

## **General Development and Implementation of Sustainable Building Design in Arch. S.D.**

Years before, when fellow architects in Hong Kong knew about the bold attempt of Architectural Services Department of steering into the unexplored territories of “environmental protection”, their doubts seemed unanimous: Firstly, would it be feasible? Secondly, would the implementation of related policies be a hindrance to architectural design?

Today, the answer to the first question is loud and clear. In 1995, Architectural Services Department obtained the certification of ISO9001, being recognized as a public body stepping over the threshold of Quality Management. In March 1998, the Department became the first government department to obtain the certification of ISO14001. This marked the Department’s first footing onto the highway heading towards sustainability, a highway allowing no u-turns.

These developments mark the birth of new systems, and lay down the responsibilities and duties of a government department with a noble vision. As a consequence, the Department gears towards the goals of sustainability and establishes itself upon the four cornerstones on which the essential aspects firm up: “quality”, “environmental protection”, “health” and “safety”. These enrich the core concept of sustainability and foster work direction and hence internal guidelines of the Department. While upholding internal systems and disciplines, the Department also ensures consultant firms and contractors to follow the guidelines closely. The Department also establishes penalty as well as award systems, including a wide variety of competitions and assessment schemes, environmental protection awards, greening programmers and the like, with the aim of providing motives and favorable conditions for the Department and our partners to move towards the common goal of sustainability.

As architects, the main concern we still embrace is whether the establishment of systems and work procedures would function as barriers in the perspective of design and creativity? Whether the technological advancements in environmental protection could co-exist with aesthetics of architectural design, mutually supporting instead of contradicting each other.

Indisputably, my main priority falls on the aesthetics of architectural design and I need to ensure that environmental considerations function as support rather than hindrance to design concepts. Environmental considerations, nevertheless, are encompassing and inherently harmonize with nature as well as technicalities in architectural designs. Architectural Services Department has established a 15-point guideline on environmental designs. It is an extension of the 4 key areas of as well as a manifestation of a macro-view on the key concepts of sustainability:

**A. Quality:**

1. Visual impact, 2. Functionality, 3. Material use & specification.

**B. Environmental:**

4. Sustainable planning, 5. Ecological impact, 6. Enhancement to environment, 7. Energy conservation, 8. Construction waste management, 9. Daylight, illumination & visual access.

**C. Health:**

10. Noise impact, 11. Environmental health & hygiene, 12. Waste water discharge, 13. Water conservation

**D. Safety:**

14. Design waste management, 15. Operation & maintenance.

For architects, this is already a multi-dimensional solution and an answer to the second question on whether environmental policies would affect architectural designs. For discussion and exploration purpose, the five examples below are chosen from award-winning projects of Architectural Services Department in recent years. These architectural designs fully represent the successfully blending of the three essential components: aesthetics, nature and technology:

## **Wetland Park**

Situated at the North-west of Hong Kong, the Wetland Park is converted from abandoned fishponds and wetlands and has become a paradise for environmental conservation. The Park includes an indoor exhibition hall of 10,000 square meters, concealed under a grass slope. It also has an anteroom, a satellite building, and three bird hides for observing birds. The environmentally sustainable design concepts adopted include:

### Sustainable Planning

- Minimum footprint to maximize open space
- Building disposition taken into consideration of the sun path to avoid solar heat

### Ecological Impact

- Retaining existing site characteristics
- Retaining existing vegetations

### Energy Conservation

- Upgrading building services to improve energy efficiency, including the application of geothermal system
- Overall Thermal Transfer Value is between 3.8watts/m<sup>2</sup> to 16.9watts/m<sup>2</sup>
- Timber screens at appropriate locations to shading off direct sunlight
- Special galleries and lecture room to promote green concepts

### Visual Impact

- Building composition is integrated with surroundings
- Exterior wall and colors are in-line with surrounding buildings

### Environmental Health & Hygiene

- Toilets are provided with natural light and with stand-by mechanical means
- No A/C is provided for satellite building and bird hides

### Daylight, Illumination & Visual Access

- Front portal, atrium and toilets are provided with natural ventilation
- Timber louvers can diffuse direct sunlight

#### Water Conservation

- Water in artificial lakes is naturally treated
- Water conservation cistern is only 6 liter in consumption

#### Construction Waste Management

- Stone slabs recycled as pavers to save construction waste
- Formwork recycled is modified as temporary fence

#### Materials Use & Specification

- PFA was used in concrete mix
- Bricks recycled and with local pavers to reduce overseas procurement
- Oyster shells recycled to promote environmental initiative

#### Functionality

- The phase 1 building can be converted into an anteroom

### **1. The Hong Kong Museum of Coastal Defense**

This museum on coastal defense is converted from an abandoned barrack. The main feature of the museum is the physical planning being accommodating to existing topography and the original facilities, which have been sheltered under a tensile structure modeled after the design of military tent and form the core component of the museum. Perhaps the only setback in the project is that the client has turned down the unconventional suggestion of not using air-conditioning systems. The environmentally sustainable design concepts adopted include:

