

**Application of
Building Information Modelling (BIM)
in the Hong Kong Housing Authority's
Public Housing Developments**



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HKIFM Conference**

Outline of Presentation

- ◆ **Introduction**
- ◆ **Applications of BIM**
 1. **Design**
 2. **Construction**
 3. **Facility Management**
- ◆ **Integration of BIM with other technologies & the Way Forward**

Introduction

The Hong Kong Housing Authority

• Objective

The objective of the Government's housing policy is to maintain a stable environment for the sustainable and healthy development of the private property market, as well as to provide subsidized public housing for people who cannot afford private rental housing.

Vision 理想

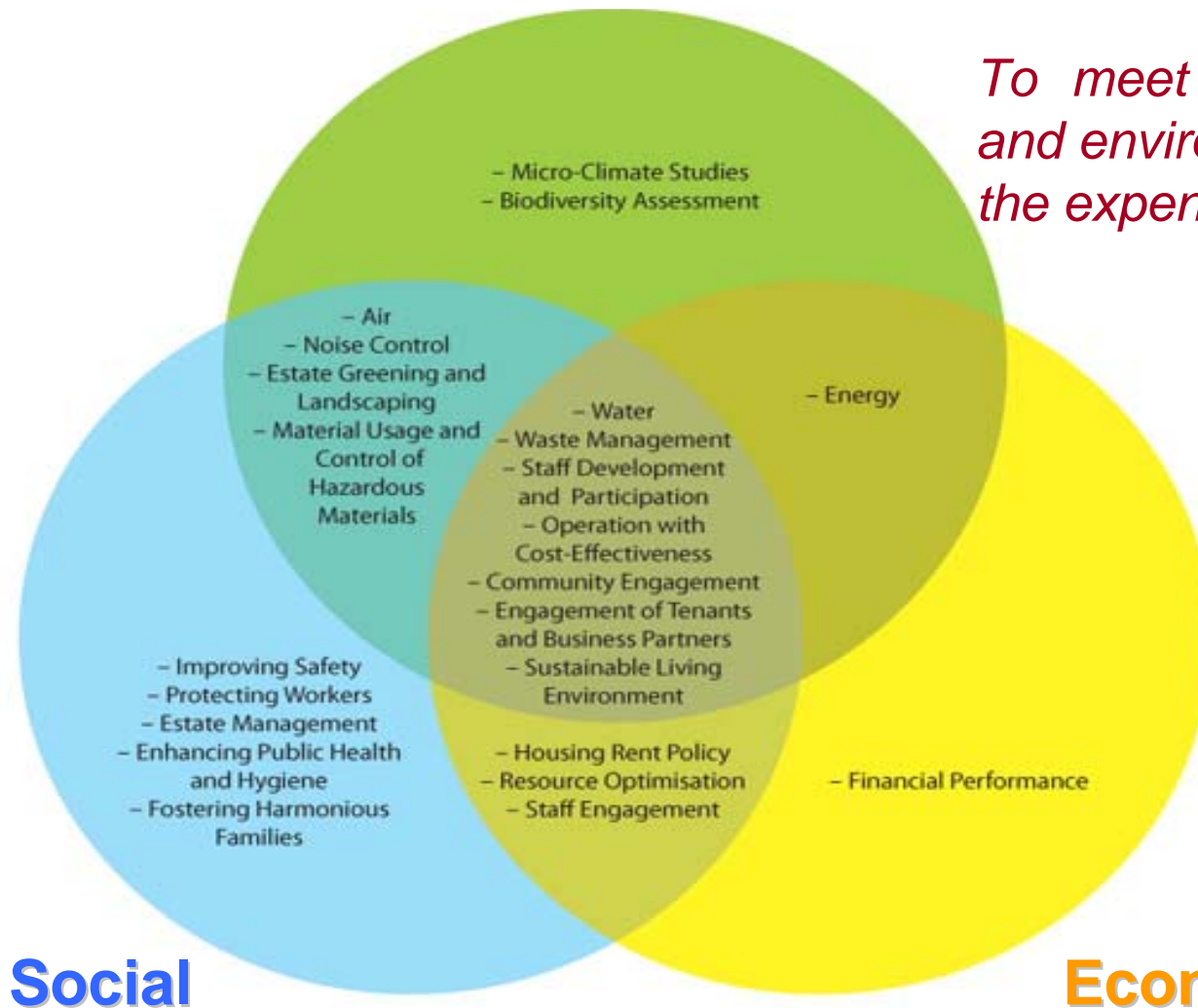
- *To help all families in need to gain access to adequate and affordable housing*

Mission 工作目標

- *To provide affordable quality housing, management, maintenance and other housing related services in a proactive and caring manner*
- *Cost-effective and rational use of public resources*
- *Competent, dedicated and performance-oriented team*

Public Housing in Hong Kong - a Sustainable Community

Environmental



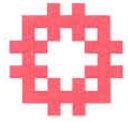
To meet present social, economic and environmental needs but NOT at the expense of future generations.

Social

Economic

A Sustainable Community

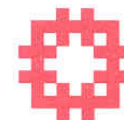
The Comprehensive Redevelopment Programme
for the Ngau Tau Kok Resettlement Estates



Partnering with Residents – Community Engagement

Tenants' Participation in Design of Greening and Open Space



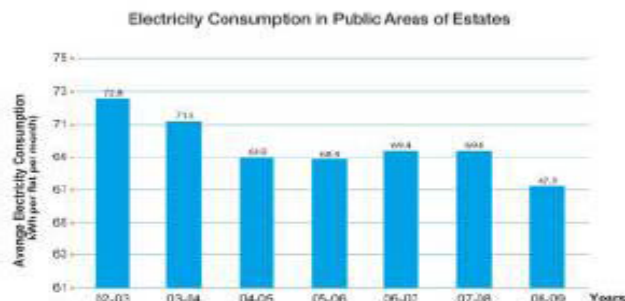


A Sustainable Community

The Comprehensive Redevelopment Programme for the Ngau Tau Kok Resettlement Estates

Energy Efficiency

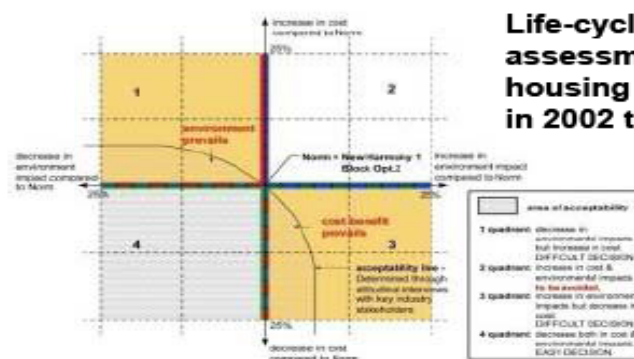
- Meet EMSD Energy Efficiency requirements
- 30% saving in annual electricity consumption at public areas
- Trial application of solar lighting and solar fan



Total of **21** Certificates under The Hong Kong Energy Efficiency Registration Scheme for Buildings -

- Electrical Installation
- Lighting Installation
- Lift & Escalator Installation

Choice of materials based on Life-cycle analysis



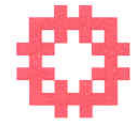
Life-cycle costing and assessment on typical public housing domestic buildings in 2002 to 2005

Choice of Materials derived for Upper Ngau Tau Kok Estate Phase 2 & 3	
1.	Reinforced Concrete Slab (Fairfaced)
2.	Reinforced Concrete Wall (Fairfaced)
3.	Wall Finishes (Internal Flat Areas) - Textured Acrylic paint (External) - Textured Acrylic paint
4.	Floor finishes (Internal Flat Areas) - Cement/sand screed
5.	Wall & Floor finishes (Kitchens and Bathrooms) - 200mm x 200mm Ceramic tiles
6.	Wall finishes (Typical Lift Lobby & Corridor) - Textured Acrylic paint
7.	Floor finishes (Typical Lift Lobby & Corridor) - 300mm x 300mm Ceramic tiles
8.	Piles - large diameter bored piles
9.	Small Power Installation - Flats
10.	Panel Walls - Internal precast drywall
11.	Fresh Water System - copper pipes
12.	Lighting Installation - Flats
13.	Internal Waterproofing - liquid applied

以人為本

A Sustainable Community

Sau Mau Ping South Estate
- Apply Wind and Solar Energy



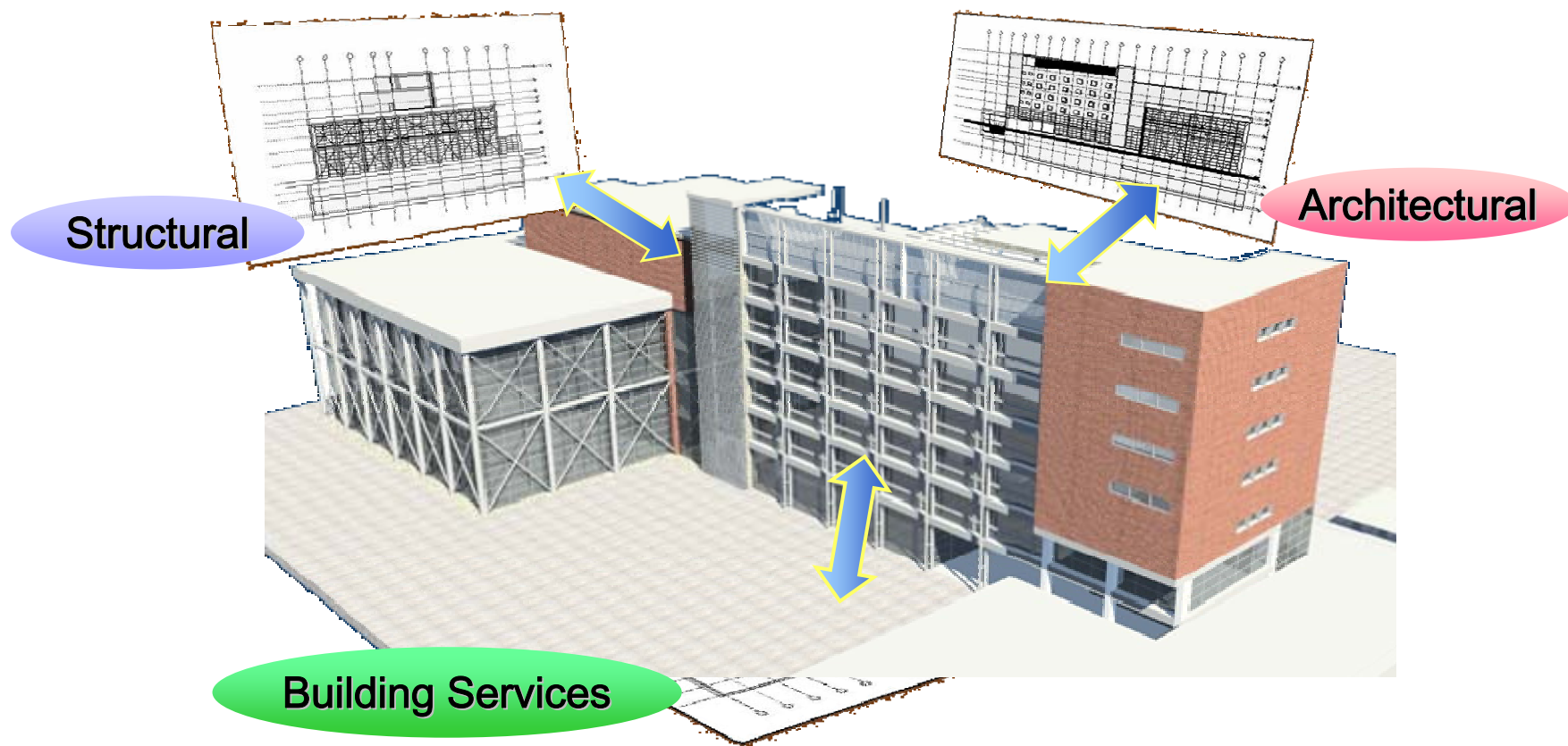
Generate Renewable Energy for LED Lighting over 850m² Open Space with Educational Value and Estate Identity



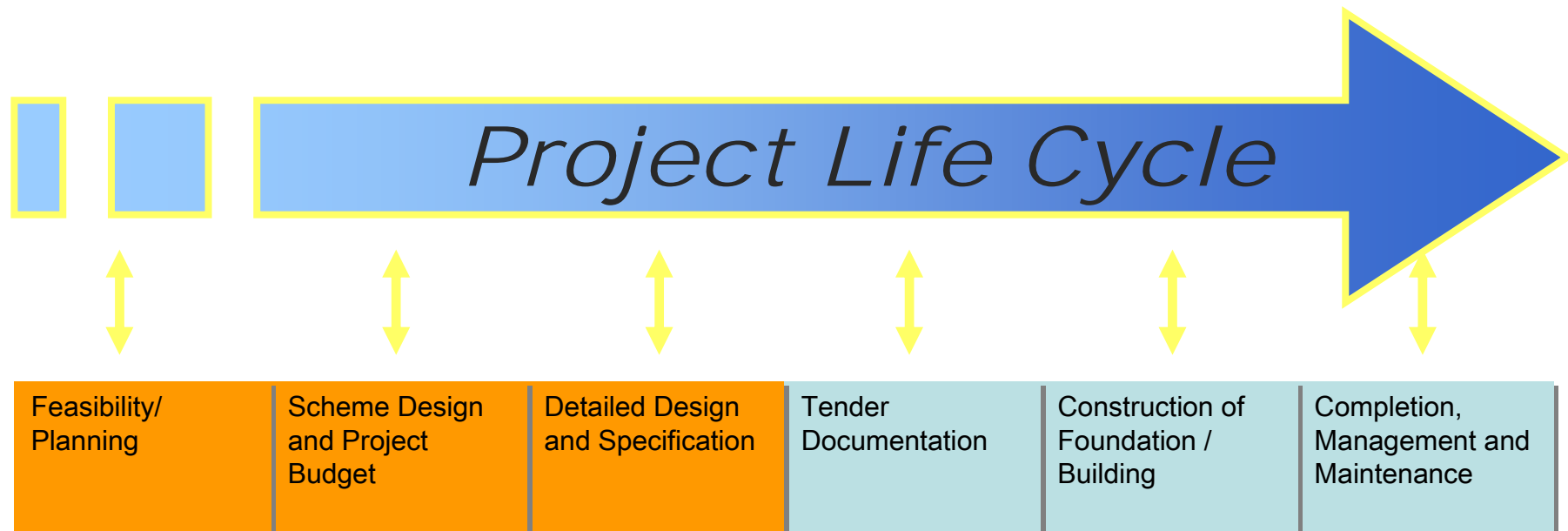
- ◆ **Applications of BIM**
 1. **Design**
 2. **Construction**
 3. **Facility Management**

