

COSTING OF ‘GREEN’ HOME INITIATIVES IN URBAN RENEWAL PROJECTS

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ABSTRACT

Environmental construction is becoming a trend in the Hong Kong Special Administrative Region (HKSAR). Quantity surveyors should definitely have to know how to make allowances in cost estimates for environmental construction. The Urban Renewal Authority (URA) in HKSAR has promoted environmental construction in its projects in the past nine years since its establishment in 2001. Its projects have incorporated various ‘green’ provisions and also obtained, if appropriate, certification of the highest ‘platinum’ standard by the Building Environmental Assessment Method Society (HK-BEAM), which is a well-known independent environmental assessment certification body in HKSAR. In May last year, URA launched its corporate environmental policy and introduced advanced ‘green’ provisions in its projects. Looking to the future, HK-BEAM launched a set of new enhanced certification standards as from April this year. In addition, the HKSAR government is going to make it mandatory to adopt the energy efficiency design guidelines issued by the government in future projects. In order to prepare realistic cost estimates for urban renewal projects, quantity surveying consultants in HKSAR should get themselves familiar with the ‘green’ provisions adopted by URA and other environmental construction requirements in HKSAR.

Keywords: environmental construction, cost estimates, urban renewal projects.

INTRODUCTION

The problem of environmental degradation is a very serious one. Taking the Hong Kong Special Administration Region (HKSAR) as an example, its green house gas emissions climbed to 45 million tonnes in 2008, which represented an 18% increase over the past decade. The most important greenhouse gas we are producing is carbon dioxide and the biggest source of carbon dioxide emissions is electricity generation.

There are currently more than 40,000 buildings in HKSAR and 500 to 600 new buildings are going up every year. These buildings consume nearly 90% of the total local electricity and in the process they produce about half of HKSAR’s total greenhouse gas emissions.

With the initiatives taken by the HKSAR Government and the private sector, these kinds of numbers should begin to fall. The 2007-08 Policy Address of the Chief Executive stated that

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“Hong Kong will honour its pledge and seek to achieve a reduction in energy intensity of at least 25% by 2030 (with 2005 as the base year)”.

There will always be more that can be done, and one major front remains unopened to build an environmentally sustainable future for HKSAR. It is possible to extend the reach of environmentally sustainable practices and policies into the residential area, where the people all live. This is what the Urban Renewal Authority (URA) has done since its establishment in 2001.

URA is a non-government body and endeavours to redevelop dilapidated buildings into new buildings of modern standard and environmentally-friendly design, and to promote sustainable development in the urban area of HKSAR, with most of its new buildings being residential buildings.

Environmental provisions in the development projects of the URA will gradually have a meaningful bearing on the overall construction costs. To provide realistic cost estimates for urban renewal projects, quantity surveying consultants working on URA projects should get themselves familiar with the ‘green’ provisions adopted by URA and other environmental construction requirements in HKSAR.

URA’S ENVIRONMENTALLY SUSTAINABLE POLICY

URA has all along stipulated that the design and construction of its redevelopment projects must be consistent with the government’s Urban Renewal Strategy (URS). The guidelines set out in the URS contain, inter alia, the following environmental objectives:

- redeveloping dilapidated buildings into new buildings of modern standard and environmentally-friendly design; and
- promoting sustainable development in the urban area

Environmental sustainability is the rock on which URA is building its urban renewal strategy centering on its four core business areas viz. redevelopment, rehabilitation, preservation and revitalization (4Rs). URA’s policy on environmental sustainability is applicable for all its operations, i.e. 4Rs, but with emphasis on redevelopment projects since this is the area where the most impact can be made by adopting ‘green’ initiatives.

Since its establishment in 2001, URA itself has been awarded four BEAM platinum ratings, the highest distinction possible, for the environmental sustainability of four projects: Mount Davis 33 in Kennedy Town, Vision City in Tsuen Wan, i-home and Florient Rise in Tai Kok Tsui. Further, there are three projects that have provisionally obtained BEAM platinum ratings. They are a testament to URA’s commitment to environmental sustainability in its redevelopment projects.

