

SBS5397 Final Year Project 1 (BSE Conceptual Design)

Feasibility study of BEAM Plus

Feasibility study of BEAM Plus in early design stage consists 6 major steps as follows:

1. Select appropriate assessment scheme
2. Maximum credit applicable to the project
3. Check with the prerequisites and outline the design criteria for the project
4. Evaluate against BEAM Plus what the highest rating is achievable by current design and identify the limitations
5. Gap analysis on the current situation and the target rating
6. Review all potential solutions if the target rating cannot be achieved. Evaluate them against design and cost consideration.

Select appropriate assessment scheme

BEAM Plus provides four major schemes for assessing different types of building. In this construction project, you need to select the most appropriate scheme according to your design brief.

These four assessment tools are shown as followings:

- BEAM Plus New Buildings
- BEAM Plus Existing Buildings (Comprehensive Scheme or Selective Scheme)
- BEAM Plus Interiors
- BEAM Plus Neighbourhood

Softcopy of the tool can be found in <https://www.hkgbc.org.hk/eng/BEAMPlus.aspx>

Maximum credit applicable to the project.

Every assessment scheme is designed to cover most significant aspects for different types of projects. Not all credits are suitable to all project. For some credits, BEAM plus provided “exclusions” to indicate the circumstance for the project exempted from the credit.

2	SITE ASPECTS	2.P	PREREQUISITE
		SA P1	MINIMUM LANDSCAPING AREA
	EXCLUSIONS	Buildings or sites not for residential use; or residential sites less than or equal to 1,000 m ² .	
	OBJECTIVE	Encourage building development to preserve or expand urban greenery to enhance the quality of living environment, reduce surface runoff to drainage system and minimise impacts on fresh water and ground water systems during building use.	
	REQUIREMENT	It is required to demonstrate compliance with appropriate planting on site equivalent to at least 20% of the site area.	

Check with the prerequisites and outline the design criteria for the project

As pre-requisite must able to achieve if a project is prepared to submit for the assessment. Designers needs to review how to achieve the pre-requisite before conducting the feasibility study. "Assessment" outlines the requirement in this pre-requisite.

3	MATERIALS ASPECTS	3.P	PREREQUISITE
		MA P2	USE OF NON-CFC BASED REFRIGERANTS
	EXCLUSIONS		None.
	OBJECTIVE		Reduce the release of chlorofluorocarbon into the atmosphere.
	REQUIREMENT		Using non-chlorofluorocarbon (CFC)-based refrigerants in HVAC&R systems.
	ASSESSMENT		The Client shall submit a report by a suitably qualified person giving details of the HVAC&R system installed and demonstrating that no chlorofluorocarbon (CFC)-based refrigerants are being used in the HVAC&R systems.
	BACKGROUND		<p>Chlorofluorocarbons (CFCs) are the major contributory substances of serious ozone depletion. The reaction between a CFC and an ozone molecule in the earth's stratosphere contributes to catalytic destruction of ozone. Due to ozone depletion, increased UV exposure leads to increases in skin cancer (e.g. Malignant Melanoma and Cortical Cataracts), damage to plants, and reduction of plankton population in the ocean's photic zone.</p> <p>In 1985, the Antarctic ozone hole was discovered, causing worldwide concern. In 1987, representatives from 43 nations signed the Montreal Protocol to limit CFC usage. At Montreal, the participants agreed to freeze production and phase-out use of CFCs. Since the adoption and strengthening of the Montreal Protocol, the usage and emissions of CFCs has reduced.</p> <p>The U.S. Environmental Protection Agency (U.S.EPA) has developed and implemented regulations for management of ozone depletion substances (ODSs) in the United States. The regulations include programs that ended the production of ODSs and require the manufacturers to label products either containing or made with chemicals that have significant ODSs.</p> <p>In Hong Kong, the Ozone Layer Protection Ordinance (Cap. 403) 1989 [1] gives effect to Hong Kong's international obligations to control the manufacture, import and export of ozone depleting substances. Ozone Layer Protection (Controlled Refrigerants) Regulation 1994 [2] requires the conservation of controlled refrigerants used in large scale installations and motor vehicles. Ozone Layer Protection (Products Containing Scheduled Substances) (Import Banning) Regulation 1993 prohibits the import of portable fire extinguishers containing halons and other controlled products from a country or place which is not a party to the Montreal Protocol, unless the Authority considers that it complies with the requirements of the Protocol.</p> <p>Banning the usage of CFCs in refrigerants slows the ozone depletion and global climate change. Non-CFC building equipment has standard specification. New non-CFC HVAC&R equipment is cost and energy effective. Selecting non-CFC HVAC&R equipment may increase energy saving and equipment efficiencies.</p>

