

## Green Interior Renovation by Architectural Services Department

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### ABSTRACT

Architectural Services Department (ArchSD) supports the Government's role to promote low carbon buildings in Hong Kong and at the same time to share the good practices in our green building projects with the building industry. A holistic integrated approach from design to construction and then maintenance is adopted.

To demonstrate the good practice of sustainable project delivery at interior space, this paper introduces two renovation projects in which sustainable and sensible solutions have been implemented. They are the renovation of 1/F Main Block of APB Centre and the renovation of the 10/F Government Logistics Centre (GLC) into an administration office as part of the relocation project of the Printing Workshop for the Government Logistics Department (GLD).

APB Centre is a government building and ArchSD is the premises user. The renovation project at APB Centre was to transform the storage area at 1/F into a green workplace to demonstrate the good practice in achieving low carbon, healthy and modern indoor environment. GLD's Printing Workshop relocation project involved the refurbishment and alteration works of 3 floors of the GLC at Chai Wan to accommodate the printing machineries and office accommodation. The renovation works at 10/F has transformed the existing space into an administration office of the Printing Workshop with green and pleasant environment for the staff. Sustainable design in both projects was achieved through energy efficient air-conditioning and lighting design, sustainable materials selection, excellent indoor environmental quality, etc. In APB Centre project, an innovative radiant cooling system was also employed for the open office areas. Both projects have achieved Platinum ratings under the BEAM Plus Interiors accreditation and, in particular, the renovated 1/F Main Block of APB Centre is the first government office in Hong Kong achieving the Platinum Rating under this assessment system launched in September 2013.

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### 6. INTRODUCTION

This paper introduces two renovation projects, commissioned by Architectural Services Department (ArchSD), in which sustainable and green features and practices have been implemented. They are "the renovation of 1/F Main Block of APB Centre" and "the renovation of the 10/F Government Logistics Centre (GLC) into an administration office". Both projects have achieved the BEAM-Plus Interiors Version 1.0 Final Platinum.

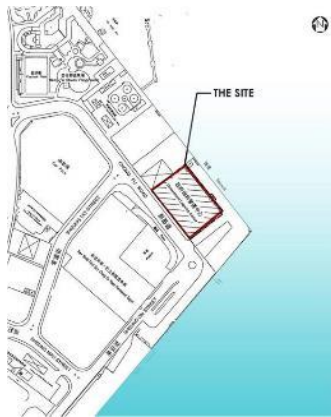


Site Plan



Renovated office area

The new ArchSD office transformed from an existing store is located on 1/F Main Block, APB Centre, Hunghom. It has an internal floor area of around 800m<sup>2</sup> accommodating about 100 staff. The renovation was completed in March 2015 and successfully demonstrated the feasibility of practice of a sustainable office renovation.



Government Logistics Centre



Reception

The refurbishment of the 10/F GLC is part of the relocation project of the Printing Workshop for Government Logistics Department (GLD). The refurbishment work has transformed the once unattractive space into a green and lively contemporary office for the Printing Division of GLD. The refurbished area is about 930 m<sup>2</sup> which mainly consists of open plan office, cellular offices, conference room, reception and balcony.

## 7. KEY FEATURES OF THE RENOVATION OF 1/F MAIN BLOCK OF APB CENTRE

The renovation project adopted a holistic approach on sustainable design, green construction, environmental friendly operation and maintenance to transform an existing office premises to a green workplace. Almost all furniture, partitions and electrical appliances in the new office were reused from the existing office to minimize purchasing of new items. Sustainable and innovative design strategies, such as radiant cooling system, indirect LED lighting, automatic control for building systems, water efficient fixtures, sustainable materials and flexible layout were integrated to create a low carbon, green, healthy and modern indoor environment to the office occupants.

The sustainable design features including interior space design, interior green wall, sustainable materials selection and energy efficiency features are described below:

### 3 Feature 1 – Sustainable materials

More than 97% of the furniture and partitions in the new office were relocated from the existing office and more than 80% of newly installed materials were from sustainable sources. The new office adopted bamboo for the wall covering (photo below refers) and skirting. Bamboo is a well-known rapidly renewable material having a harvest cycle of less than 10 years. The raised floor system (photo below refers) and carpet were made of recycled materials in the manufacturing process and the doors were made of sustainable timber.



Bamboo wall panel



Raised floor system and carpet were made of recycled materials

The project also planned for the reuse of building materials at the end of life cycle of the office. All newly installed elements are in modular design and easily disassembled in the next renovation for potential reuse.

### 4 Feature 2 – Waste management from demolition to operation

In demolition stage, the demolished concrete was reused in another ArchSD site, as the filling materials. In construction stage, recyclables were sorted and stored properly in the designated area to facilitate recycling from time to time. Over 98% of the demolition and construction waste (C&D waste) from the renovation work was recycled. In operation stage, several types of recyclables, including Paper, Metal, Plastic, Glass and Rechargeable Batteries are provided.