In May 2009, URA promulgated its environmental policy, which has been posted onto its web site (www.ura.org.hk). The policy is the logical, even predictable, evolution of the URA’s work to date, which has done much in tackling urban decay and helping those less fortunate in society to improve their living conditions. In formulating the policy, URA has also taken on board the experience of many cities overseas. It has drawn on the latest environmental technology and sought the advice of leading experts with hands-on experience in the field.

In the policy, URA has made commitments to reduce consumption of resources, adopt technologies that minimize pollution and implement projects in such a way as to minimize adverse environmental effects. URA hopes that its efforts will help boost public awareness of the importance of environmental sustainability, and encourage participation by stakeholders and the community at large in working together towards a sustainable future for our city. URA will endeavour to stay at the forefront and make a contribution towards the achievement of environmentally-sustainable development.

COMPREHENSIVE PLANNING IN ENVIRONMENTAL SUSTAINABILITY

Technology alone is not the answer for environmental sustainability in project development. URA insists on proper planning and design to achieve environmental sustainability. It believes that smart planning and thoughtful design will together contribute just as much to environmental sustainability as technology alone.

For instance, since 2006 the Hong Kong Planning Standards and Guidelines require large scale projects over a certain site area to carry out air ventilation assessment (AVA). Notwithstanding that URA's projects were usually not of the large scale as stipulated in the guidelines, URA has still adopted the guidelines and conducted AVA for its projects, where appropriate, under planning. The air ventilation assessment studies were to assist URA to explore a practical and feasible scheme for enhancing air ventilation for projects and their surroundings.

Also in consideration of the impact of development projects to the surroundings, URA also conducts daylight studies, where appropriate, on the proposed schemes of future developments in order to ascertain that there is no significant impact to the daylight environment of adjoining buildings. URA has also incorporated facilities into projects that enhance the traffic condition in the neighbourhood, e.g. provision of public light bus terminus and pavement widening at Langham Place in Mongkok and Vision City in Tsuen Wan. These facilities have eased traffic congestion and facilitated pedestrian flow in the urban areas.

Provision of public open space is also an important element in URA's project planning. Since its establishment in 2001, URA has implemented 37 projects spreading over the urban area e.g. Central, Wanchai, Sheungwan, Shamshuipo, Mongkok etc. and have provided about 200,000 ft² of public open space. The greening in the open space can absorb carbon dioxide and thus help in slowing down climate change.

DESIGN AND TECHNOLOGIES

In terms of design and technologies, the URA's policy guidelines cover the following six main environmental provisions:

- 1) Energy efficiency
- 2) Water conservation
- 3) Environmentally-friendly building materials
- 4) Greening
- 5) Facilities for collection of recyclable wastes
- 6) Reduction of construction wastes and environmental nuisance during construction

It endeavors to look into practical technologies that can be adopted in its projects. Here are some examples of the environmental provisions that have been or will be incorporated into the projects of the URA.

Energy efficiency

Since 1998, the Electrical and Mechanical Services Department of the HKSAR has issued a set of design guidelines on energy efficient building services, which include lighting installation, air conditioning installation, electrical installation, and lift and escalator installation. Compliance to these guidelines is on a voluntary basis. However, the government is proposing mandatory compliance in the near future.

URA, as an environmentally-caring organisation, has adopted the guidelines in its projects since its establishment. On top of this, URA projects have incorporated additional energy saving provisions. Examples of these provisions include maximizing the provision of natural lighting and ventilation in the building design, providing shading from the sun, procuring domestic appliances with energy labels, installing water-cooled chiller systems in lieu of air-cooled chiller systems and using energy efficient electrical lighting.

URA has also explored other possible energy saving devices for incorporation into its future projects, such as:

1) High thermal performance structural fabrics

The climate in HKSAR is hot and humid. Appropriate glazing design, selection of materials and location of glazing openings will improve the thermal performance. Using solar control glass with low shading coefficient like low e-glass or tinted glass can reduce the solar heat gain and thus reduce the energy consumption for air-conditioning. In the HKSAR, it is common to use solar control glass in commercial buildings but not in residential buildings. It is the time that such glass type is considered for use in residential buildings in order to reduce overall cooling loads and heat island effects.