Building Information Modelling (BIM)

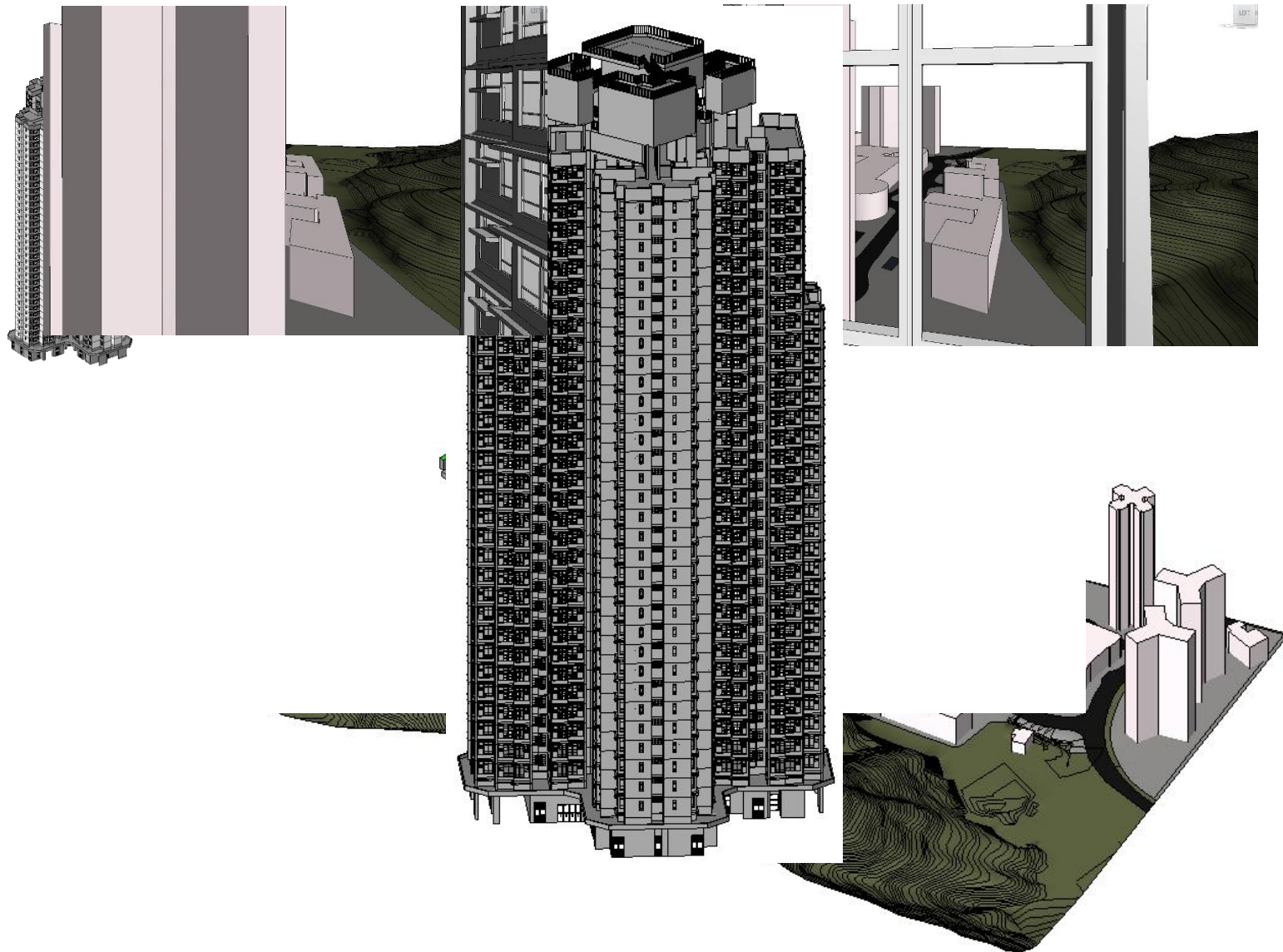
- ◆ is the process of generating 3-dimensional, digital representation of building data throughout its life cycle.



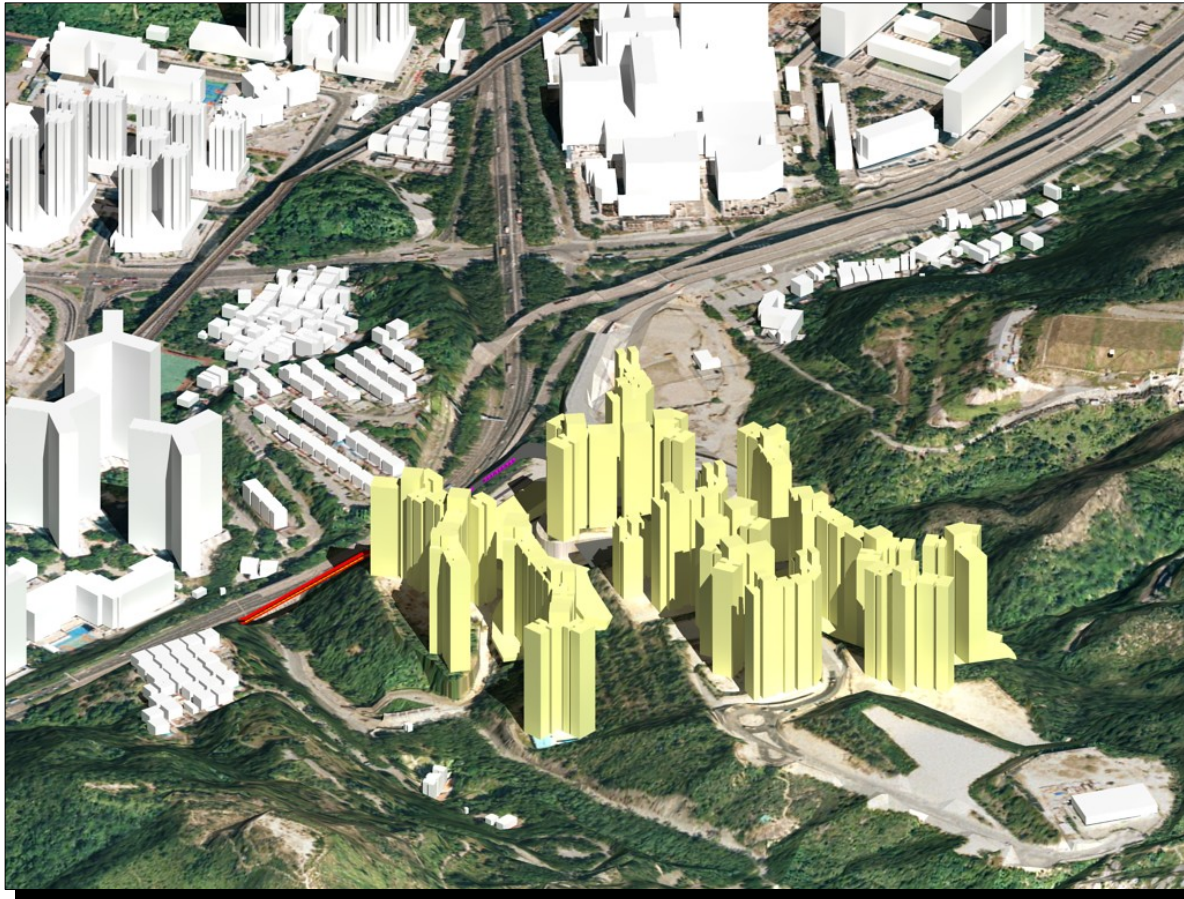
Examples of BIM applications throughout whole project life cycle