Designers should response to the assessment criteria and provide instruction to different parties to follow.

3.1 Material Aspects Pre-requisite 2 (MA P2)

- **Pre-requisite Intent (Use of Non-CFC Based Refrigerants)**
Reduce the release of chlorofluorocarbon into the atmosphere.
- **Pre-requisite Requirement**
Using no chlorofluorocarbon (CFC)-based refrigerants in HVAC&R systems. Submit a report by a suitably qualified person giving details of the HVAC&R system installed and demonstrating no CFC-based refrigerants used in HVAC&R systems.
- **Feasibility Status**
MEP Consultant committed that this pre-requisite requirement (MA P2) is achievable. No equipment with CFC-based refrigerants shall be adopted. Prerequisite shall be achieved.

The follow table shows the pre-requisites:

<i>Credit</i>	<i>Title</i>
<i>SA P1</i>	MINIMUM LANDSCAPING AREA
<i>MA P1</i>	TIMBER USED FOR TEMPORARY WORKS
<i>MA P2</i>	USE OF NON-CFC BASED REFRIGERANTS
<i>MA P3</i>	CONSTRUCTION/DEMOLITION WASTE MANAGEMENT PLAN
<i>MA P4</i>	WASTE RECYCLING FACILITIES
<i>EU P1</i>	MINIMUM ENERGY PERFORMANCE
<i>WU P1</i>	WATER QUALITY SURVEY
<i>WU P2</i>	MINIMUM WATER SAVING PERFORMANCE
<i>IEQ P1</i>	MINIMUM VENTILATION PERFORMANCE

Evaluate against BEAM Plus what the highest rating is achievable by current design and identify the limitations

From most of the project experience, some credits are less under the control of developer. Most of them are related to site aspect. If the gaps between the assessment criteria and existing condition are not too far away, developer and designer can overcome those barriers.

Credit	Credit item	Able to be influenced by design	Able to be influenced by management
SA P1	MINIMUM LANDSCAPING AREA	Yes	
SA 1	CONTAMINATED LAND		
SA 2	LOCAL TRANSPORT		Yes
SA 3	NEIGHBOURHOOD AMENITIES		Yes
SA 4	SITE DESIGN APPRAISAL	Yes	
SA 5	ECOLOGICAL IMPACT		
SA 6	CULTURAL HERITAGE		
SA 7	LANDSCAPING AND PLANTERS	Yes	
SA 8	MICROCLIMATE AROUND BUILDINGS	Yes	
SA 9	NEIGHBOURHOOD DAYLIGHT ACCESS	Yes	
MA 10	DEMOLITION WASTE REDUCTION	Yes	Yes

It can find that 9 out of 15 Site aspects have been evaluated. The remaining credit SA 10 – SA 15 can be achieved by management and design. If sufficient budgets and care are applied to building design and construction, all of these credits are achievable. An a preliminary, the highest rating can be fixed.

The for all credits, including the above credits. It is noted that

- Credits applicable – that the credit cannot be exempted.
- Credit achieved – based on the current design practices, the credit is likely to be complied.
- Possible credit – credit should only be achievable if more cost or design consideration is applied. If the credit is certainly not achievable under affordable resources, it should not be marked as possible credit.