2) Renewable energy lighting systems

The emission of carbon dioxide can be minimized by using natural resources, i.e. the sun and the wind, for generation of power for street lamps. Hybrid street lamps use a combination of direct sunlight, wind and electric light working together in the same lighting system. The wind turbine and solar panels convert wind power and solar power into electrical energy which is stored in batteries for use by the lamp. To cater for insufficient electrical energy being generated by natural resources during calm and cloudy days, the lamp is backed up by switching to mains power, if necessary.

3) Natural lighting and ventilation

Using sunlight instead of artificial lighting for the indoor environment helps in the reduction of carbon dioxide emission from power plants. However, sunlight cannot reach the inner parts of the building. Light pipes can offer the solution by leading sunlight into the indoor environment. It can be installed at the landscaping podium garden to light up areas, e.g. car-parks, directly underneath.

Daylight transmission performance of light pipes is limited by distance. This problem may be overcome by electronic sunlight collectors. The collectors can be installed at the landscaping podium garden to collect sunlight through highly efficient lens. The sunlight is then fully reflected within the optical fibre connecting to the lens on one end and to the tailor made lighting fitment installed inside the building on the other end. The availability of sunlight can be maximized by means of a solar tracing device, which is motorized by solar electricity to allow the lens to rotate in line with the solar angle.

Wind catchers can reduce the operation period of mechanical ventilation system in the indoor space. It can be installed at the podium level to collect fresh air from the ambient environment and to divert the air through a vertical duct to the interior below for ventilation purpose. Both positive and negative wind pressures are used to deliver supply air and extract ventilated air.

4) Solar hot water system

The system is simple in construction. The solar thermal collector converts solar radiation into thermal energy and provides hot water. It can produce hot water at 900kWh per meter square. Certainly, such system is weather dependent. Availability of adequate sunlight for such system in congested urban areas being occupied by high-rise buildings may be difficult. However, such a system may be placed at the podium level of a development for supplying hot water to the clubhouse.

5) Lighting control and advanced energy saving light fittings

Lighting control such as occupancy sensor and timer control in common areas can reduce the lighting operation period during non-occupied period and save lighting energy consumption. Lighting control can be further enhanced by providing zoning for lighting.

Energy consumption can be minimized by installing energy saving lighting, such as LED, T5 fluorescent tubes, to common areas to limit the power consumption per square metre. For example, LED emergency exit signs can save up to 45% of light energy as compared with emergency exit signs with normal light tubes/bulbs.

6) Energy saving air-conditioning devices

Heat recovery system can reduce the ventilation load energy consumption by recovering cooling energy from exhaust air and pre-cooling the intake fresh air. It is estimated that this device can save up to 4% of the ventilation load of an air-conditioning system. Such device is commonly used in commercial buildings but can also be implemented in the club houses of residential buildings.

Demand control ventilation device can adjust the fresh air supply flow rate by monitoring the carbon dioxide concentration of the indoor areas. The operation hours of the air fans can suit the actual occupancy of the areas and thus the energy consumption by the air fans can be reduced.

Water conservation

Water is also one of the precious natural resources. Examples of measures that have been adopted by URA to reduce the use of water include:

1) Rainwater collection system

Rainwater can be collected and stored for use in non-portable purposes such as flushing, cleansing and irrigation. A rainwater collection system includes catchment areas for the rainfall and storage tanks of reasonable sizes.

2) Condensate water system

Condensate water from air-conditioners and air-handling units can also be collected for non-portable purposes including topping up water for cooling towers.

3) Low water consumption sanitary fittings

Water consumption can be reduced by installing taps with low flow rate, dual flushing and low-volume cisterns, automatic control urinals and automatic control taps. Low water consumption will also result in reduction of waste water and thus energy required for its treatment.

Environmentally-friendly building materials

Focusing on recycled and recyclable materials and materials that don't harm the atmosphere's ozone layer is another important element in URA's development projects. For instance, the safety matting of children playgrounds is made of recycled plastic bottles and rubber tyres. The timber-like external flooring to the landscaping areas is composed of recycled plastics and timber wastes. The refrigerants of air-conditioning units and components of insulation materials contain substances whose production and use result in a low level of damage to the ozone layer.

Greening

It is easily the most aesthetically-pleasing and noticeable of all the environmental provisions. In addition, trees and plants can absorb carbon dioxide and thus assist in reducing global warming. They can also serve as an insulation layer for reducing heat gain and in return can reduce the need for air-conditioning.