BIM - from modular flats to feasibility study



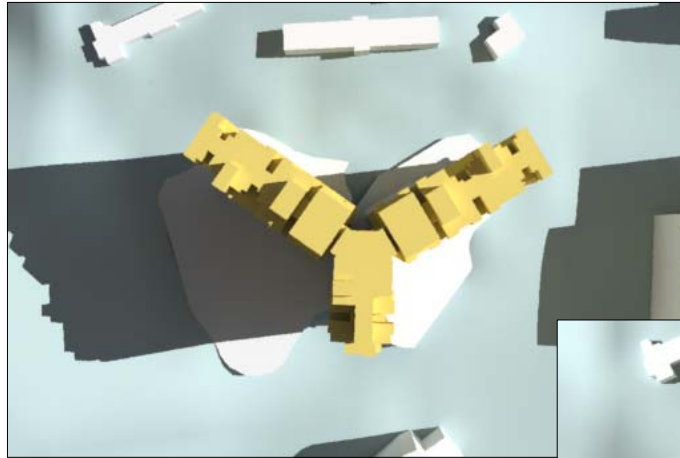
Visual Assessment



3D Terrain and Building Models

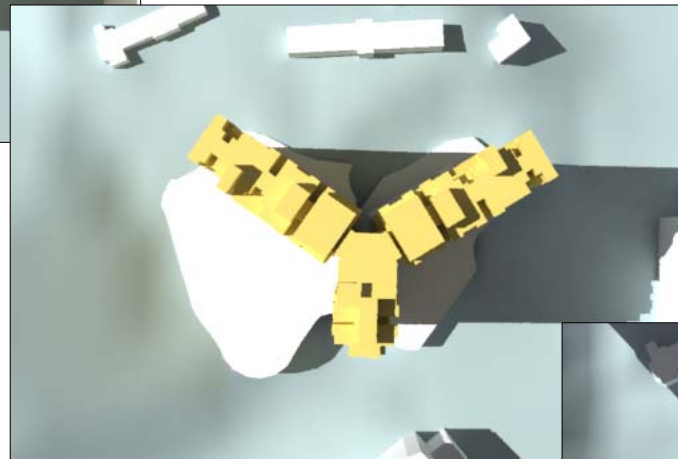


Environmental Studies – Sun Shading



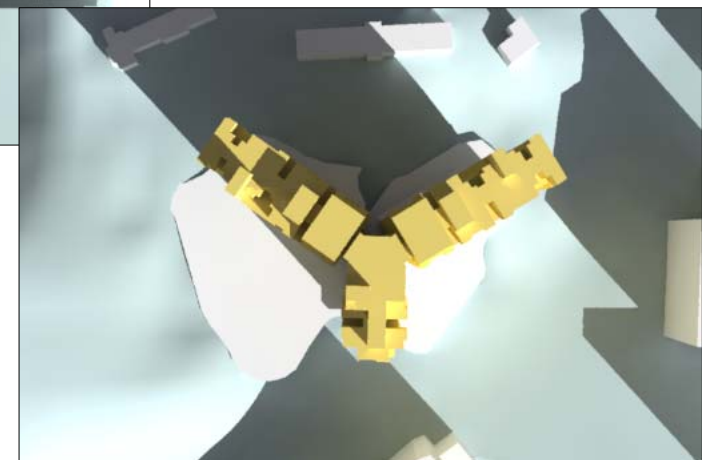
Summer Morning

The north landscape area is almost completely shaded throughout the year



Summer Afternoon

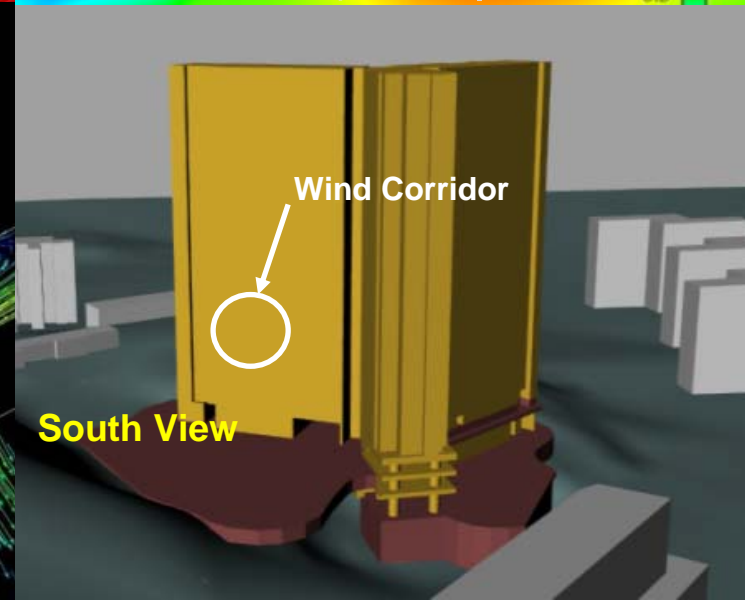
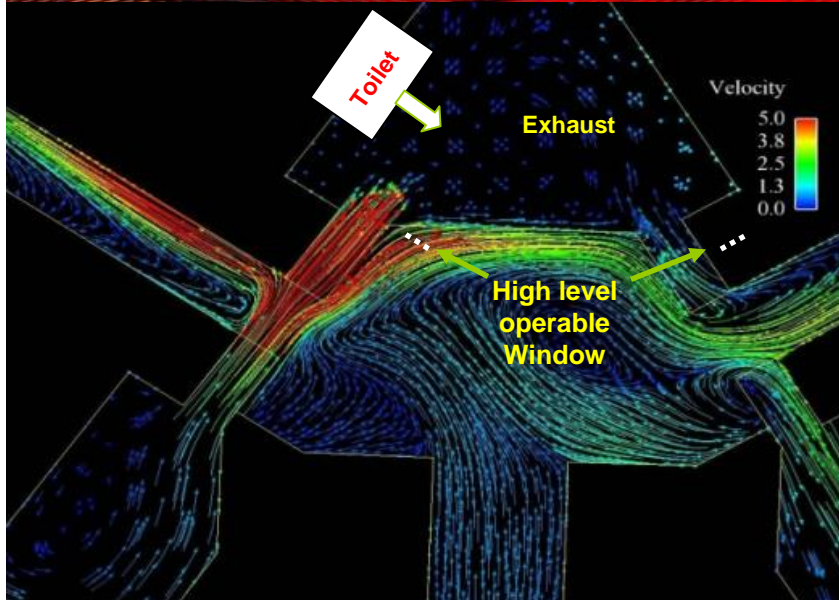
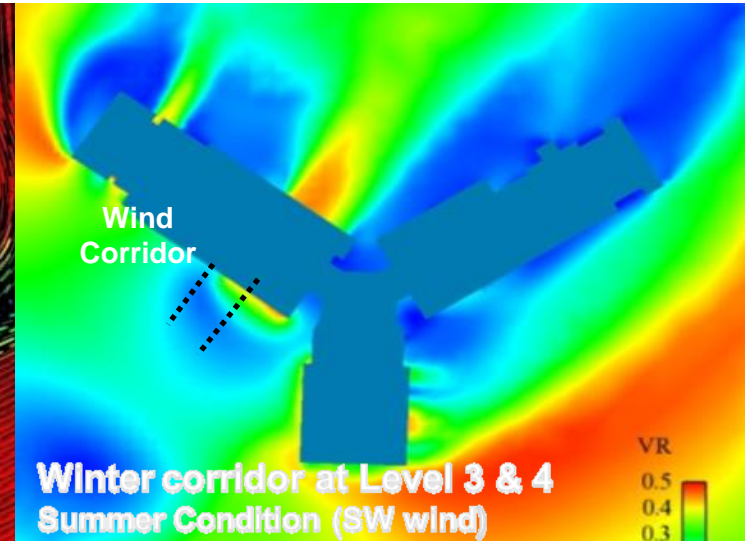
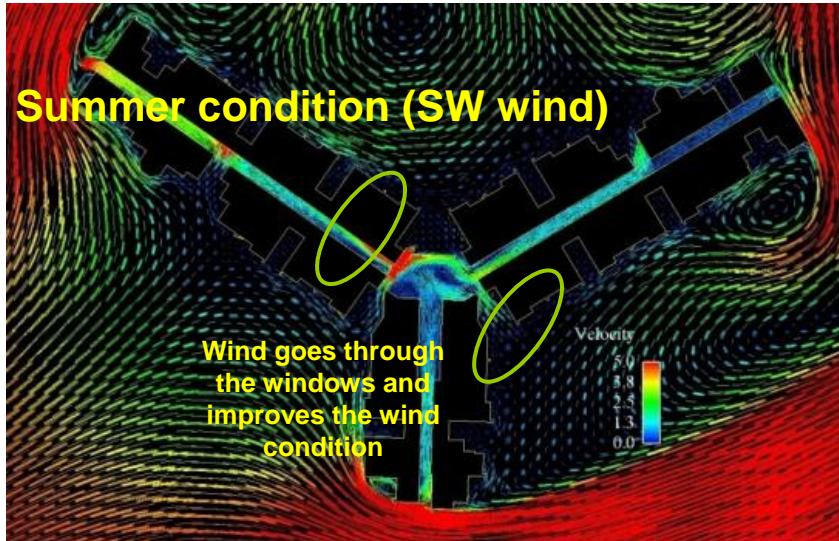
Recreational facilities are located on the Eastern and Southern part of the site to avoid over-heating