*Demolished concrete was used in another site as filling materials*



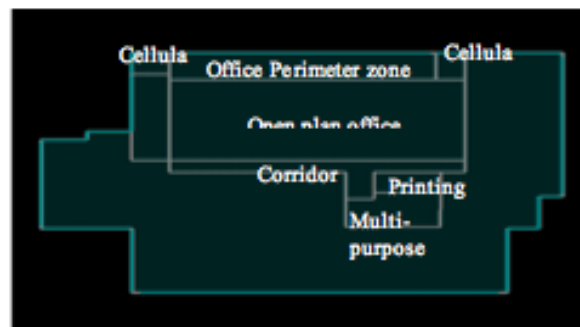
*Recycle collection bins in the new office*

## 5 Feature 3 – Energy

Energy Conservation Measures are applied in this project. The building automation control such as occupancy sensors are installed in the open plan office to turn off the lighting and air-conditioning system after office hours and daylight sensors are installed within 5 metres from the perimeter zones for dimming control, both helping reduce energy consumption in the office.



*Occupancy sensors for lighting system*



*Energy model for the new office*

Energy simulation for the baseline building was conducted by the software – eQUEST 3.64, which is a sophisticated building energy use analysis tool that provides professional results. eQUEST has all capabilities described in Appendix A – Building Energy Analysis of Code of Practice for Energy Efficiency of Building Services Installation 2012 Revision 1 (BEC 2012). The baseline building in this project's energy simulation runs used the assumptions and modelling methodology described in BEC 2012 with its addendum.

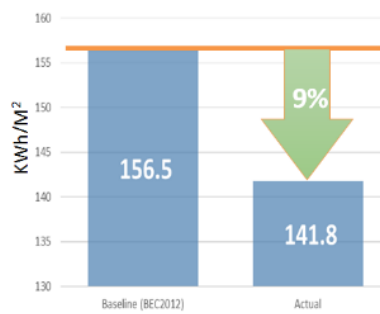
The predicted baseline annual energy consumption and carbon emissions of the office are 156.5 kWh/m<sup>2</sup> and 101.0 tonne CO<sub>2</sub> respectively.

The real time energy consumption of the office is monitored by the energy meters, temperature sensors and flow meters. The data are feedback to Building Management System (BMS). The real time consumption is transmitted to the environmental display system at the entrance of the office (photo below refers).



Real time environmental display system

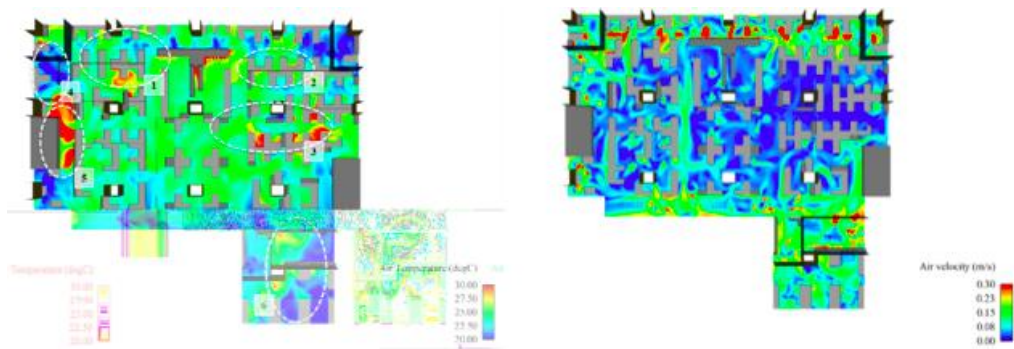
The actual annual operating energy consumption and carbon emissions of the office in the previous year (Apr 2015 to Mar 2016) were 141.8 kWh/m<sup>2</sup> and 91.2 tonne CO<sub>2</sub> respectively. Therefore, the actual energy consumption is reduced by around 9% from the BEC2012 baseline.



Annual office energy consumption

## 6 Feature 4 – Indoor environmental quality (IEQ)

To analyse the distribution of indoor air temperature and air speed and evaluate the indoor thermal comfort, a three-dimensional Computational Fluid Dynamic (CFD) analysis has been conducted. The velocity distribution within the study area, which is affected by the office layout and the location of vent openings and mechanical fans, has been simulated under operating conditions. The thermal comfort simulation under steady-state full load conditions has also been carried out.



CFD models for air temperature and air velocity

A green wall serving as an air filter is installed in the main corridor of the office. Its combination with the air-conditioning system allows the return air from the office to pass through the green wall before recirculation. This helps refresh air supply to the office.



The plants provide a visual indoor display and also act as an air filter to actively remove Volatile Organic Compounds from the indoor air.

*Bio-filtration green wall*

Other key elements of IEQ of the office include – A task light for every workstation, CO<sub>2</sub> sensors to monitor the CO<sub>2</sub> concentration and an independent local exhaust system provided for the printing room.