URA development projects must make maximum use of landscaping in open spaces, on roof gardens, in street planting and in vertical greening. Generally, about 30 to 50 % of the uncovered areas in each development project will be covered with landscaping.

URA has explored various enhanced greening methods. Starting from the first URA project, Mount Davis 33, URA projects have laid turfs on roof tops, such as machine rooms, where possible. In order to explore possible means of providing vertical greening, URA appointed a consultant in 2006 to conduct a study. The first largest vertical greening panel in the URA projects with an area of about 800m² was installed in Vision City located in Tsuen Wan. This large green panel was the co-effort of the joint venture developer and URA. This has set a precedent for the use of vertical panels in future URA projects.

Facilities for collection of recyclable waste

In Hong Kong SAR, the continued rapid growth in waste has resulted in the running out of landfill space far earlier than expected. Construction waste has put tremendous pressure on the landfills. Building new landfills is very costly and will deprive the valuable land for more beneficial use. It is a pressing need for implementation of necessary measures in reduction and recycling of waste.

The practical measures in collecting recyclable waste have been implemented in URA projects. Contractors working on URA projects are encouraged to collect recyclable construction waste on site. For instance, URA's demolition projects generally adopt a selective-demolition method. Recyclable materials such as reinforcement, plastic pipes and metals, are taken down and collected prior to the physical demolition of the structure.

In addition, facilities are provided at each floor of the residential buildings to collect the recyclable domestic waste. Certainly, they need to be the right size for the population they serve and they must be serviced adequately.

Reduction of construction waste and environmental nuisances during construction

URA encourages the reduction of construction waste and environmental nuisances during construction. The adoption of design such as pre-fabricated external walls, drywall partitions minimizes construction waste. The introduction of noise mitigation measures such as environmental demolition method, and the implementation of proper environmental management planning minimizes potential nuisance to surrounding buildings.

ENVIRONMENTAL PERFORMANCE ASSESSMENT

The Building Environmental Assessment Method (BEAM) is a popular environmental performance assessment method adopted in HKSAR. BEAM is devised by a local non-profit making organization, the Business Environment Council. BEAM assesses the environmental performance of a development on the basis of six aspects, which include site, materials, energy, water, indoor environmental quality and innovations. There are four ratings for the environmental performance, viz. Platinum, Gold, Bronze and Silver. For ascertaining the environmental performance, URA generally requires the achievement of 'platinum' rating, the highest distinction possible, for its projects under BEAM.

In association with the formation of the Green Building Council in HKSAR in November 2009, an updated version of BEAM, BEAM-PLUS, has been put in place with effect from 1 April 2010. This updated method will still assess the environmental performance from those six aspects but with much higher requirements on obtaining the credits. For instance, a building services design meeting the energy efficiency guidelines issued by the government would not obtain a credit under BEAM but would be a prerequisite for assessment under BEAM-PLUS.

Such enhanced assessment requirements may lift the environmental standards of the buildings in future. URA will have to review the environmental provisions to be specified in its future projects in order to obtain a high environmental rating under BEAM-PLUS.

SUMMING UP

It is the mission of URA to construct quality buildings and to promote environmental-sustainable developments. URA projects will follow the environmental policy, and each project will incorporate appropriate environmental provisions that are practical and feasible in accordance with its particular condition. URA does not rest there. It will keep on exploring the possible measures and technologies for enhancement of environmental performance in its projects.

One of the core services provided by quantity surveyors is cost management. The crux of cost management is to facilitate clients to complete their project developments within the budget. A realistic budget should be built on a comprehensive estimate. The essential elements in arriving at a comprehensive estimate include the full knowledge of the client's requirements and their cost implications.

Quantity surveyors working on URA projects should therefore have good knowledge of the potential environmental provisions to be included in URA projects. In order to provide top quality cost management services, they may have to conduct cost studies for those environmental provisions and to build cost models for environmental developments before offering their cost advice.

With the growing demand for reducing carbon emissions, it is expected that there will be more new environmental building technologies and products coming into the construction industry. To be sustainable, quantity surveyors must gear up themselves to get familiar with these new technologies and products and to give their valuable and precise cost advice for facilitating the clients to build within their budget.