Integration of BIM in Public Housing Development

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International QS BIM Conference

香港房屋委員會
Hong Kong Housing Authority

Speaker :

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Deputy Director of Housing

(Development & Construction)

Contents

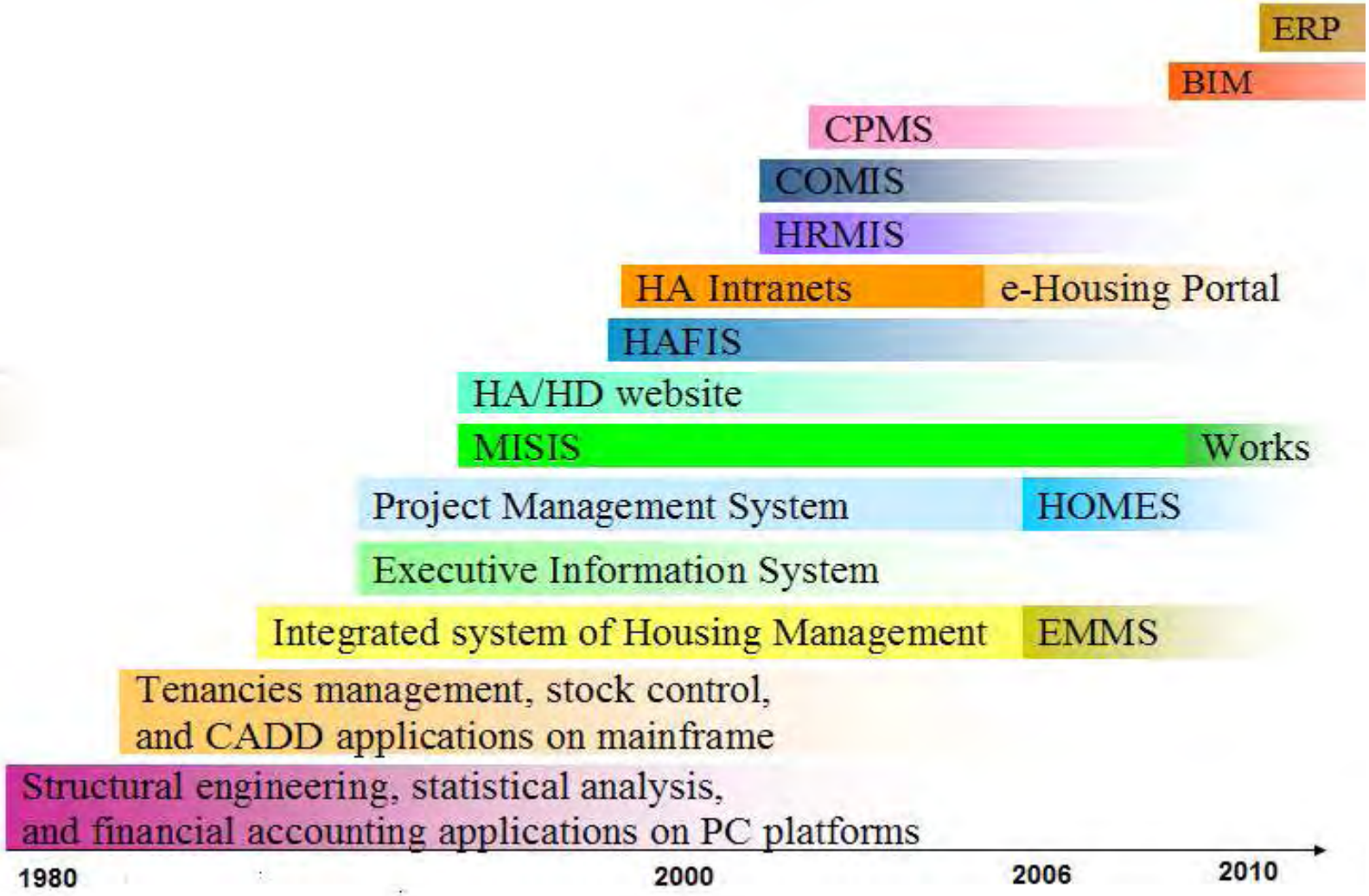
Introduction to HA

Hong Kong Housing Authority

- The Hong Kong Housing Authority (HA) is a statutory body established in April 1973 under the Hong Kong Housing Ordinance. The Housing Department is HA's executive arm.
- HA develops and implements a public housing programme to meet the housing needs of people who cannot afford private rental housing.
- Approximately 30% of the Hong Kong population is now living in public rental housing units.
- The HA has an existing stock of about 730,000 rental flats.
- We build 79,000 new PRH flats for five years from 2012/13 to 2016/17 and build 100,000 new PRH flats for the five years starting from 2018.
- We build 17,000 new HOS flats for four years from 2016/17 to 2019/20 and thereafter 5,000 new HOS flats a year.

ICT in HA

Information & Communication Technology (ICT)



Concept of BIM

Building Information Modeling

"Building Information Modeling (BIM) is the process of developing and using three-dimensional, digital representation of building data throughout its life cycle."