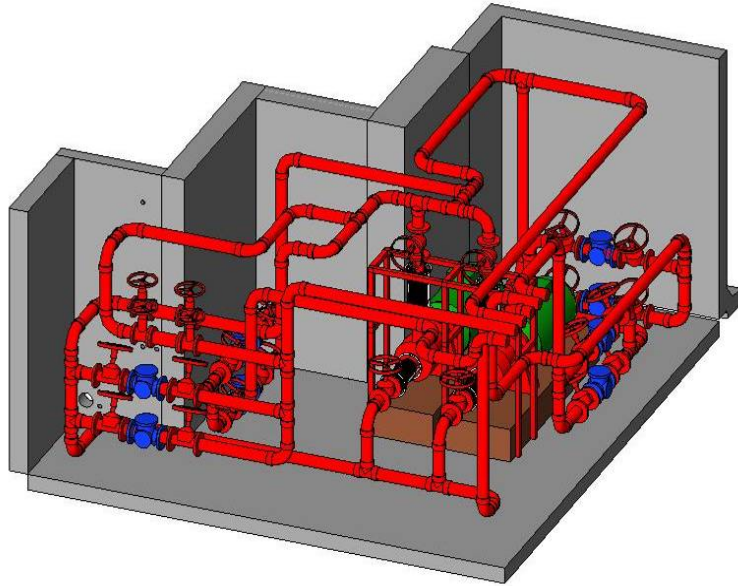
Winter Morning

Environmental Studies

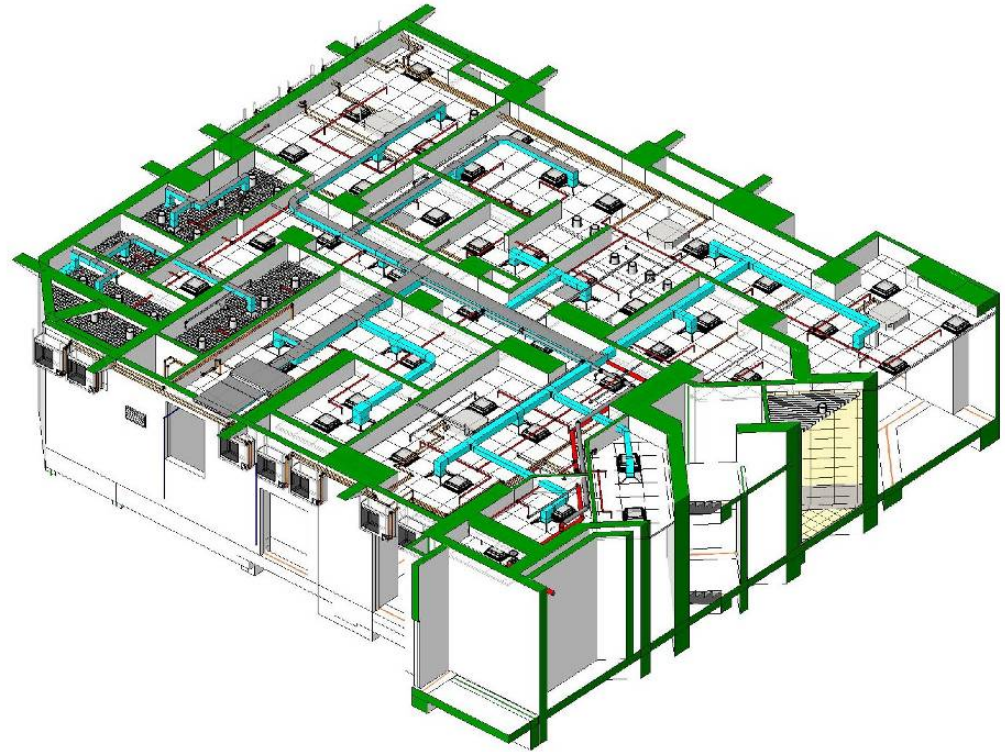
Airflow & Ventilation Study



Design and Coordination

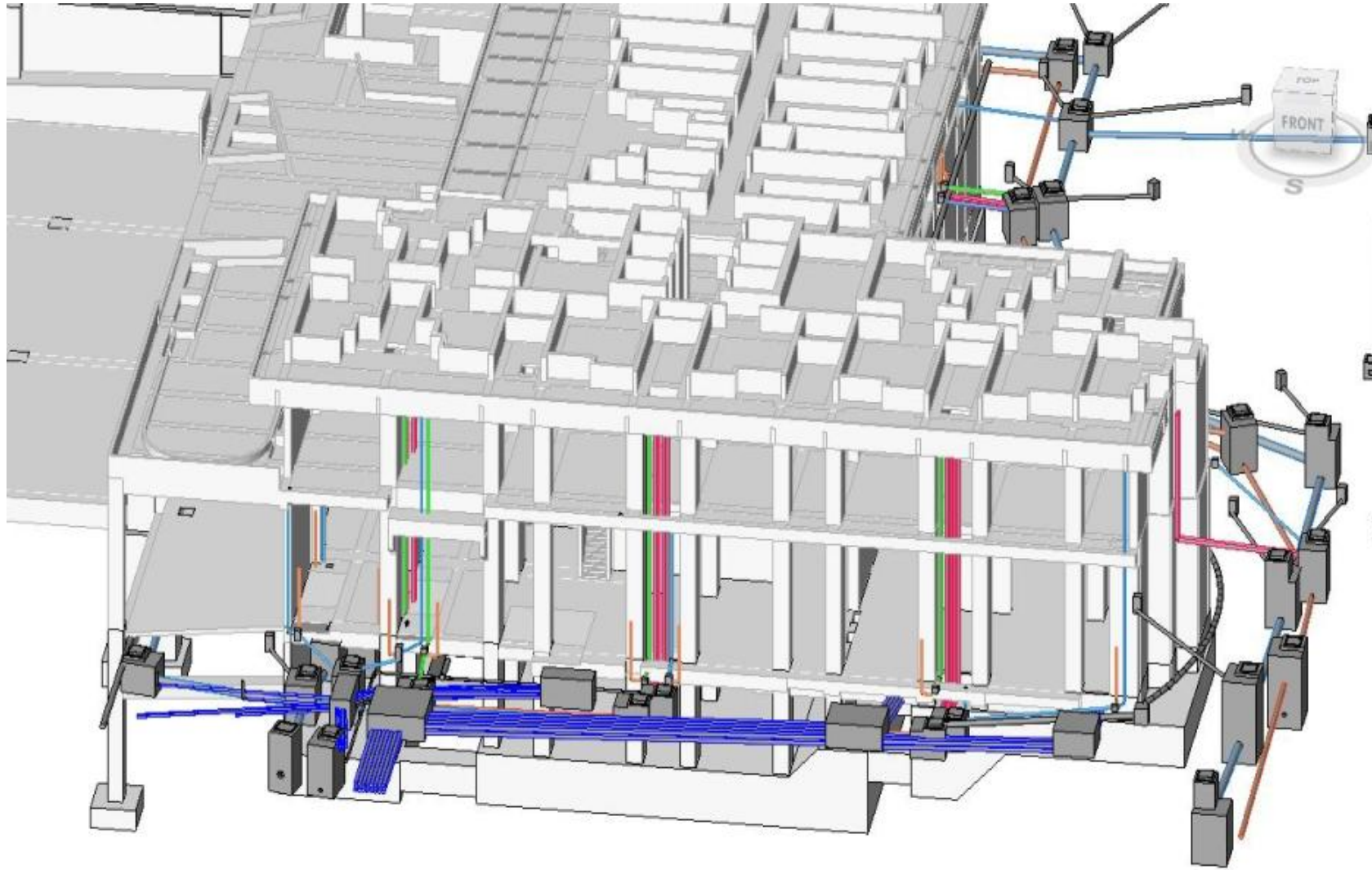


Fire Services Pump Room



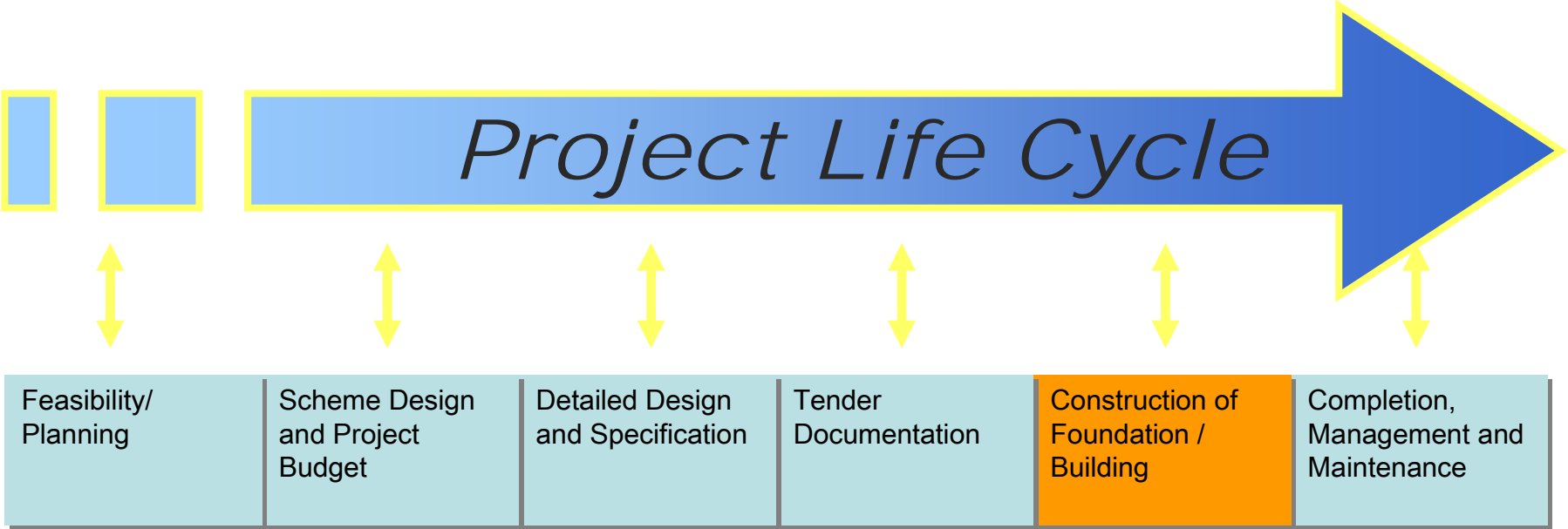
Pipes in Ceiling Void

Design and Coordination



Underground Services and Utilities

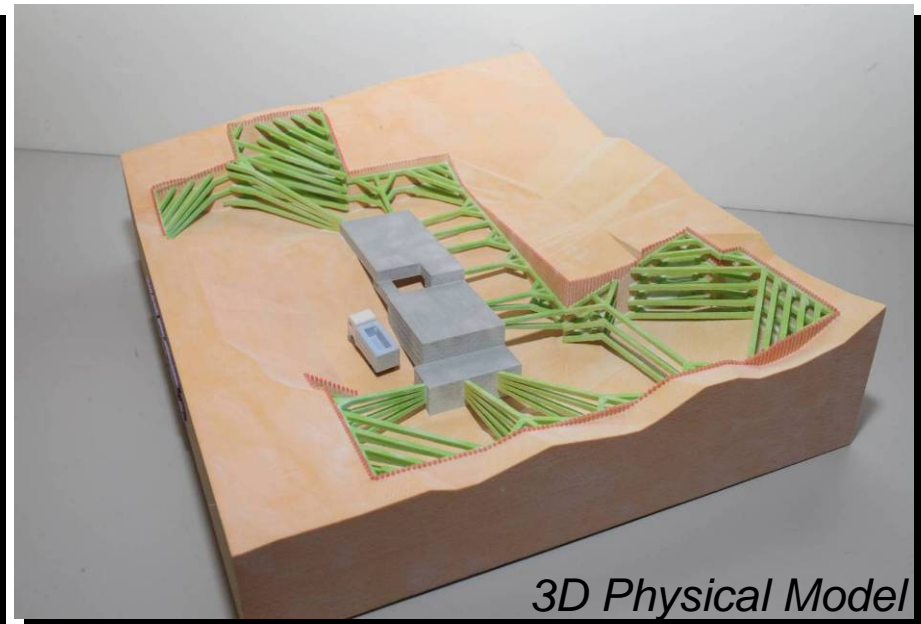
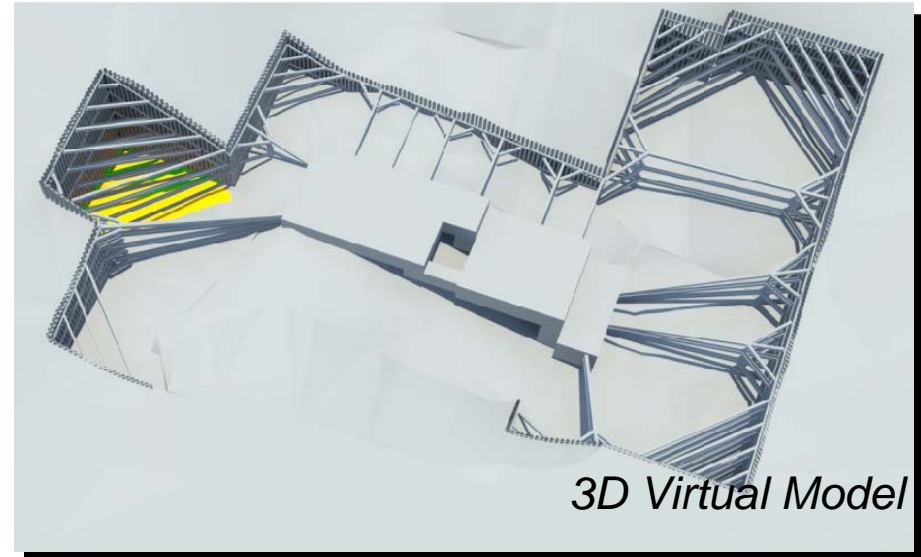
Examples of BIM applications in construction



Site Formation - Excavation, Lateral support

Kwai Chung Area 9H

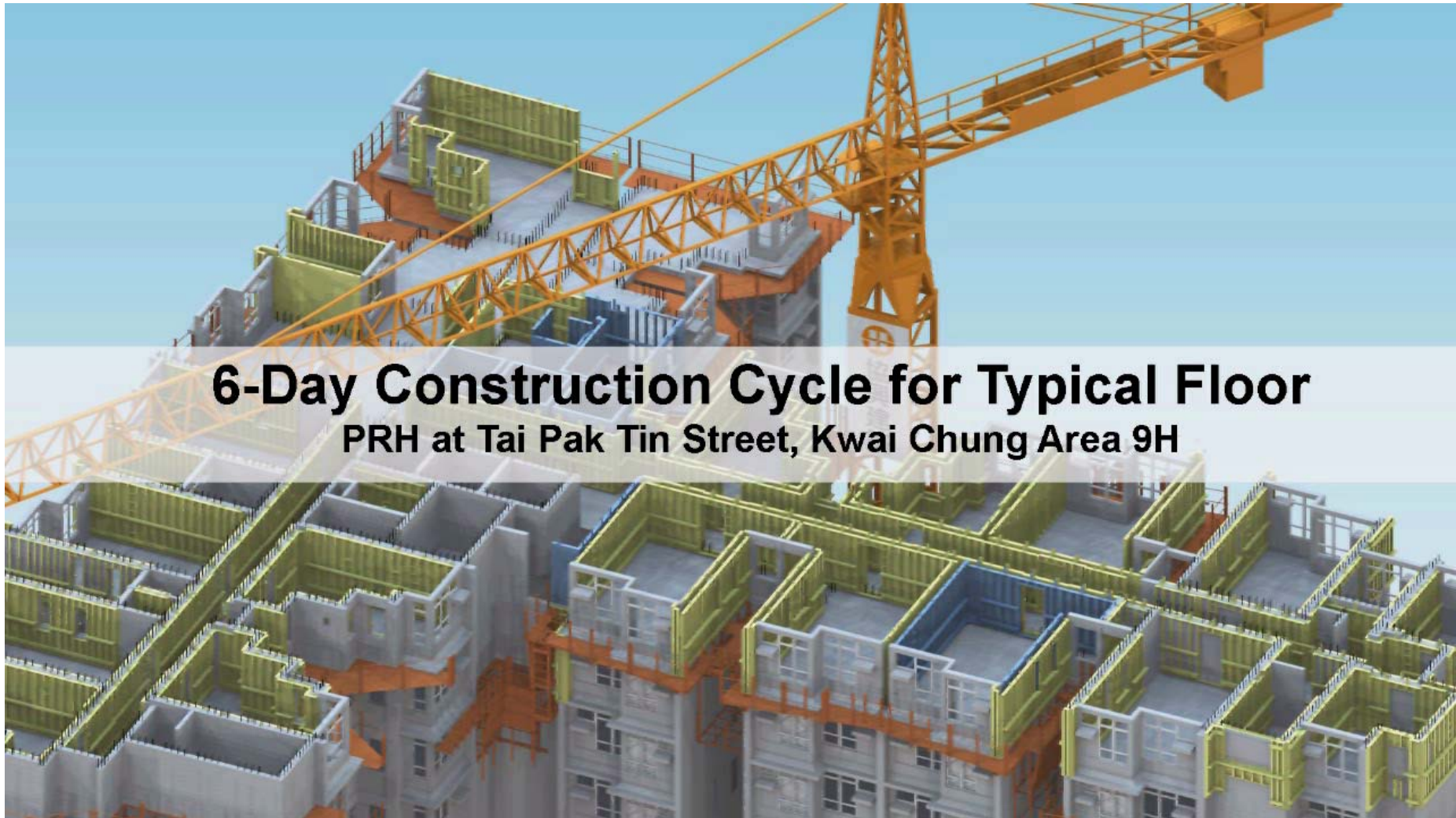
1. Complicated excavation and lateral support system on site
2. 3D model is easier to understand than 2D drawings and written method statements
3. Discussed with site staff and contractor before construction to ensure smooth/safe operations



Safety and Logistics Arrangement



6 – Day Construction Cycle



6-Day Construction Cycle for Typical Floor
PRH at Tai Pak Tin Street, Kwai Chung Area 9H

6 – Day Construction Cycle

Floor	No. of Working Day																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1/F	Prestcast Façade and Steel Mold Installation																													
2/F	Material Storage Platform Installation and Cycle Learning																													
3/F	Learning of Working								4 Days																					
4/F	Six Day Cycle with Tower Crane Climbing						2 Days																							
5/F	Six Day Cycle				2 Days																									

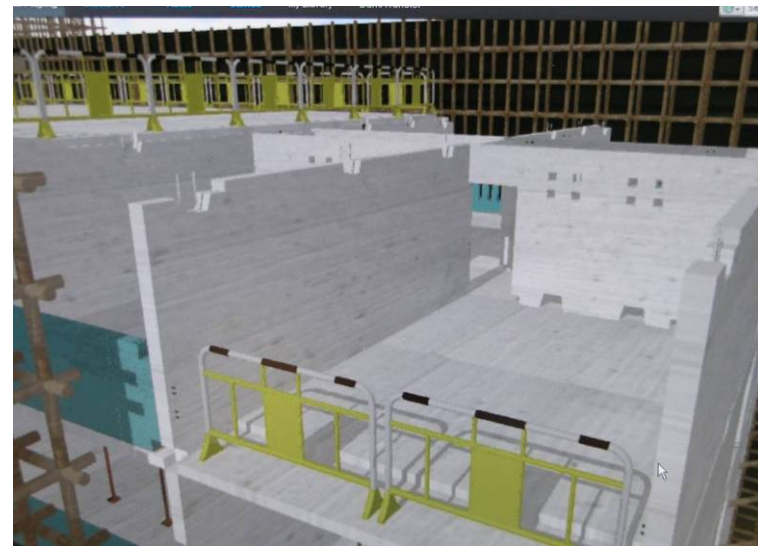
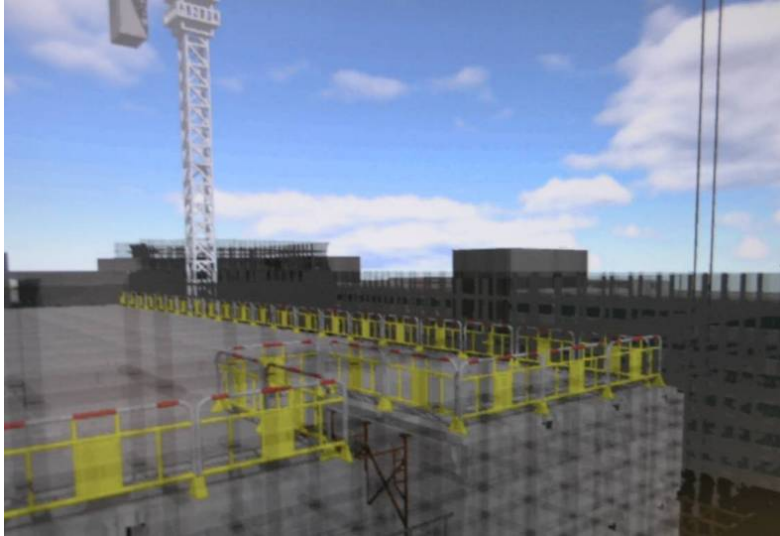
Use of BIM to assist Construction Management

- ◆ Identify and resolve site difficulties
- ◆ Simulate site programme and operation to enhance safety
- ◆ All relevant parties can comprehend the designed demolition sequence more effectively
- ◆ Assist to plan and walkthrough working areas
- ◆ Assist to simulate buildability
- ◆ Assist to conduct safety training with BIM models instead of physical mock-up

