<td>Provision of at least 3 enhanced provisions for access for disabled persons</td>
</tr>
<tr>
<td>IEQ 23</td>
<td>Amenity Features</td>
<td>Provision of at least 3 enhanced amenity features for building users and building operation and maintenance</td>
</tr>
</tbody>
</table>
Examples of Achieved Credits in IEQ Section

IEQ 5 Construction IAQ Management
- Provision of replacement of all filters prior to occupancy
  - Minimum Efficiency Rating Value (MERV) 13 filter is provided for AHU.
  - Ensure better indoor air quality.

IEQ 22 Access for Persons with disability
- At least 3 enhanced provisions for access for disabled persons

IEQ 12 Ventilation in Common Area
- Provision of adequate ventilation at common areas
  - Provide natural ventilation for:
    - Staircase (1.5)
  - Provide mechanical ventilation for:
    - Toilet (0.5)
    - Corridors (0.5)
    - Lift lobbies (0.5)

IEQ 16 INTERIOR LIGHTING IN NORMALLY OCCUPIED AREAS
- Not Applicable

IA 1 INNOVATIVE TECHNIQUES
- IFCU
  - Lift Counter Weight Optimization
  - Chilled Headboard
  - Integrated Solar Hot Water Cladding
  - Achieved

IA 2 PERFORMANCE ENHANCEMENTS
- SA 1 CONTAMINATED LAND
  - Achieved
- SA 4 SITE DESIGN APPRAISAL
  - Achieved
- SA 5 ECOLOGICAL IMPACT
  - Not Achieved
- MA 1 BUILDING REUSE
  - Not Achieved
- EU 3 EMBODIED ENERGY IN BUILDING STRUCTURAL ELEMENTS
  - Not Achieved
- EU 10e INDEPENDENT COMMISSIONING AUTHORITY
  - Not Achieved
- WU 4c A COMBINATION OF RAINWATER AND GREYWATER
  - Not Achieved
- IEQ 12b USE OF NATURAL VENTILATION
  - Not Achieved
- IEQ 16 INTERIOR LIGHTING IN NORMALLY OCCUPIED AREAS
  - Not Applicable
- IEQ 19 NOISE ISOLATION
  - Not Achieved

IA 3 BEAM PROFESSIONAL
- Involvement of BEAM Professional in the project
  - Achieved

Examples of Achieved Credits in IA Section

Innovative Design (1) - iFCU

Energy Saving Smart Intelligent Fan Coil Unit

Energy Saving Solution by replacing high efficiency permanent magnet motor and control driver, thus saving as much as 80% power consumption at low speed.

Energy Saving : 149,432.94 kWh / Year

Advantages
- 100% speed controllable
- iFCU™ Thermostat equipped with “AUTO” mode, moderating fan speed is performed by real-time room temperature feedback
- Low operating temperature - Motor heat dissipation is lowered by 95% at low speed.

<table>
<thead>
<tr>
<th>Speed</th>
<th>iFCU™ motor (°C)</th>
<th>AC motor (°C)</th>
<th>Diff. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1.2</td>
<td>2.9</td>
<td>95%</td>
</tr>
<tr>
<td>Middle</td>
<td>2.3</td>
<td>18.1</td>
<td>87%</td>
</tr>
<tr>
<td>High</td>
<td>4.9</td>
<td>11.6</td>
<td>58%</td>
</tr>
</tbody>
</table>

Operating temperature rise of motor

Innovative Design (2) - Lift Counter Weight Optimization

Lift Counter Weight Optimization
- By setting the optimal lift counter weight, energy can be saved
- Energy Saving : 15,930kWh / Year

Innovative Design (3) - Chilled Headboard

Chilled Headboard

Principle:
- Tenant will stay in bed during sleeping hour
- Energy to cool down the spaces apart from the bed will be wasted
- Headboard cooler installed above the headboard to generate cool air

Advantages:
- Electricity for air-conditioning can be reduced significantly compared with traditional air-conditioner
- Further enhance the cooling effect at bed area
- Reduce A/C energy during bed time

Innovative Design (4) - Solar Hot Water Cladding

Enhancement in Energy and towards Zero Carbon

Integrated Solar Hot Water Cladding (Innovation)

An integrated method with curtain wall cladding to obtain renewable energy from solar heat

Principle
- Water tubing installed at the back and connected to a water re-circulating system
- Water flow through the tubing heated up and the heat will transfer to town water through the heat exchanger
- Only energy input for the system will be the pumping energy of water re-circulation