BIM's Versatility

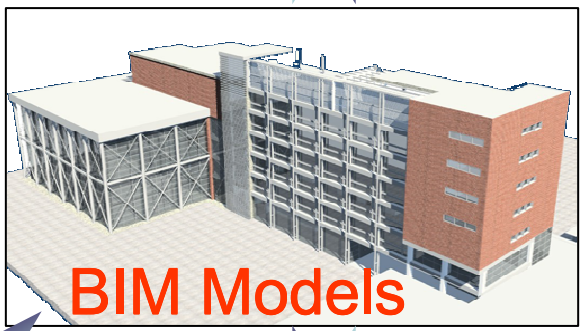
Construction

Design

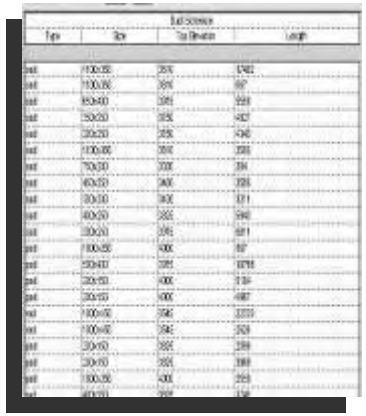
Simulation

2D Drawings

Rendering

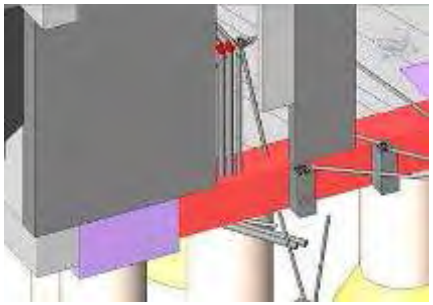


Performance Analysis



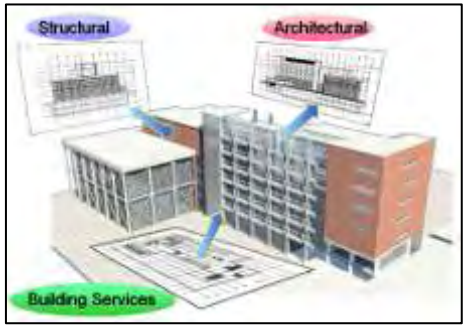
Material Quantities

Visual Impact

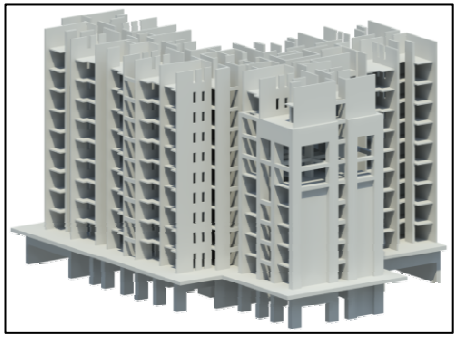


Collision Check

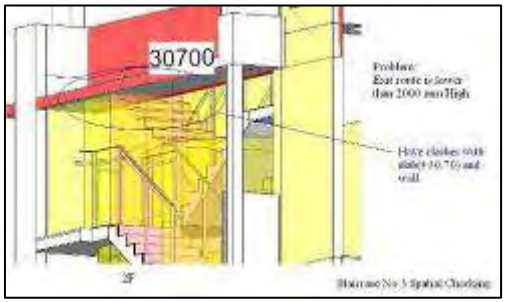
BIM Software