4D Simulation of Demolition of Precast Building in Lower Ngau Tau Kok Estate

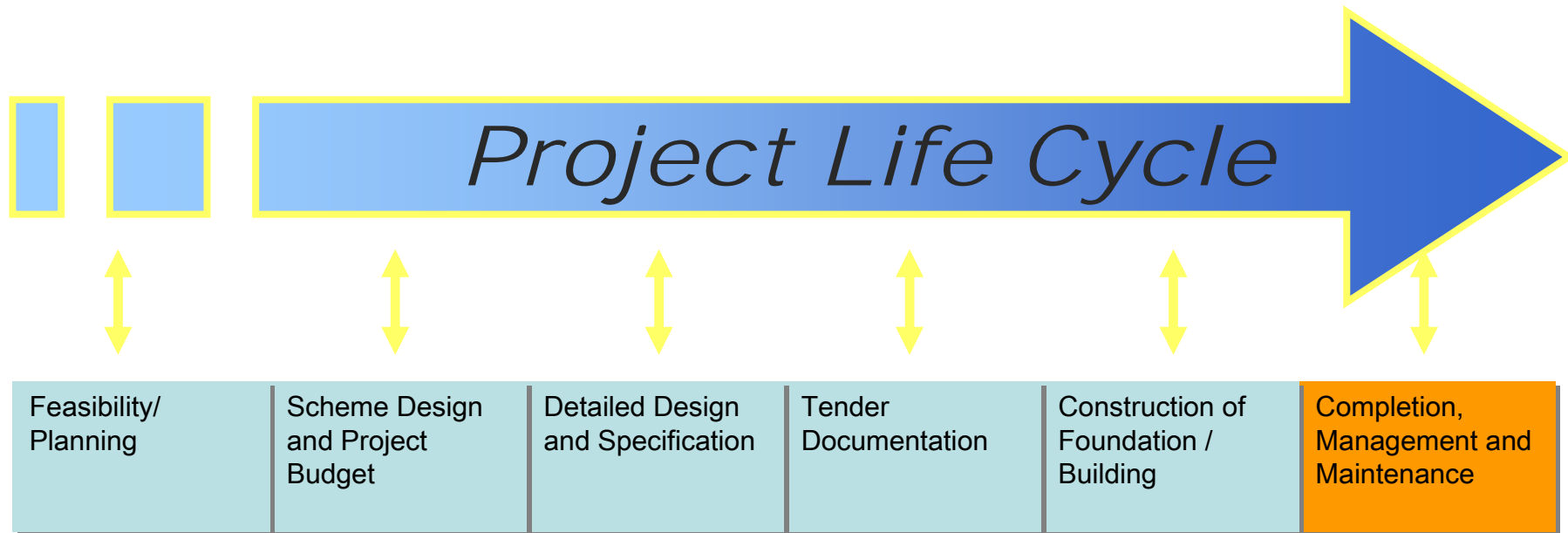


Effective Site Safety Planning

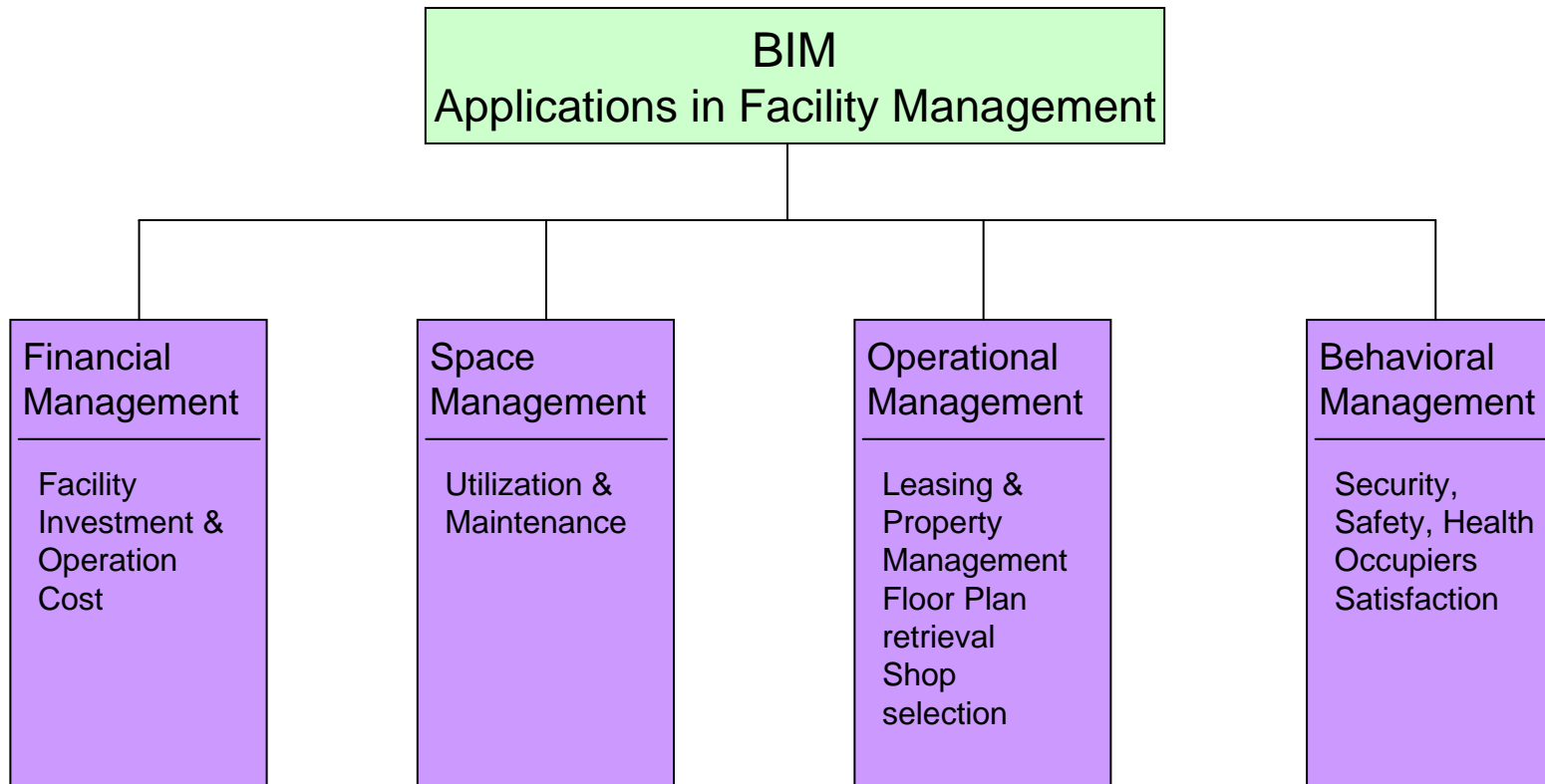


Simulation of Demolition Sequences

Examples of BIM applications in Facility Management



Potential use of BIM for Facility Management



YAU LAI SHOPPING CENTRE

- Seven-storey Commercial Centre adjacent to MTR Yau Tong Station
- Approximate Gross Floor Area of 8,810 sq.m.
- Building completion in 6/2010

Scope of BIM

- ◆ Modelling
- ◆ Clash Detection
- ◆ Spatial Checking
- ◆ Design Refinement
- ◆ 2D and 3D Combined Services Drawings (CSD)
- ◆ Leasing
- ◆ Facility Management (First trial)
- ◆ Animation



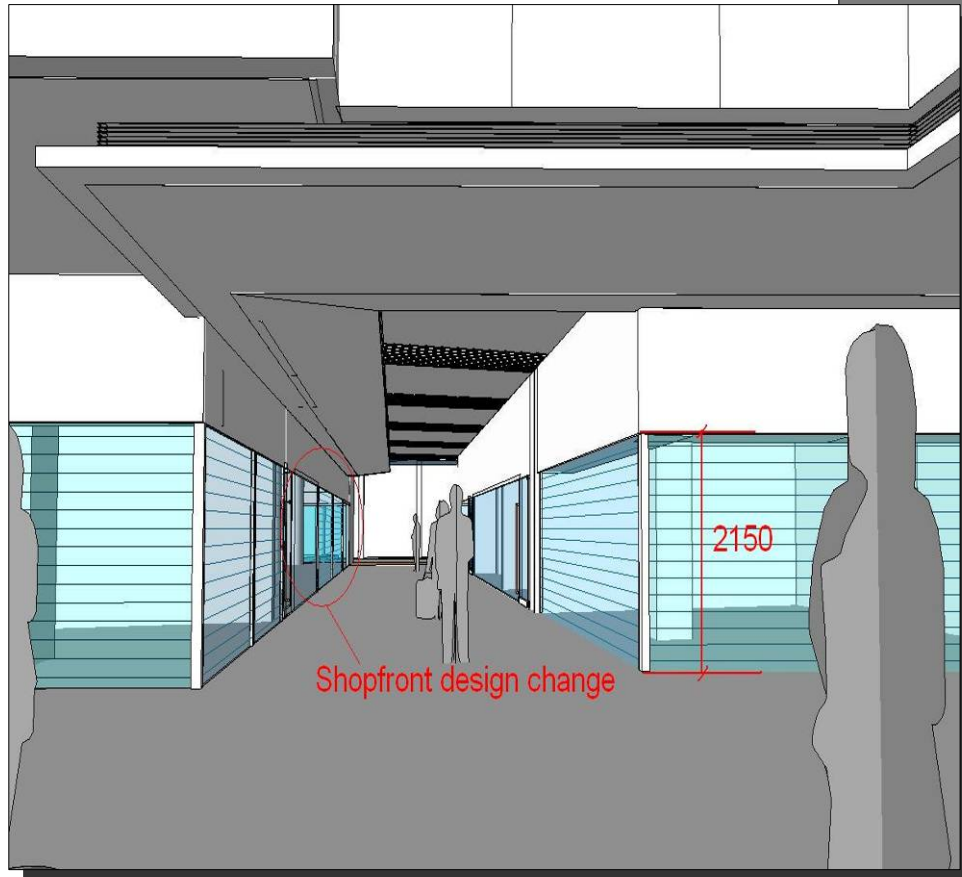
YAU LAI SHOPPING CENTRE

BIM assists in Services and Utilities Management

- Careful planning & reduce risk of clashes at both planning and design stage
- Effective daily facilities management & provide platform of retrieval of useful data & accurate visualization
- Build up appropriate combined record for regular repair, preventive maintenance and life cycle reference.

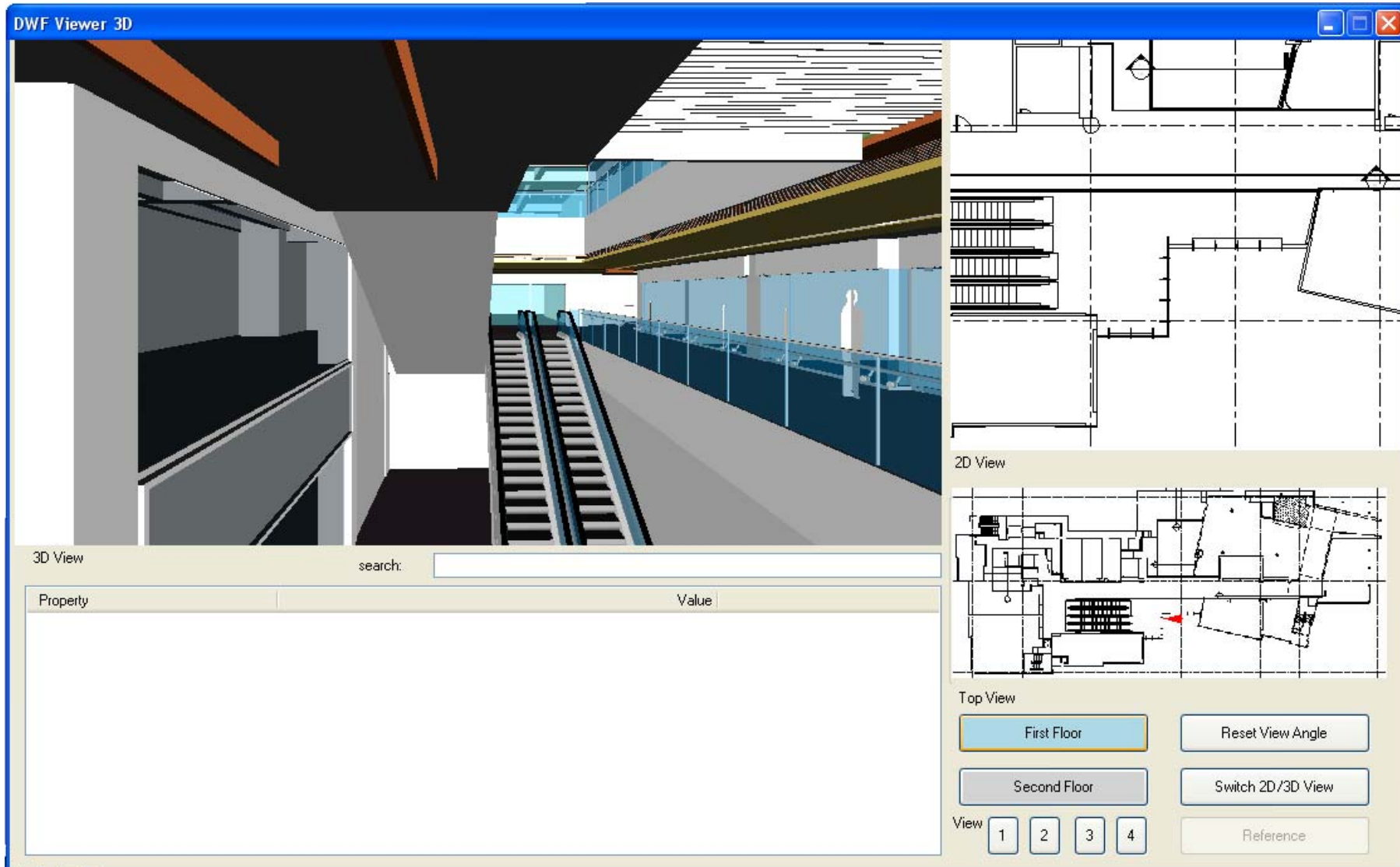
BIM Application in Space Management

➤ Better Visualization



Facilities Management

Let's take a look at each floor...



Facilities Management

Take a look at the Shop fronts

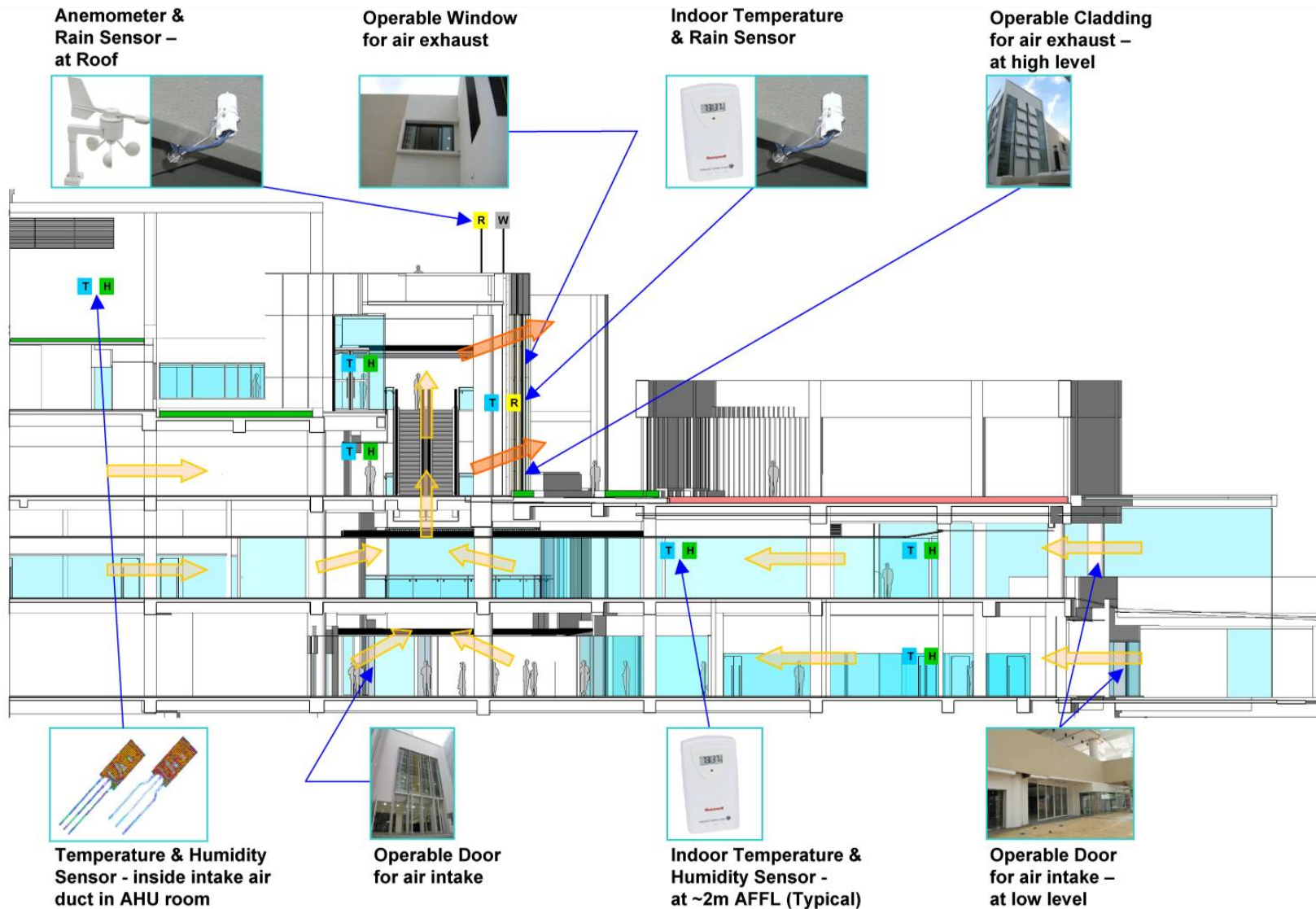
The screenshot displays the DWF Viewer 3D interface. The main window is divided into several sections:

- 3D View:** A perspective view of a shop front with a yellow wall and a blue glass railing. A search bar is located below the view.
- 2D View:** A top-down architectural drawing of the shop front, showing the layout of the wall and railing.
- Top View:** A detailed top-down view of the shop front, showing the railing and wall structure.
- Property Table:** A table listing the properties of the selected object, "Window Wall".
- Navigation and View Controls:** Buttons for "First Floor", "Second Floor", "Reset View Angle", "Switch 2D/3D View", and "Reference". A "View" section contains four numbered buttons (1, 2, 3, 4).