4 ENERGY USE

Credit ID	Credit Descriptions	Credits Applicable			Credit(s) Achieved			Possible Credit(s)			Actions for Preliminary Evaluation
		A	B	C	A	B	C	A	B	C	
Area Ratio (Scores broken up according to % of CFA with different AC systems)											
4.P	PREREQUISITE										
EU P1	MINIMUM ENERGY PERFORMANCE										
	Demonstrate the compliance with the Building Energy Codes (BECs) released in 2007 version.	Pre			Y						MEP: replied the BS design shall comply with Standards of EMSD COPs
4.1	ANNUAL ENERGY USE										
EU 1	REDUCTION OF CO ₂ EMISSIONS										
	(c) Residential Buildings 1 credit for a reduction of CO ₂ emissions or annual energy consumption by 3%	1			1						ARCHITECT/ MEP - To review design parameters against Baseline parameters, and advise if proposed design could meet or better than the baseline. BEAM - To preliminary evaluate the energy saving and advise energy saving features
	2 credits for a reduction of CO ₂ emissions or annual energy consumption by 4%	1			1						
	3 credits for a reduction of CO ₂ emissions or annual energy consumption by 5%	1			1						
	4 credits for a reduction of CO ₂ emissions or annual energy consumption by 6%	1			1						
	5 credits for a reduction of CO ₂ emissions or annual energy consumption by 7%	1			1						
	6 credits for a reduction of CO ₂ emissions or annual energy consumption by 8%	1			0			1			
	7 credits for a reduction of CO ₂ emissions or annual energy consumption by 9%	1			0			1			

Gap analysis on the current situation and the target rating

BEAM Plus gives rating to each category and has requirements for minimum rating achievement for each grade. The weighting is shown as below:

Category	Weighting (%)
Site Aspects (SA)	25
Materials Aspects (MA)	8
Energy Use (EU)	35
Water Use (WU)	12
Indoor Environmental Quality (IEQ)	20
	100

And the minimum achievement required for each category under different grade is shown in below:

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

For Innovative and Addition (IA), there are two methods to achieve.

1. BEAM Pro involvement in project
2. Innovative idea
 - 2.1. new ideas which making contribution to Green building
 - 2.2. Performances beyond normal credit requirement. This is only applicable to those credit with "Bonus" point. Please remember that the "Bonus" point is grouped in IA instead of their corresponding category. There, it cannot be double counted AND not helping in achieving a higher mark in their original category.

2	SITE ASPECTS	2.2	SITE PLANNING AND DESIGN
		SA 4	SITE DESIGN APPRAISAL
	EXCLUSIONS	None.	
	OBJECTIVE	Encourage a proactive approach in order to achieve greater integration of site planning issues.	
	CREDITS ATTAINABLE	1 + 1 BONUS	
	PREREQUISITES	None.	
	CREDIT REQUIREMENT	1 credit for site design appraisal report demonstrating a proactive approach to achieve greater integration of site planning and design issues, and at least 50% of relevant sub-items of the Urban Design Guidelines in the Hong Kong Planning Standards and Guidelines are achieved.	
		1 BONUS credit for 100% of relevant sub-items of the Urban Design Guidelines are achieved.	
	ASSESSMENT	The onus is on the Client to demonstrate that site planning and design have taken into full account the physical and environmental aspects of the immediate site surroundings and neighbourhood. A report shall be submitted that explains and details the design team's efforts in achieving integration of the development with the immediate surroundings, covering as a minimum the negative, neutral or positive impacts associated with:	

A table should be constructed to indicate the number of point and percentage of mark achieved by the current design with a breakdown to each category and overall results

