HK-BEAM : Improving the Life Cycle Performance of New Residential Buildings

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Introduction

Hong Kong faces many challenges in tackling its housing needs into the next millennium. Our growing population and ageing building stock points to an indisputable need for more homes, but we must begin to reconcile this with the pressures on our environment. How can we set foot on the road to a more sustainable city? The latest HK-BEAM guideline, *HK-BEAM for New Residential Buildings (Version 3/99)*[1], brings us a step closer to embracing these challenges.

HK-BEAM (the Hong Kong Building Environmental Assessment Method) is the independent certification scheme to encourage best environmental practice throughout a building's life-cycle : planning, design, construction, use, and ultimate 'de-construction'. HK-BEAM sets a range of best practice criteria (the coverage of which is listed at the end of this paper) for environmental performance, against which buildings are submitted for assessment on a voluntary basis. The results of the assessment are presented on the HK-BEAM certificate as a rating of Fair, Good, Very Good, or Excellent. Over a dozen developers and owners in Hong Kong have so far used HK-BEAM to distinguish their buildings from others in the market place.

As with the two HK-BEAM standards set up in 1996 (for existing office premises[2] and new office designs[3]), *HK-BEAM for New Residential Buildings* seeks to:

- distinguish buildings of reduced environmental impact from others in the market place;
- encourage best environmental practice in design, construction, management and maintenance;
- set standards which go beyond legislation and current practice; and
- raise the awareness of developers, designers, contractors and operators.

The HK-BEAM criteria provide tangible targets for developers and designers to pursue, whilst stimulating the expectations of the community, during each stage of the building's life cycle described below.

The Coverage of HK-BEAM for New Residential Buildings

In an environmental sense, a truly sustainable approach to building new homes requires us to look at their whole "life cycle costs". Only then can we begin to address the stages of planning, design, construction, use, and deconstruction.

On the whole, current legislation looks at the start of this life cycle. *The Hong Kong Planning Standards and Guidelines (HKPSG)* and the *Environmental Impact Assessment (EIA) Ordinance* address issues such as land use, infrastructure compatibility, and the mitigation of local problems during construction and operation. However, there is little guidance to 'design-in' building features that will help to reduce a buildings environmental impact throughout its lifetime.

In each of the following areas, features of the assessed building are compared to the HK-BEAM best practice environmental standards, all of which go beyond current legislation. 'Credits' are achieved where the standards are achieved, with the total number credits awarded defining the overall HK-BEAM rating.

Planning

Whilst the EIA Ordinance requires the potential impacts of projects to be assessed during their planning (and controlled during construction and operation), relatively few residential developments are covered. Most estates (if served by public sewers, with fewer than 2000 units, and not located in "sensitive" locations) need not consider their impacts at this stage. Pity, since creative and imaginative planning can remove many environmental problems from later in the building's life cycle.

HK-BEAM allows developers and designers to earn credits by the consideration of their environmental impacts at the earliest stage. Assessments of potential noise, air quality, water and ecology problems from the development are required, following the principals of an EIA, with measures identified to mitigate and enhance the local environment. Such forward thinking should prove to be a popular approach - avoiding retrospective costs and perhaps increasing premiums in the future.

Design

Compared to practices overseas, the use of 'virtual' design tools (such as the simulation of solar gains and wind movement) to harness the building's micro-climate remains quite limited in Hong Kong. Such exercises provide

an invaluable insight into how the building could perform, providing the opportunity to test infinite ideas and innovations in massing and envelope being tested out before a spade is put in the ground. How many homes in Hong Kong get too hot because of the sun's penetration through windows, only to become too cold because of poorly sized air conditioning units? HK-BEAM's credits focus upon using the structure itself to create a comfortable, healthy and efficient living space, with less reliance upon engineered systems.

Another noticeable gap in local knowledge and information is the 'life cycle cost' of building materials. As yet there is no single resource or agreed formula by which clients can compare the environmental qualities of different materials. HK-BEAM makes a start, drawing attention to material production (energy content, toxicity and pollution) and disposal (recyclability and waste generation), though currently using research from overseas. As with HK-BEAM for offices, however, putting new concepts on the agenda will do much to raise the demand for such information and stimulate suppliers to respond.

Construction

Its all very well to think through the planning and design of a new residential development, but often the most visible sign of environmental failures come during the construction stage. Increased regulation of construction and the environment in recent years, and the gradual adoption of environmental management systems (EMS) by some contractors, has served only to make these failures more evident.