Property	Value
Object Name	Window Wall
Id	197f110d-79a5-460d-ad41-465db8a9fe4
Base Constraint	05 2/F
Base Offset	0
Room Bounding	Yes
Top Constraint	05 2/F
Top Offset	2210
Unconnected Height	2210
Structural Usage	Non-bearing
Area	31 m ²
Length	14214
Volume	0.79 m ³

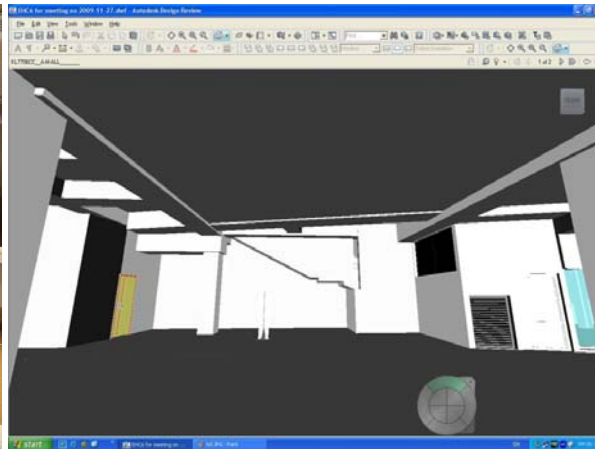
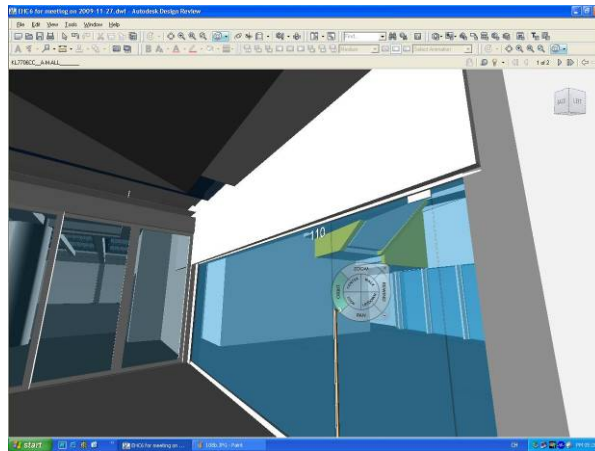
Facilities Management

Zoom in special design features, e.g. Hybrid Ventilation System



Facilities Management

Prospective tenants can visualize the space before placing bids



Facilities Management

For Building Services Installations

The image displays two software windows side-by-side. The left window is titled "DWF Viewer 3D v1.0" and shows a 3D perspective view of a modern building interior. A prominent feature is a yellow escalator with black handrails, set against a background of glass walls and structural elements. Below the 3D view is a search bar and a "Property" table.

Property	
Id	2db3e57b-4611-4d...
Category Name	
Family Name	
Type Name	
Level	
Escalator No.	

The right window is titled "PJ1227-IE-01-07B AS BUILT Layout1 (1).pdf - Adobe Acrobat Pro Extended". It displays a detailed architectural floor plan of the same area shown in the 3D view. The drawing includes grid lines labeled C, D, and E, and various annotations such as "TEMPERED GLASS BALUSTRADE", "30mm RECESS AREA", and "ALUMINIUM CLADDING". It also shows the locations of "ESC 1 & 2" and "ESC 3 & 4". A title block in the bottom right corner contains the following information:

AS-BUILT	
PROJECT NO.	
DATE	
SCALE	
SHEETING INFORMATION	
SHEETS OF BUILDING CONTRACTORS LIMITED	
DRAWING NAME:	
DRAWING NO.:	
REVISION	
NO.	DESCRIPTION
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Facilities Management

Retrieve Escalator documents from BIM models easily



HONG KONG HOUSING AUTHORITY
FORM CLOP-FL1
Certificate on examination of lift or escalator and on
testing of safety equipment provided therefor
upon completion of the installation

Date : _____

To: The Director of Housing

*Lift/Escalator No. : _____ *Block/House : _____ *Estate/Court : _____
I, _____, *registered lift engineer (No. L _____) / registered escalator engineer (No. E _____),
certify that the above *lift/escalator was examined and the safety equipment provided therefor was tested, in accordance with section 12(1)
of the Lifts and Escalators (Safety) Ordinance, Chapter 327, by me on the _____ day of _____.
I am satisfied that, on the _____ day of _____, the above lift/escalator was in safe working order.
Next periodic examination of the *lift/escalator and periodic testing of its safety equipment shall be carried out on or before
_____.

香港房屋委員會
表格 CLOP-FL1
有關檢驗新安裝升降機或自動梯及測試其安全設備之證明書

日期 : _____

致：房屋署署長

裝設於 _____ *邨/苑 _____ *樓閣之第 _____ 號*升降機/自動梯。
本人 _____ 為*註冊升降機工程師(編號 L _____) / 註冊自動梯工程師(編號 E _____)，茲證明本人曾於
_____ 年 _____ 月 _____ 日按照升降機及自動梯(安全)條例(香港法例第327章)第12(1)款之規定，檢驗上述升降機/自動梯，並測
試其安全設備。
本人於 _____ 年 _____ 月 _____ 日認為上述升降機/自動梯效能良好，操作安全。
下次定期檢驗*升降機/自動梯及定期測試其安全設備必須於 _____ 年 _____ 月 _____ 日或之前進行。

Contractor Number *RLC/REC [] [] [] [] [] []
承建商編號

Signature of registered *lift/escalator contractor
註冊*升降機/自動梯承建商簽署

Signature of registered *lift/escalator engineer
註冊*升降機/自動梯工程師簽署

I certify that the above certificate issued by the *registered lift engineer/registered escalator engineer was received and registered.
證明經已收到由*註冊升降機工程師/註冊自動梯工程師簽署之上述證明書，並且予以登記。

Senior Building Services Engineer/Ordinance
for Director of Housing
房屋署署長(高級屋宇裝備工程師(條例)代行)

Date : _____
日期

*Delete where inapplicable
將不適用者刪去
CLOP-FL1 (1.2010)

Certification of Completion
(CLOP-FL1)



HONG KONG HOUSING AUTHORITY
FORM CLOP-FL3
Certificate on periodic examination of escalator or periodic
testing of safety equipment provided therefor, or both

Date : _____

To: The Director of Housing

Escalator No. : _____ *Block/House : _____ *Estate/Court : _____
I, _____, registered escalator engineer (No. E _____), certify that -
(a) the above escalator was examined by me in accordance with section 22 of the Lifts and Escalators (Safety) Ordinance, Chapter
327, on the _____ day of _____.
(b) the safety equipment provided for the above escalator was tested *by me in accordance with section 24 of the Lifts and
Escalators (Safety) Ordinance, Chapter 327, on the _____ day of _____.
I am satisfied that, on the _____ day of _____, the above escalator *and the safety equipment
provided for the above escalator was in safe working order.
Next periodic examination of the escalator and/or periodic testing of its safety equipment shall be carried out on or before
_____.

香港房屋委員會
表格 CLOP-FL3
定期檢驗自動梯或定期測試其安全設備或兩項一併進行之證明書

日期 : _____

致：房屋署署長

裝設於 _____ *邨/苑 _____ *樓閣之第 _____ 號自動梯。
本人 _____ 為註冊自動梯工程師(編號 E _____)，茲證明 -
(甲) 本人曾於 _____ 年 _____ 月 _____ 日按照升降機及自動梯(安全)條例(第327章)第22條之規定，檢驗上述自動梯。
(乙) *本人曾於 _____ 年 _____ 月 _____ 日按照升降機及自動梯(安全)條例(第327章)第24條，測試上述自動梯之安全設備。
本人於 _____ 年 _____ 月 _____ 日認為上述自動梯及上述自動梯之安全設備效能良好，操作安全。
下次定期檢驗自動梯及/或定期測試其安全設備必須於 _____ 年 _____ 月 _____ 日或之前進行。

Contractor Number REC [] [] [] [] [] []
承建商編號

Signature of registered escalator contractor
註冊自動梯承建商簽署

Signature of registered escalator engineer
註冊自動梯工程師簽署

I certify that the above certificate issued by the registered escalator engineer was received and registered.
證明經已收到由註冊自動梯工程師簽署之上述證明書，並且予以登記。

Senior Building Services Engineer/Ordinance
for Director of Housing
房屋署署長(高級屋宇裝備工程師(條例)代行)

Date : _____
日期

*Delete where inapplicable
將不適用者刪去
CLOP-FL3(1.2010)

Certification of Periodic Examination
(CLOP-FL3)

Facilities Management

Easy to retrieve the Glass Wall information from BIM

The image displays a software interface for BIM (Building Information Modeling) with a focus on facilities management. It features three main components:

- DWF Viewer 3D:** A window on the left showing a 3D perspective view of a building interior with a glass wall. Below the view is a "Property" panel with the following attributes: Object Name, Id, Base Constraint, Base Offset, Room Bounding, Top Constraint, Top Offset, Unconnected Height, Structural Usage, Area, Length, and Volume.
- windowwall.pdf - Adobe Reader:** A central window displaying a technical document for a "CBCO 24 40" chain drive actuator. The document includes a product image, the brand "SE CONTROLS", and technical specifications: "Stroke 200/ 250/ 380/ 500/ *700/ *800 mm" and "CHAIN DRIVE ACTUATOR 24V dc 400N". It also lists "Applications" with icons for different window types and "Features" for "Natural Ventilation" and "Smoke Ventilation".
- Background:** A 2D architectural drawing of a floor plan, showing the location of the glass wall and the actuator.

At the bottom right of the interface, there are several control buttons: "Reset View Angle", "Switch 2D/3D View", and "Reference".

Facilities Management

Easy to retrieve Building Services Installations

The image displays a software interface for facilities management, showing a 3D model of a building interior, a 2D floor plan, and a PDF document titled "Chalice 2C Surface.pdf".

The 3D model (DWF Viewer 3D v1.0) shows a modern office interior with a glass railing, a large pillar, and several yellow cylindrical lighting fixtures mounted on the ceiling. A search bar is visible below the 3D view.

The 2D floor plan (Top View) shows a layout of rooms and corridors. A specific room is labeled "CX/107". Below the floor plan are navigation buttons: "LG2", "LG1", "G/F", "1/F", "2/F", "Reset View Angle", and "Switch 2D/3D View".

The PDF document (Chalice 2C Surface.pdf - Adobe Acrobat Pro Extended) displays the following information:

- Product:** Chalice 2C Surface
- Subject:** Leaflet
- Date:** December, 2006
- Author:** Dennis Cheung
- Contact:** dennis.cheung@thorn.com.hk

Leaflet

Chalice 2C Surface – A range of surface mounted downlights for compact fluorescent lamps.

Product Photo

Product Description

- Body and bezel made by steel painted powder coated in white.
- Available in horizontal lamp position.
- Choice of high frequency or conventional control gear.
- Ideal for commercial offices, corridors and under canopies.

Installation & Mounting? ?

2 key holes fixing points in the installation plate directly to the ceiling, fixing enters; 220 mm. Body and reflector are retained by screws to the installation plate. Body height: Horizontal lamp - 180mm.