<i>Category</i>	Applicable Credits	Credits likely to be Achieved	% of Achieved Credits	Category Weight Factor	Weighted Achieved Score
<i>Site Aspects (SA)</i>	21.0	15.0	71%	25%	17.9
<i>Material Aspects (MA)</i>	22.0	5.0	23%	8%	1.8
<i>Energy Use (EU)</i>	38.0	23.0	61%	35%	21.2
<i>Water Use (WU)</i>	8.0	5.0	63%	12%	7.5
<i>Indoor Environmental Quality (IEQ)</i>	23.0	16.0	70%	20%	13.9
<i>Innovations and Addition (IA)</i>	1.0	3.0	-	-	3.0
Overall Scoring					65.3%

The rating for each category should also be listed

	Achievement	Sub-Rating
<i>Site Aspect (SA)</i>	17.9	Platinum
<i>Energy Use (EU)</i>	21.2	Gold
<i>Indoor Environmental Quality (IEQ)</i>	13.9	Gold
<i>Innovative and Addition (IA)</i>	3.0	Platinum
Overall Scoring	65.3	Gold
Resultant Rating	Gold	

The differences between target and current marks should also be indicated.

<i>Category</i>	<i>Applicable Credits</i>	<i>Achieved Credits</i>	<i>Threshold of Gold</i>	<i>Buffer from Gold</i>
<i>Site Aspects (SA)</i>	21.0	15.0	12.6	1.4
<i>Material Aspects (MA)</i>	22.0	5.0		
<i>Energy Use (EU)</i>	38.0	23.0	22.8	0.2
<i>Water Use (WU)</i>	8.0	5.0		
<i>Indoor Environmental Quality (IEQ)</i>	23.0	16.0	13.8	2.2
<i>Innovations and Addition (IA)</i>	1.0	3.0	2.0	1.0
Overall Rating		65.3	65.0	0.3

Review all potential solutions if the target rating cannot be achieved. Evaluate them against design and cost consideration.

In case of the mark is not fulfilling the target values and hence, the credits under “possible credit” should be review and discuss with design team members whether can it be justify in terms of technical and financial aspect.

Credits

SA 4	Site Planning and Design (100% follows the Urban Design Guidelines) (Bonus)
SA 7b	Soft Landscaping
SA 8a	Wind Amplification (to review the simulation result)
MA 2	Modular and Standardized Design
MA 7a	Outside Surface Works and Structures
MA 10	The demolition waste reduction
MA 11	Construction Waste Reduction, <i>60% waste reduction</i>
IEQ 10	Background Ventilation
IEQ 12b	Use of Natural Ventilation (<i>Common Areas</i>) (Bonus)
IEQ 14a	Thermal Comfort in Naturally Ventilated Premises (<i>Performance with natural ventilation</i>)
IEQ 19	Noise Isolation
IEQ 23a	Amenity for the benefit of building users
EU	Any 5 additional credits from EU including the following: 1. EU 1 2. EU 2 3. EU 6

After revisiting the possible credit and deciding actions to be taken, the credit table should be reviewed and highlighted which category(-ies) is/are the most critical in achieving a higher rating to the design team.

Category	Applicable Credits	Credits likely to be Achieved	% of Achieved Credits	Category Weight Factor	Weighted Achieved Score
<i>Site Aspects (SA)</i>	21.0	17	81%	25%	20.2
<i>Material Aspects (MA)</i>	22.0	9	41%	8%	3.3
<i>Energy Use (EU)</i>	38.0	28	74%	35%	25.8
<i>Water Use (WU)</i>	8.0	5	63%	12%	7.5
<i>Indoor Environmental Quality (IEQ)</i>	23.0	20	87%	20%	17.4
<i>Innovations and Addition (IA)</i>	1.0	4	-	-	4.0
Overall Scoring					78.2%

Category	Achievement	Sub-Rating
<i>Site Aspect (SA)</i>	20.2	<i>Platinum</i>
<i>Energy Use (EU)</i>	25.8	Platinum
<i>Indoor Environmental Quality (IEQ)</i>	17.4	<i>Platinum</i>
<i>Innovative and Addition (IA)</i>	4.0	<i>Platinum</i>
Overall Scoring	65.3	<i>Platinum</i>
Resultant Rating		Platinum