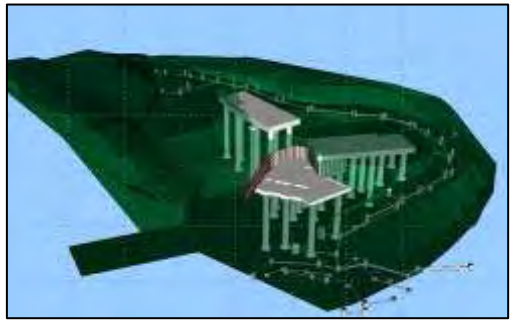
Revit (BIM Modeling)



ETABS/ ORION (Structural Analysis)



Solibri (Code Checking)

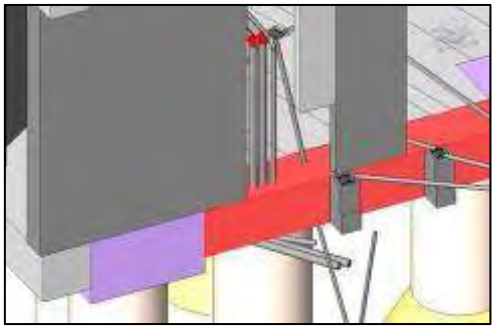


Civil 3D (CE/GE Design)

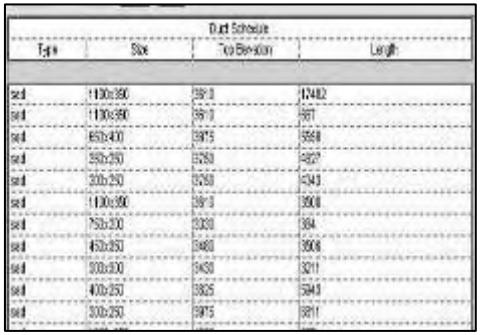
Navisworks (4D Simulation)

3D Max (Photo-realistic Rendering)

Ecotect (Performance Analysis)



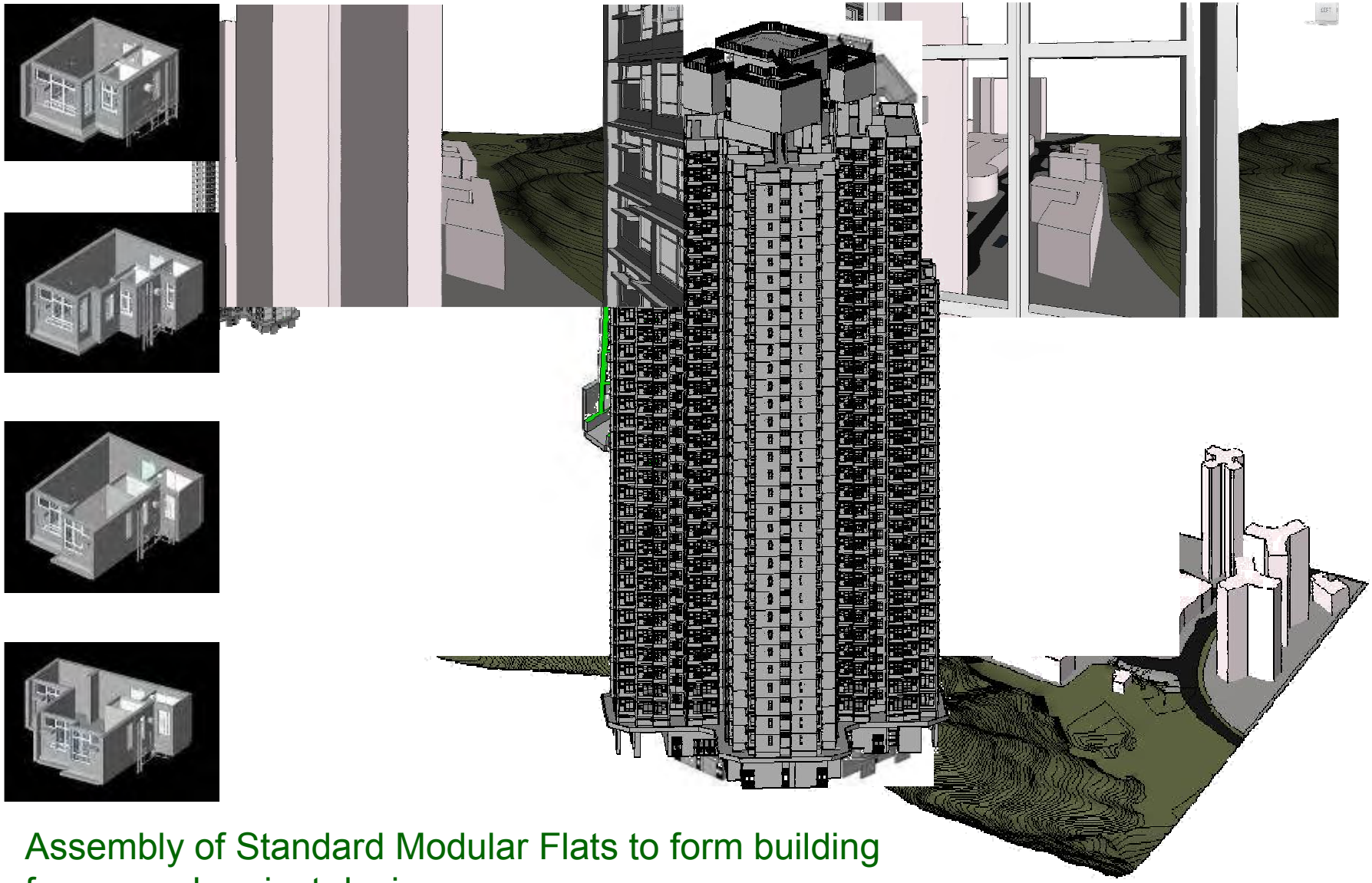
Navisworks (Collision Check)