Dimensions

Page 1 of 2

Benefits in applying BIM on Facility Management

- ✓ Effective control in facility investment & operation
- ✓ Effective control on space management, interior design, fitting-out & relocation
- ✓ Enhance asset control in property & maintenance management
- ✓ Achieve user's satisfaction, perception & participation

- ◆ **Integration of BIM with other technologies & the Way Forward**

**We can integrate BIM
with other technologies
for more potential applications :**

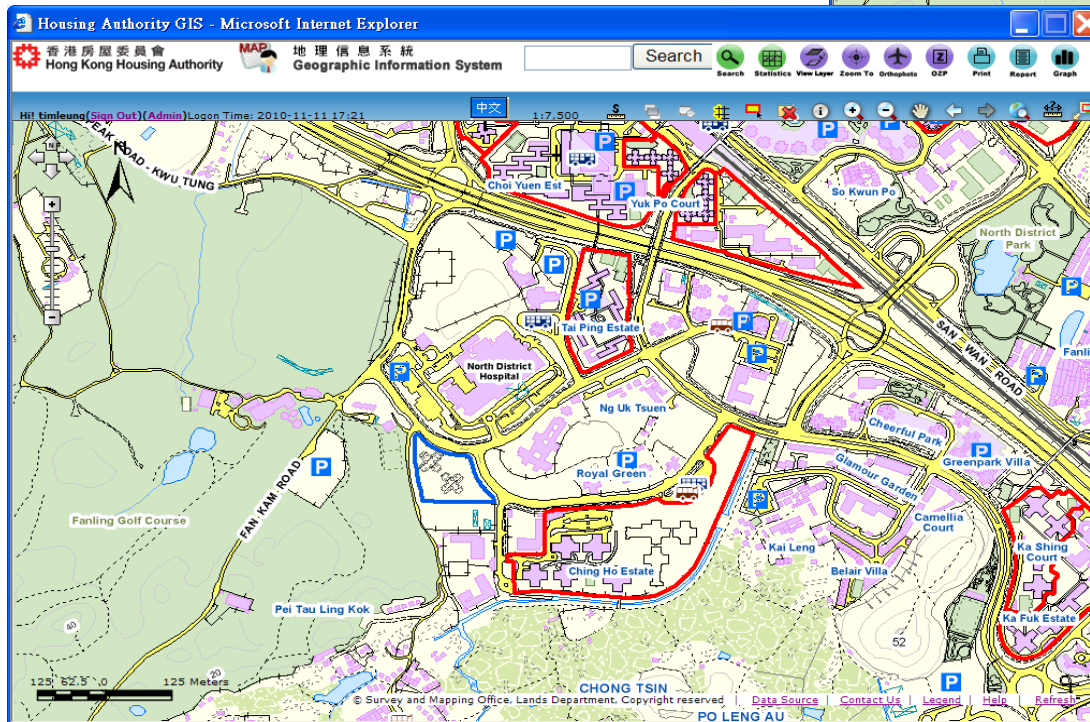
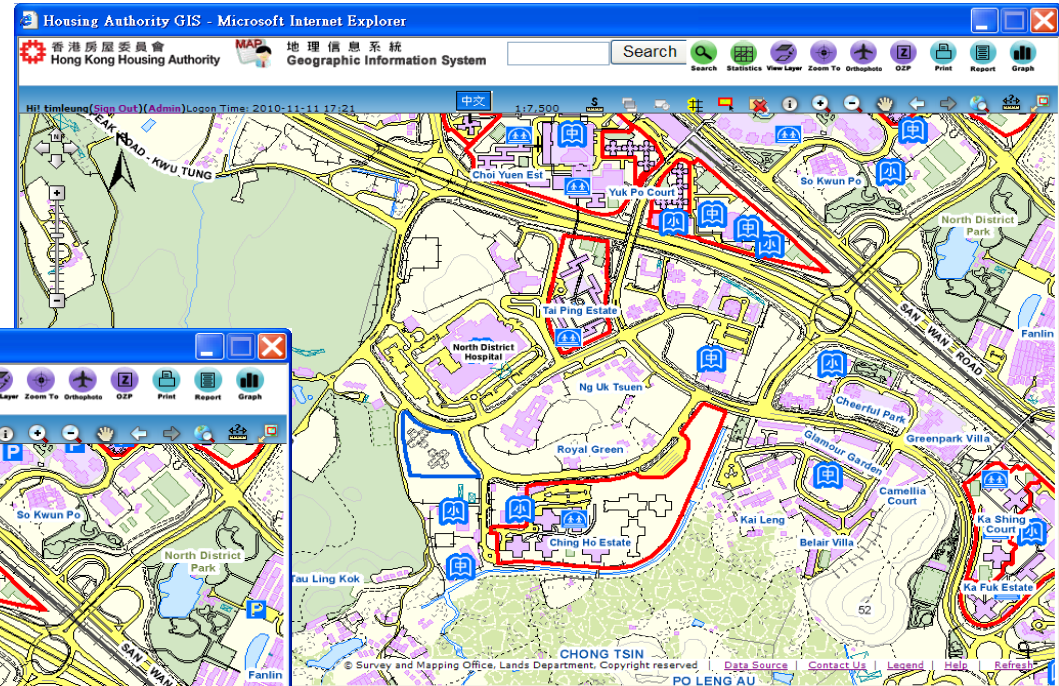
- ◆ Radio Frequency Identification Detection (RFID)
- ◆ Mobile / Handheld technologies
- ◆ Geographic Information System (GIS)
- ◆ HOMES (Project / Contract Management)

Integrate with GIS for estate wide Facility Management

◆ Educational

For example, checking nearby community facilities

◆ Parking Facilities

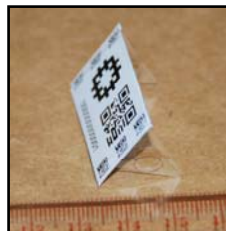


Integrate BIM with Radio Frequency Identification Detection (RFID) to track facilities maintenance record

- (a) Heavy duty tags – use in precast façade by embedment into concrete (Can withstand more severe working conditions, such as at high temperature; in chemical and presence of metallic interference)



- (b) Light duty tags – use in concrete cubes, timber doors, trucks



Application of RFID in Monitoring the Disposal of Construction and Demolition Materials

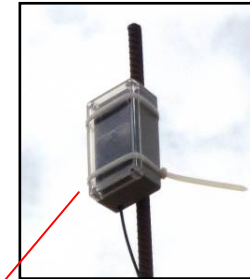
RFID Readers for Trucks entering & leaving the Site



RFID Reader adjacent to Weight-bridge



Camera for recording loading condition



Recorded Information

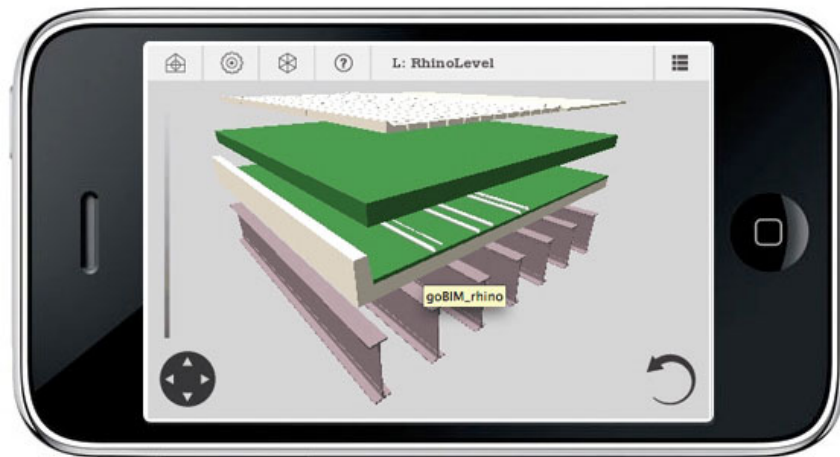


RFID Tag

Trial at So Uk Estate Phase 1

Potential viewing of BIM models on handheld devices


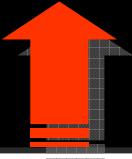
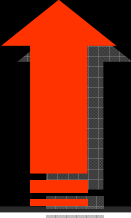
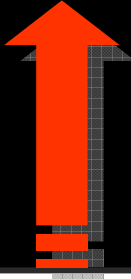
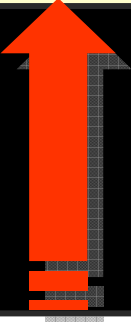
Easy to check facilities and retrieve information anytime anywhere.



Our Goal

Apply BIM to all new projects from design stage by **2014/15**

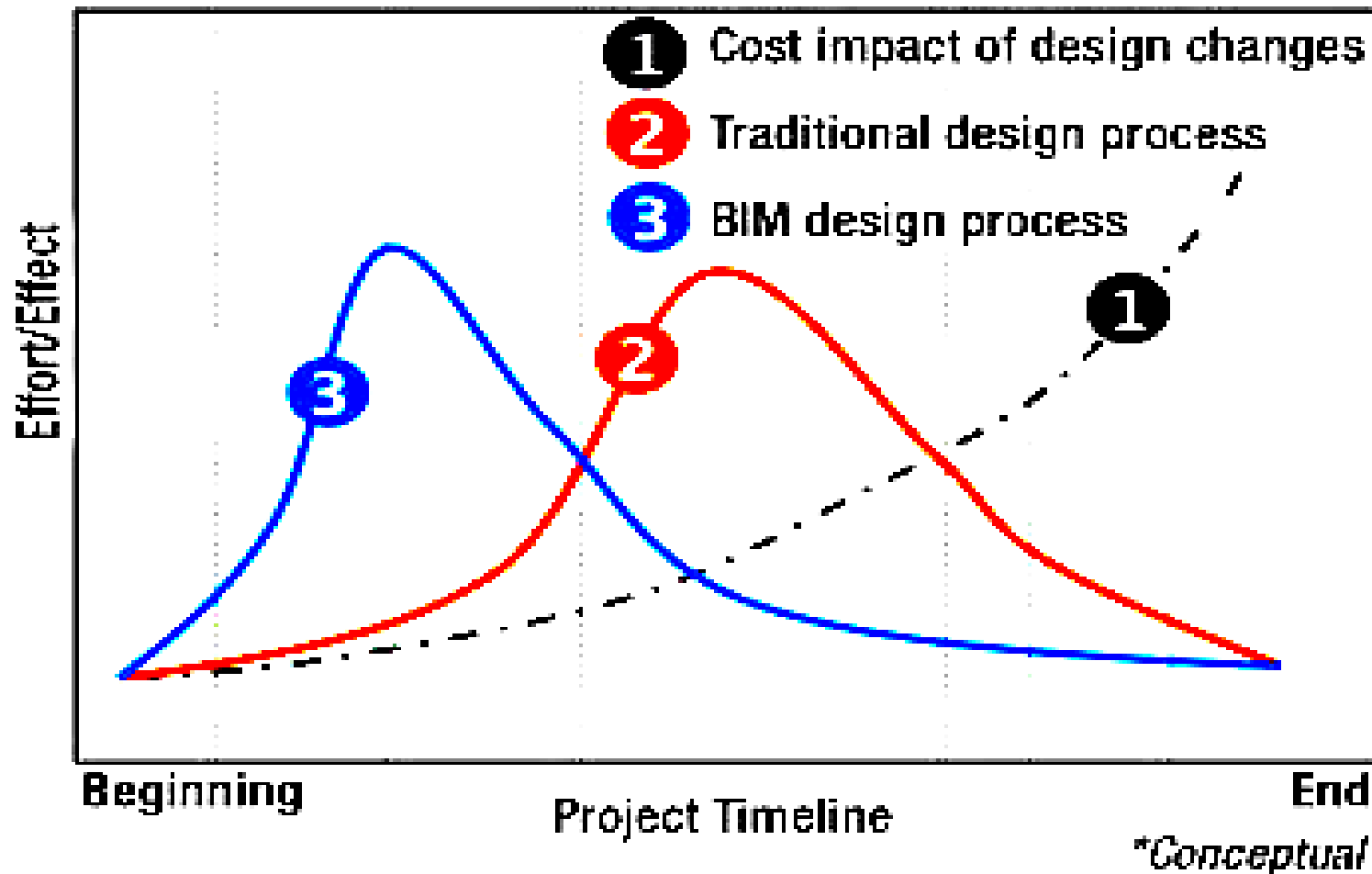
Transformations to Year 2014 /15

	10/11	11/12	12/13	13/14	14/15
Current	9 projects				
Annual		~ 2 - 3 projects*			
By 14/15					~ 20 projects*
Demand on BIM Skill & Experience					

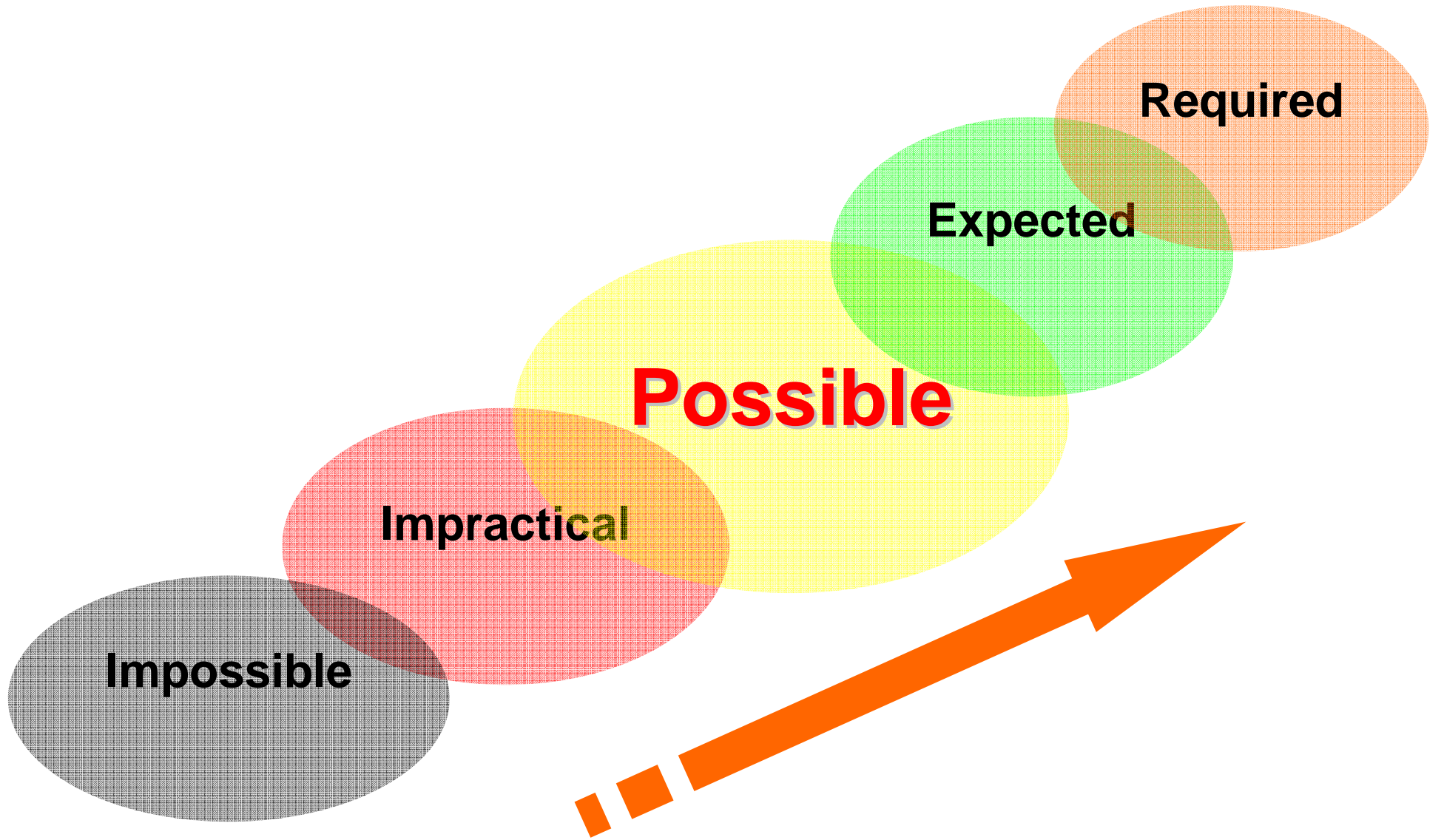
* The numbers of projects will be subject to adjustment