In this respect, HK-BEAM places the onus on the client to implement a contractual framework with the main contractor during the tendering stage. Credits are awarded where the contractor adopts an environmental management plan (EMP) for the project, which requires (by the contractor) the identification of potential environmental impacts, and the means and timing of their mitigation. Such an approach, which includes requirements for regular monitoring and reporting, has been adopted with some success for infrastructure projects in Hong Kong, though requires the full commitment of the client in ensuring its successful implementation.

Use & Deconstruction

Whilst the assessment of the life cycle lies beyond the scope of *HK-BEAM New Residential,* (the certificate covers just the planning, design and construction stages) clients are encouraged to look ahead to how they can contribute to more sustainable operation, maintenance and decommissioning. The latter remains the largest challenge, where many consider that the 'deconstruction' of a building is not feasible given current construction techniques, market demand for recyclable and reusable fixtures, and the lack of time and space availability. HK-BEAM, at least, seeks to encourage flexibility in design to reduce resource consumption and waste generation by future occupants, and to make tenants aware of important considerations such as the benefits of energy efficient appliances and non-hazardous finishes, etc.

The Assessment Process for HK-BEAM

The HK-BEAM assessment process commences during the early stages on planning and design (best before tendering), so that the client can include the appropriate requirements in the design specification. The provisional HK-BEAM certificate sets the standard which the client intends to achieve upon building completion. In the meantime checks are made by the assessment body, though on-site inspection and verification, to ensure that the agreed measures are in fact being implemented. As with *HK-BEAM for New Office Designs,* credits will be withdrawn by the assessor where the required standards are not met. On the other hand the philosophy of HK-BEAM is always to recognise positive steps taken to improve the performance of buildings, a feature much valued by its clients.

Since 1996 HK-BEAM has increasingly been adopted by developers, owners and occupiers in the office sector and forms an important environmental commitment of several forward-thinking clients. Organisations which have so far submitted properties for assessment include Swire Properties, HongKong Land, the Housing Department, HongkongBank, the Architectural Services Department, Hang Lung Real Estate Agency, the Hong Kong Electric Company, the Land Development Corporation, the Great Eagle Company, Hong Kong & China Gas, the Open University of Hong Kong, and the Government Property Agency.

Conclusions

As a community we continue to grapple with the concept of Sustainable Development - meeting the needs of the present without compromising the means of the future - and what it means for Hong Kong. The design, construction and use of our buildings consumes enormous quantities of resources; creates untold environmental pollution; generates much of our waste. Our buildings shape of our urban environment and control our overall quality of life. In short, as a large sector of the economy, the construction industry can make a significant contribution to a more sustainable environment.

HK-BEAM provides a unique stepping stone towards embracing such environmental issues. The trial version of the scheme for new residential buildings has attracted a great deal of well informed feedback from industry, much more than for the original HK-BEAM in 1996. The widespread adoption of HK-BEAM and other such initiatives, coupled with these increasing levels of awareness, interest and concern, would play an important role in building a

more environmentally sustainable future.

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- The Centre of Environmental Technology, Ltd, for the implementation and management of building assessments under HK-BEAM.

Attachment - The Coverage of HK-BEAM for New Residential Buildings

HK-BEAM New Residential sets best practice standards for our new homes on three scales :

Global issues and use of resources cover the effects that buildings have on the planet and it's atmosphere beyond the local region. The objective is to make buildings more efficient in the use of energy and materials, with credits relating to :

- energy efficiency (in the building fabric, lighting, lifts, and other installations);
- deforestation and loss of biodiversity (through timber use in construction and finishing);
- environmental management strategies (for both the design and construction teams);
- stratospheric ozone depletion (from ozone-damaging building materials);
- depletion of natural resources (such as water, natural aggregates and building materials).

Local issues cover aspects that affect the Hong Kong environment in general, or the immediate surroundings of a building, with credits relating to :

- ecological impacts and landscaping;
- wind and microclimate conditions around the building;
- designing-out potential noise, air and water impacts during the operation of the building;
- construction management to mitigate pollution to air, water and land;
- waste management and water conservation, etc.

Indoor issues, including all aspects of building design, installation, finishes and operation which affect the health, comfort or well-being of the occupants :

- thermal comfort, solar heat gains and ventilation;
- indoor air quality;
- lighting quality;
- noise and vibration; and
- hazardous materials, etc.

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[1] *HK-BEAM Version 3/99 : An Environmental Assessment Method for New Residential Buildings. Centre of Environmental Technology, Ltd*

[2] *HK-BEAM Version 2/96 : An Environmental Assessment Method for Existing Office Premises. Centre of Environmental Technology, Ltd*

[3] *HK-BEAM Version 1/96 : An Environmental Assessment Method for New Office Designs. Centre of Environmental Technology, Ltd*