Cost X (Material Quantities)

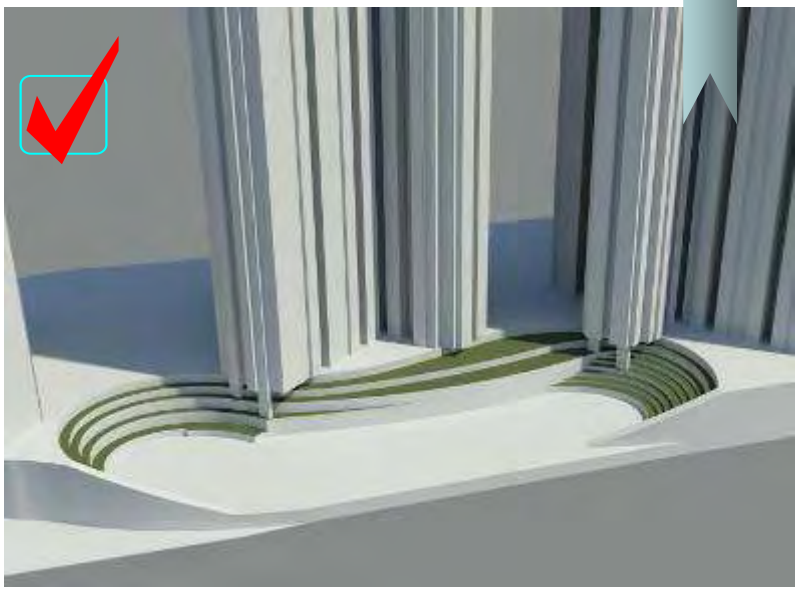
Adoption of BIM in Current Projects

Quick Assembly of Domestic Blocks

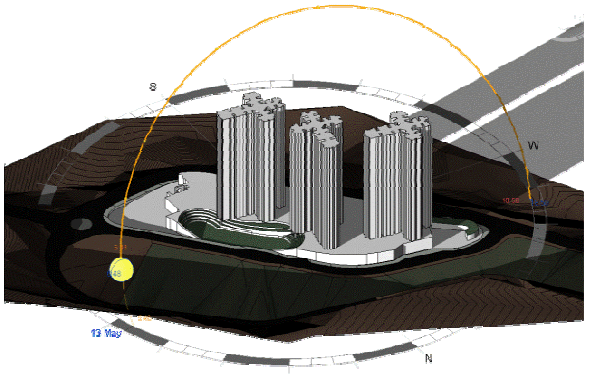


Assembly of Standard Modular Flats to form building for general project design.