BIM Shifts the Resource Profile :

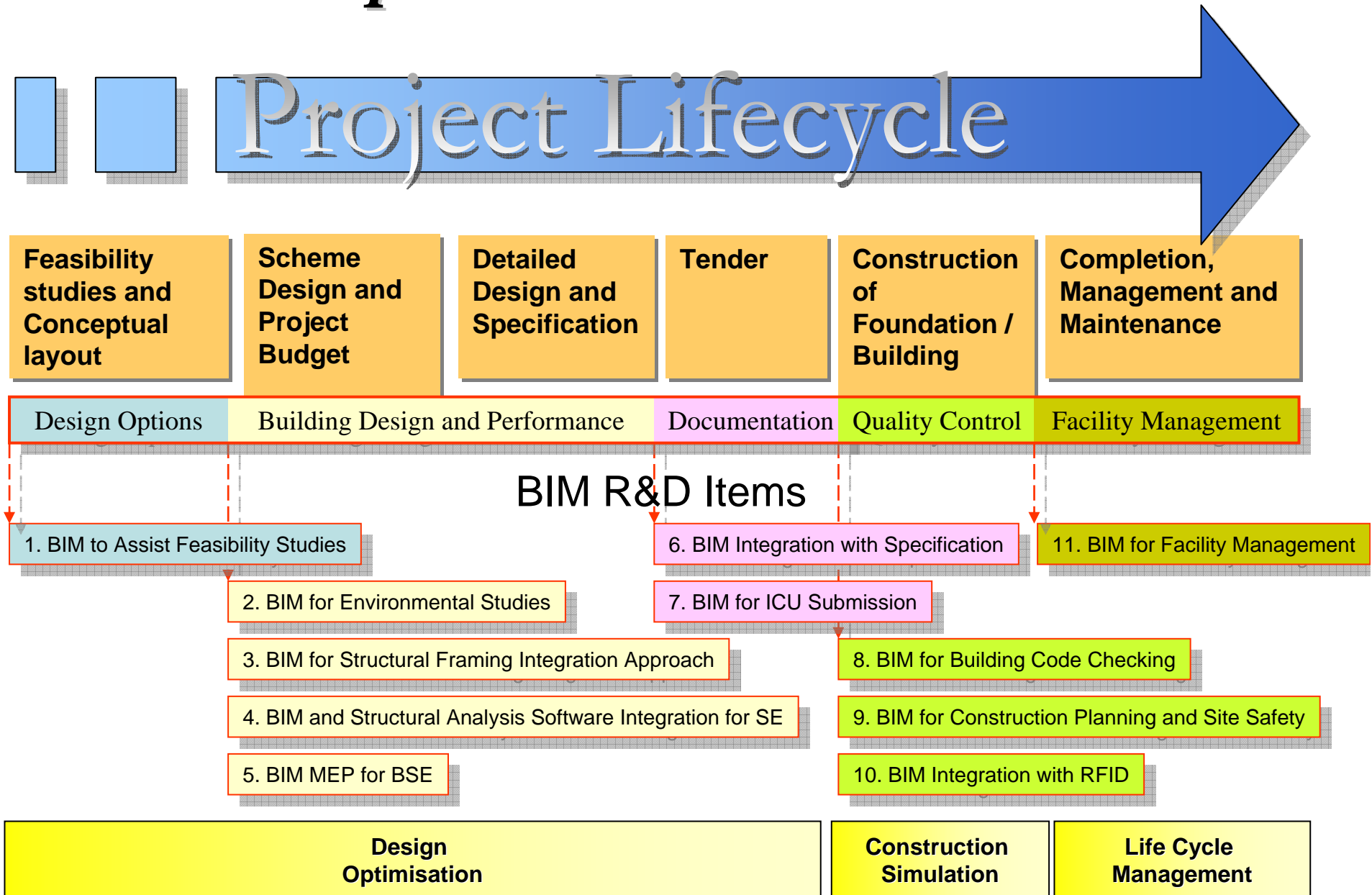
BIM Process Shifts the Design Curve*



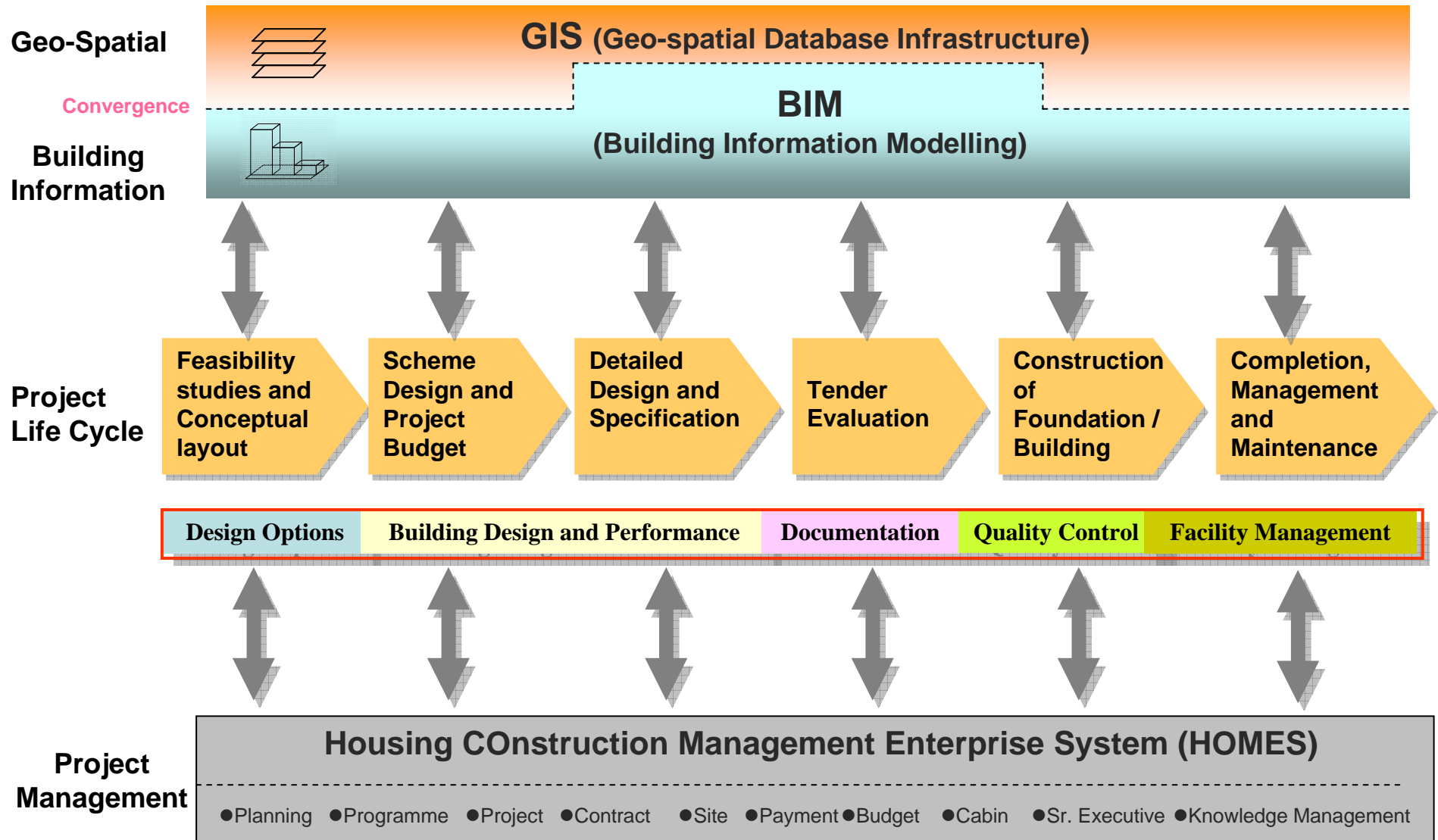
What's our big picture?



Proposed BIM R&D Items



Integration of BIM, GIS & HOMES



***We have met the CEO of BIM (Dec 2009) and
CEO of GIS (July 2010), and discussed with
them about our dream...***



CEO of Autodesk



CEO of ESRI

Way Forward

HA will continue to use BIM to enhance our portfolio towards smart living, safety and sustainability -

- ◆ BIM facilitates simulation of design feasibility, buildability & site operation.
- ◆ BIM facilitates professional team members such as planners, architects & engineers to visualize & resolve design to make decision effectively.
- ◆ BIM provides useful data for facilities management, repairs & preventive maintenance.
- ◆ BIM provides effective record system for life cycle costing & maintenance monitoring.

Fulfilling the Housing Authority's Mission : We apply BIM to help deliver our housing programme ...

According to our Core Values : 4Cs

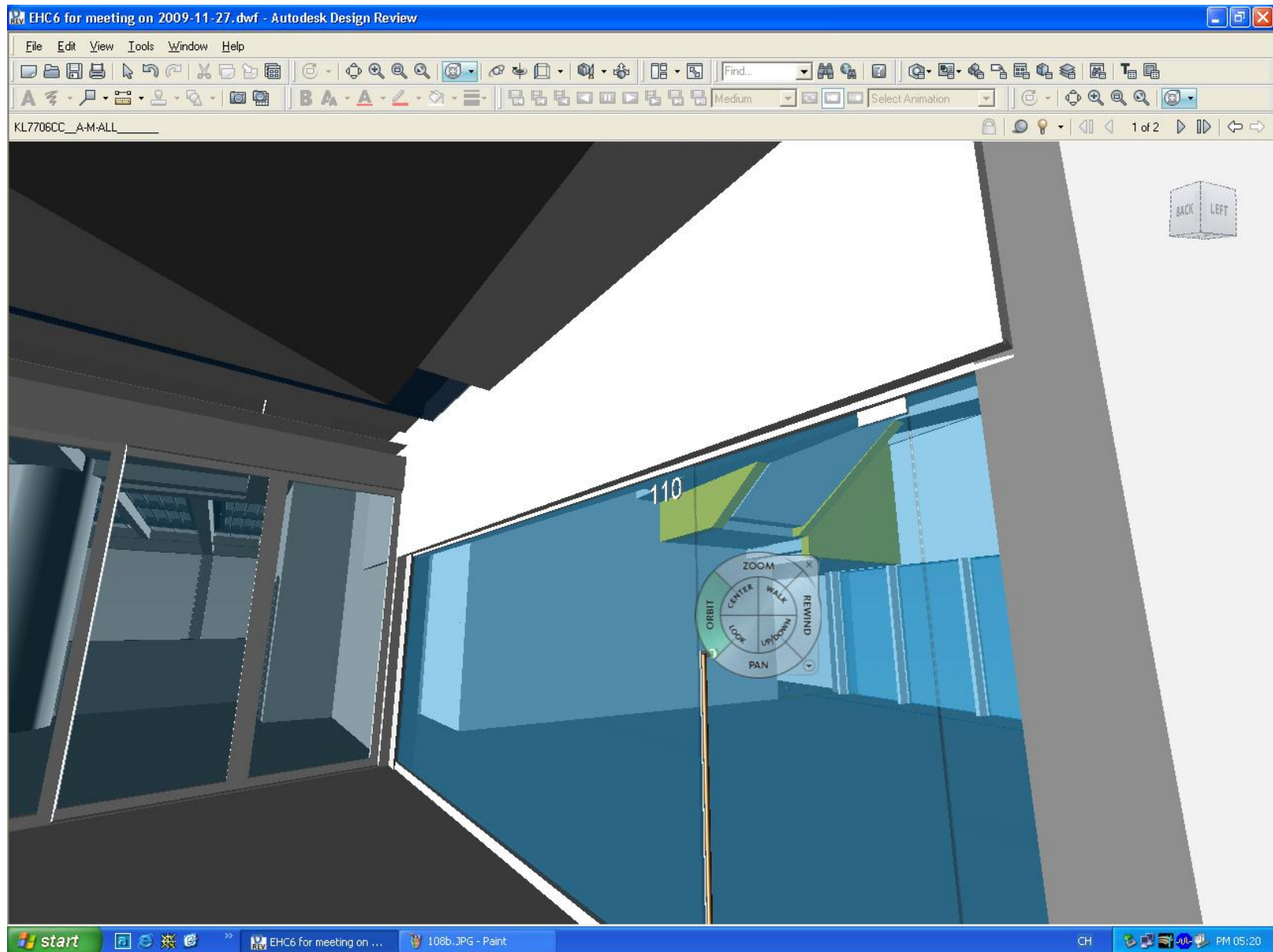
- Caring
- Customer-focused
- Creative
- Committed

Email : ada.fung@housingauthority.gov.hk

Website “<http://www.housingauthority.gov.hk/en>”

Thank You !

BIM Presentation of Individual Shop Front



BIM Presentation of Individual Shop Layout

