Integrating BIM for Sustainable Planning, Design, Construction and Facilities Management for Hong Kong’s Public Housing Development

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To lead a multi-disciplinary team to implement various public housing developments in Hong Kong

To oversee the development and application of Information Technology to suit the diverse business practices of the Development & Construction Division of the Housing Department, including acting as the chairman of the Division’s Steering Committee on Building Information Modeling (BIM) and Geographic Information System (GIS)
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## Part 1 – Introduction

## Part 2 – Integrating BIM for Sustainable Planning, Design, Construction and Facilities Management for Hong Kong’s Public Housing Development

## Part 3 – Achievements and Way Forward
Hong Kong Housing Authority (HKHA) implements one of the world’s largest public housing programme

**Housing Estates in Hong Kong**
- Adopt **functional and cost-effective design** in the Planning, Design, Construction and Management of housing projects;
- Promote **healthy living and green environment** in the work;
- Act with **caring and partnering culture beyond baseline performance**.

- **756,000** flats in use
- **280,000** new rental & subsidized sale flats from 2017/18 to 2026/27
- **2,140,000 (30%)** population
- **14,000+** workers daily
- **99** listed contractors
- **80+** active suppliers
- **9,000+** HA staff
Part 1: Introduction

Building a Sustainable Community

To meet present social, economic and environmental needs but NOT at the expense of future generations.

- Vitalize local economy
- Optimize use of social welfare and communal facilities
- Enhance accessibility & linkage
- Enhance social interaction
- Strengthen community identity
- Economical
- Environmental
- Social

- Promote renewable energy
- Minimize construction waste
- Balance the development potential
- Enhance environmental comfort by considering microclimate in planning
- Minimize environmental impact to the neighborhood
- Integrate green landscape planning
- Enhance environmental awareness
- Enhance health & exercise awareness for all ages
- Encourage outdoor family activities
Part 1: Introduction

Integrating IT to Enhance Productivity

- Structural Engineering, Statistical Analysis, and financial accounting applications on PC Platforms
  1980
- Tenancies Management, Stock Control, and CADD applications on mainframe
  1982
- PASS
- Executive Information System
  1990
- HAFIS
  1995
- HA Intranets (e-Housing Portal)
  1996
- HOMES
- BIM
  2006
- ERP (Enterprise Resources Planning System)
  2011
- HA Intranets (e-Housing Portal)
  1996
- HA/HD Website
- MISIS
  1992
- Integrated System of Housing Management (EMMS)
  1984
- COMIS
- HRMS
  2001
- GIS (Geographic Information System)
- RSMS (Remote Site Monitoring System)
  2009
- DrgMS (Drawing Management System)
  2012
- DCSMS (Site Mobile System)
  2015
- ETrMS (Enterprise Tree Management System)
  2016
- HePLAN
  2011
- SLIS (Specification Library System)
  2014
- SAFD (Semi-Automated Foundation Design)
  2017

Organisers:
- CONSTRUCTION INDUSTRY COUNCIL
- HKGBC
- SBE SERIES
- iSBE
- Sustainable Buildings and Climate Initiative
- FIDIC
- Global Alliance for Buildings and Construction

International Co-owners:
Technology Application and Innovation

130 **Building Information Modelling** technology allows construction professionals to carry out design and construction works in a virtual environment, which helps avoid changes in the construction process as far as possible, reduce risks and render clarity to project costs in various stages. The Government will actively seek to require consultants and contractors to use this modelling technology when undertaking design of major government capital works projects from next year onwards.

131 The Construction Industry Council will set up an innovation and technology application centre to provide a platform for introducing innovative technologies into the industry to enhance productivity. The centre will commence operation in the second half of this year.
HA’s BIM Applications Encompass Full Design and Construction Cycle

**Part 2: BIM Applications**

- **Scheme Design**
  - Planning
  - Value Management
  - Automated Foundation Design (SAFD)

- **Detail Design**
  - Lighting Simulation
  - Daylight Analysis

- **Statutory Submission**
  - Statutory Submissions
  - Thermal Value Calculation (RTTV)

- **Construction**
  - Construction & Safety Planning
  - BIM & RFID Integration
  - 5D BIM (QTO)

- **Post-completion**
  - Facility Management
Part 2: BIM Applications – Feasibility Studies

Integrated Use of BIM and GIS

Innovation in Integrating Civil 3D, ArcScene and Revit (CAR)

Ridge Line Analysis  Vantage Point Analysis  Shadow Analysis  Site Appraisals

Civil 3D  ArcGIS  Revit

Planning  Scheme Design  Detail Design  Statutory Submission  Construction  Post-completion

Partners & Sponsors:
Part 2: BIM Applications – Modular Flat Design

Standardized building components
(building facades, bathrooms, kitchens)

Ease of assembly
of site specific blocks

1 Bedroom Flat

1-2 Person Flat

2 Bedroom Flat

2-3 Person Flat

Planning
Scheme Design
Detail Design
Statutory Submission
Construction
Post-completion
Part 2: BIM Applications – Semi-Automated Foundation Design

**Optimize Foundation Design**

1. 3D Visualization;
2. 2D Drop-off for True BIM statutory submission;
3. Multi-directional exchange of BIM data;
4. Automatic update of Piling Schedule and Material Tables; and
5. Quantity Take Off.
Part 2: BIM Applications – Value Management
Part 2: BIM Applications – Environmental Analysis

Optimize Lighting Design for Energy Saving

Development of more energy efficient lighting operation mode (Two-level lighting design)
Part 2: BIM Applications – Statutory Submission

BIM (REVIT) → 2D DRAWINGS 3D .dwf Files (For Reference) → CHECKING

Planning → Scheme Design → Detail Design → Statutory Submission → Construction → Post-completion

3D VIEW FOR REFERENCE ONLY
Part 2: BIM Applications – Improvement of Construction Performance

Construction planning for a long-span footbridge
Cash flow simulation was created by the integration of quantities extracted from the BIM model, construction programme and cost information.

- Reveals actual and predicted cash flow of the project.
- Better understanding of project cash flow.
Integrated Use of BIM and RFID for Logistic and Supply Chain Management of Precast Elements

1. Fabrication
   - Reading RFID tag after concreting

2. Transportation
   - Reading RFID tag before delivery

3. Assembly
   - Reading RFID tag after installation

Planning and monitoring via a web platform with BIM visualization functions
The contractor documented all the detail underground utilities and structure in the BIM model at construction stage.

This as-constructed BIM model will be handed over to the Estate Management Division to assist them in carrying out future maintenance work.
Part 2: BIM Applications – Facilities Management

Provision of a Data-Rich as-built BIM Model for Facilities Management

- Scanned copy of Test Report
- Manufacturer’s Web Site
- Hyperlink to equipment, schedules, product catalogues, test reports, certificates and O&M manual etc.

Planning  Scheme  Design  Detail  Design  Statutory  Submission  Construction  Post-completion
Part 3: Achievements and Way Forward – Future BIM R&D Items

Planning  | Scheme Design  | Detail Design  | Statutory Submission  | Construction  | Post-completion
---|---|---|---|---|---
Part 3: Achievements and Way Forward – Awards

Autodesk 2009 -2015 BIM Awards

CIC BIM Excellence Award

2015 – 2016 International BIM Award
Thank you

For details of Hong Kong Housing Authority’s BIM Applications, please visit –

**English Version**

**Traditional Chinese Version**

**Simplified Chinese Version**