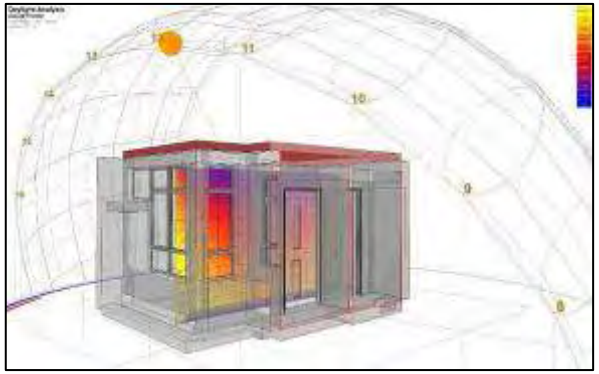
Enhance Quality of Design

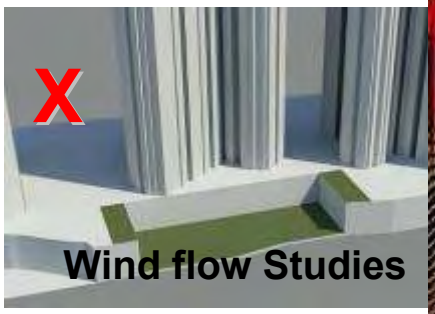


Sunlight & Shadow Studies

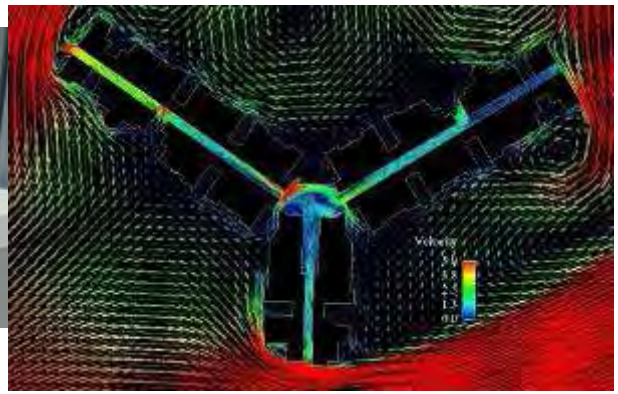


Daylight Analysis





Wind flow Studies



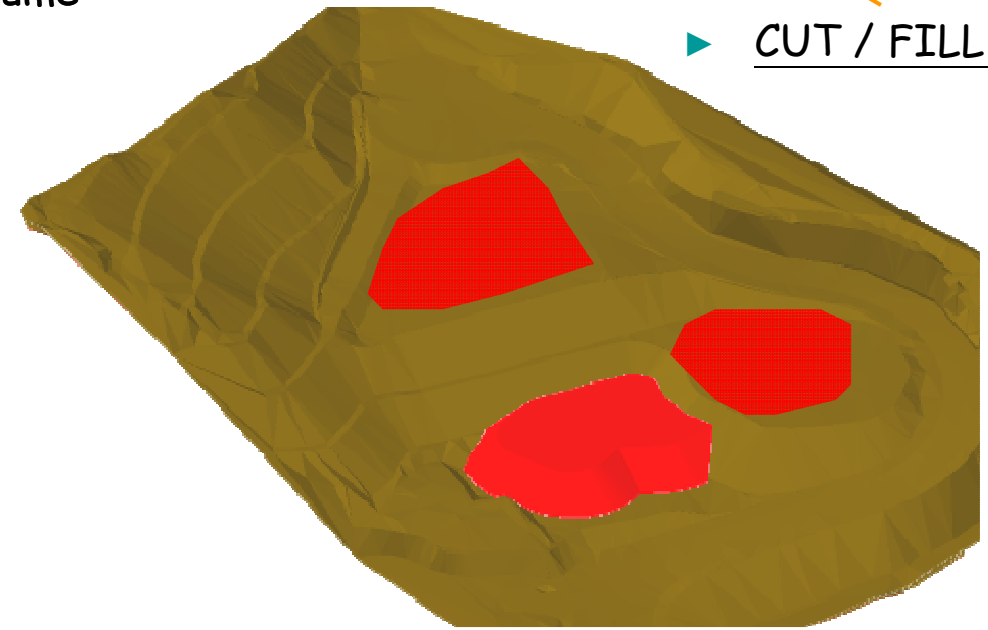
Enhance Cost Control and Environmental Protection