## 7 Feature 5 – Green roof

As part of the renovation, the existing podium roof has been transformed into a green roof with around 60 m<sup>2</sup> vegetated area. The greening can help minimize the urban heat island effect.



*New green roof*

## 8 Feature 6 – Innovation

Apart from the innovation features of real time energy use display and LED office light fittings and radiant cooling, another innovation approach is adopting the Building Information Modelling (BIM) for Operation and Maintenance in the office on 1/F Main Block, APB Centre. The BIM Application forms an accurate sharable 3D design information database of both the existing building and the new design, and can improve internal evaluation of the cross-disciplinary workflow.



*BIM Image*

*Site*

## Virtual vs Reality

### 8. KEY FEATURES OF THE RENOVATION OF THE 10/F GOVERNMENT LOGISTICS CENTRE INTO AN ADMINISTRATION OFFICE

The refurbishment work has adopted a green approach by using various sustainable design features to provide a pleasant working environment for staff. Excellent class in Indoor Air Quality has been achieved and certified by the Hong Kong Environmental Protection Department. The sustainable design features including interior space design, interior green wall, sustainable materials selection and energy efficiency features are described below:

#### 3.1 Feature 1 – Views to outside and daylighting

In order to enhance the liveliness of the office space, workstations are laid out so that at least 65% of them would have a view to the external. Special design is adopted that the upper part of the office cubicle partitions being glazed to facilitate viewing from works stations to outdoor. It also allows employees to enjoy the natural daylight, external scene and reduce the use of artificial lighting.



*Office layout plan*



*Section*



*New design of office cubicle partitions*

#### 3.2 Feature 2 – Interior green wall

Interior green wall is designed as a signature feature to enliven the indoor environment of the new office. It is located at the transition corridor from reception to the interior office space which brings a strong image about this green and sustainable office.



*Interior green wall at the corridor*

### 3.3 Feature 3 – Amenity space

The once redundant balcony has been successfully transformed into a welcoming relaxing space for staff. It is a precious opportunity for an office in an urban area to have a breakout space. Planting are provided along the balcony to soften the edge of the building.



*External view from balcony*



*New designed outdoor balcony*



*Original*

### 3.4 Feature 4 – Green materials

Materials with high recycled content, such as carpet and ceiling, are used in the refurbished office. Recycled timber decking is used at the balcony to match the images of outdoor environment. More than 50% of flooring, ceiling and door products are regionally manufactured materials.

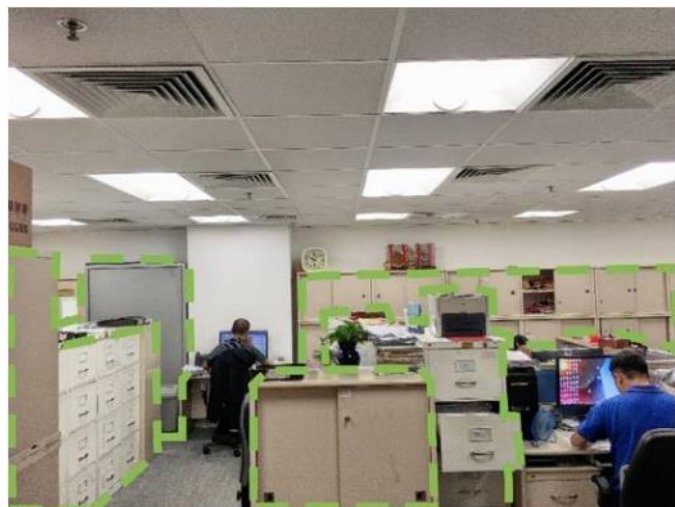
Materials containing rapidly renewable materials such as wall panels manufactured from bamboo are used in the Conference Room. These bamboo panels are regionally manufactured.



*Bamboo panels at the conference room*

### 3.5 Feature 5 – Re-use furniture

As the project is a refurbishment project, a lot of existing furniture can be re-used in the new office. A majority of the furniture (over 70%) has been re-used in the new office. It helps to reduce a lot of wastage, transport and manpower for demolition.



*Layout of re-used furniture in the new office*



### 3.6 Feature 6 – Waste recycling facilities

Facilities are provided for recycling glass and small electrical appliance in addition to the standard provision for recycling metal, paper and plastic.



*Waste recycling facilities*

### 3.7 Feature 7 – Energy efficiency

Different energy efficiency features have been adopted to reduce power consumption. The new office provides task light for every workstation and high efficient fluorescent lighting for the open plan office. Daylight sensors and occupancy sensors are installed to control the lighting and fan coil units in the office.



*High efficiency lighting at office area*

## 9. CONCLUSION

Finally, both projects have achieved Platinum Rating under BEAM Plus Interiors Accreditation after the successful transformation. ArchSD being the works agent for government properties has implemented green design not only in new development but also in renovation of existing buildings. These two projects demonstrated the sustainable design in existing premises through architectural layout design, lighting design, sustainable materials selection and good indoor environmental quality.

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