#### Sustainable Planning

- Site formation is adaptive to topography in order to maximize open space
- Redoubt is retained and sheltered by tensile roof

#### Ecological Impact

- Preservation of existing building and road alignment to echo with the natural setting

#### Enhancement to Environment

- Provision of bridge link to connect the different levels

#### Energy Conservation

- Application of new building service technology

#### Visual Impact

- Tensile structure and fair-face concrete are in coherence with natural environment

#### Environmental Health & Hygiene

- Upgrading of Indoor Air Quality

#### Daylight, Illumination & Visual Access

- The overall design facilitates natural light penetration

#### Water Conservation

- The Teflon coated tensile structure is self-cleansing

#### Construction Waste Management

- Application of prefabrication materials reduces construction waste

## **2. The Veterinary Laboratory at Tai Lung Farm**

It is an exquisitely concealed two-story building constructed along hill slopes amidst a huge spread of grassland. The main feature is the geometric construction, manifesting a combination of triangular and spherical shapes, harmonizing with a lawn, which is situated at the roof of the building. The environmentally sustainable design concepts adopted include:

#### Sustainable Planning

- Physical planning is based upon natural topography

#### Ecological Impact

- Accommodating the land form and conservation of vegetations

#### Enhancement to Environmental

- Roof garden can help to reduce solar transfer

#### Energy Conservation

- Application of energy conservation system in conjunction with building configuration

#### Visual Impact

- Low-rise design to echo with the natural setting

#### Environmental Health & Hygiene

- Class 1 Indoor Air Quality system adopted

#### Daylight, Illumination & Visual Access

- Skylight designed at strategic areas and with energy saving lighting systems

#### Construction Waste Management

- Minimize excavation to reduce construction waste

#### Material Use & Specification

- Application of energy glass and hygienic building materials

### **3. The Waterfront Park at Sai Kung**

It is converted from a neglected park and has been re-designed and re-vitalized as the new landmark of the Sai Kung District. Inside the Park are alfresco dining places, kiosks, and self-serviced visitor center. The development of the Park has become a success story of the “local economy development” model. The environmentally sustainable design concepts adopted include:

#### Sustainable Planning

- Conversion of partial structures to become alfresco dining spaces, kiosks and covered walkways
- Demolition of unwanted structures for maximization of open space

#### Enhancement to Environment

- Thematic planting and installation of covered corridor

#### Energy Conservation

- Natural ventilation for alfresco dining and kiosk instead of A/C

#### Visual Impact

- Minimization of structures
- Paper boat installation to echo with Sai Kung heritage

#### Noise Impact

- New-built toilet as a noise buffer for the park

#### Environmental Health & Hygiene

- Natural ventilation versus mechanical means

#### Material Use & Specification

- Adoption of certified timber from sustainable source

### **4. The Public Health Laboratory Center**

It is a well-equipped multi-functional building of public health laboratories that calls for clarity, simple and dainty designs. The most important is the modular and prefabrication systems used which significantly reduce construction wastes. The systemized design has become an established model for other projects to follow. The environmentally sustainable design concepts adopted include:

#### Sustainable Planning

- Intelligent physical planning to achieve design and energy efficiency
- A building rated "Excellent" by HK-BEAM

#### Energy Conservation

- Sun-shading device provided and the application of central refrigeration system
- Static contactor type capacitor banks that minimize energy lagging in the electrical system
- Variable voltage variable frequency drives installed to save energy for lift system

#### Visual Impact

- Concealment of pipes and vents for better appearance

#### Noise Impact

- Strategic disposition of space to create a natural noise barrier

#### Daylight, Illumination & Visual Access

- Natural light source allowed at main lobbies and application of energy lighting fixture

#### Construction Waste Management

- Adoption of modular system would help to reduce construction waste

#### Design Waste Management

- Stringent control of building materials would reduce wastage

#### Materials Use & Specification

- Application of easy maintenance materials

#### Functionality

- Adoption of modular system allows flexibility for future changes

#### Operation & Maintenance

- Systematic approach would facilitate operation and maintenance

What have been shown are not just petty images, these are the results of the hard works and the collective wisdom of the civil servants; stating from policy making to execution, from delineation of works to responsibilities, and from designs to achievements; altogether contributed to the success of our vision.

- \*1. Penalty and award system refers to the performance review of consultants and contractors. Poor performances would be penalized for tender suspension.
- \*2. In-house staff or independent body would conduct internal or external audits regularly.
- \*3. Environmental protection awards are designed for projects with successful application of environmental concepts, regardless of whether they are implemented by in-house staff, consultants or contractors.
- \*4. Greening programmers include interior planting, or wining awards at flower show and the Annual Green Awards.