Balancing of Cut and Fill volume

Schedule of Mass Concrete Fill for Footing						
Name	Mark	Projected Area	Surface area	Cut	Fill	Net cut/fill
Pad RFTG	Pad RFTG-4	2928m^2	3122m^2	0.00m^3	22300m^3	32m^3
Pad RFTG	Pad RFTG-1	4587m^2	4956m^2	0.00m^3	27300m^3	50m^3

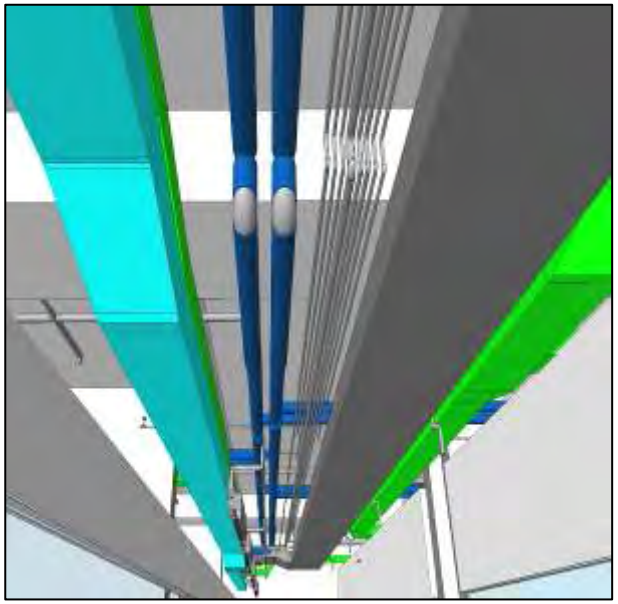
- Excavation volume

- CUT / FILL volume of each Mass Fill

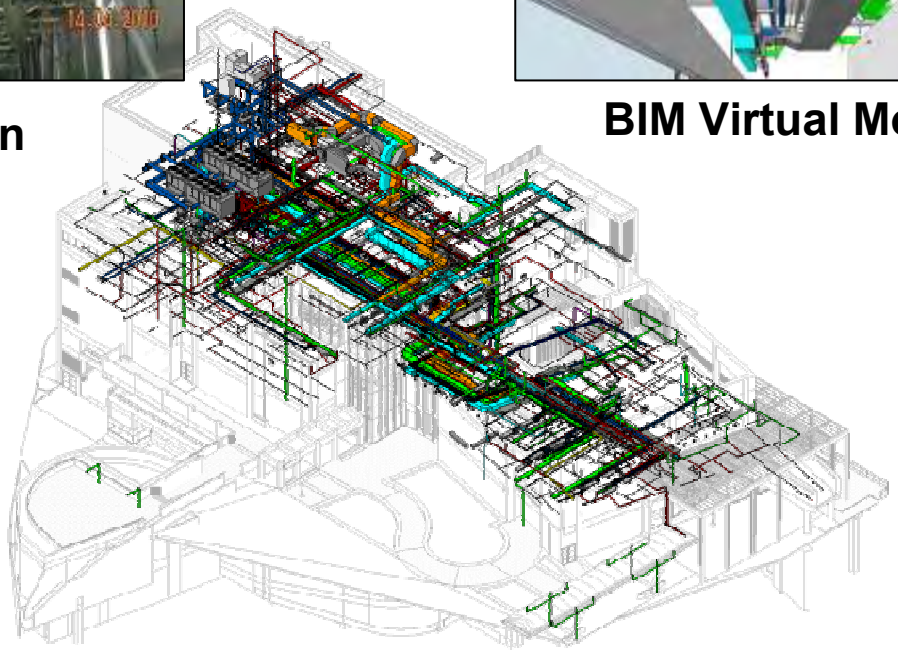


Better Building Services Co-ordination

Actual Construction

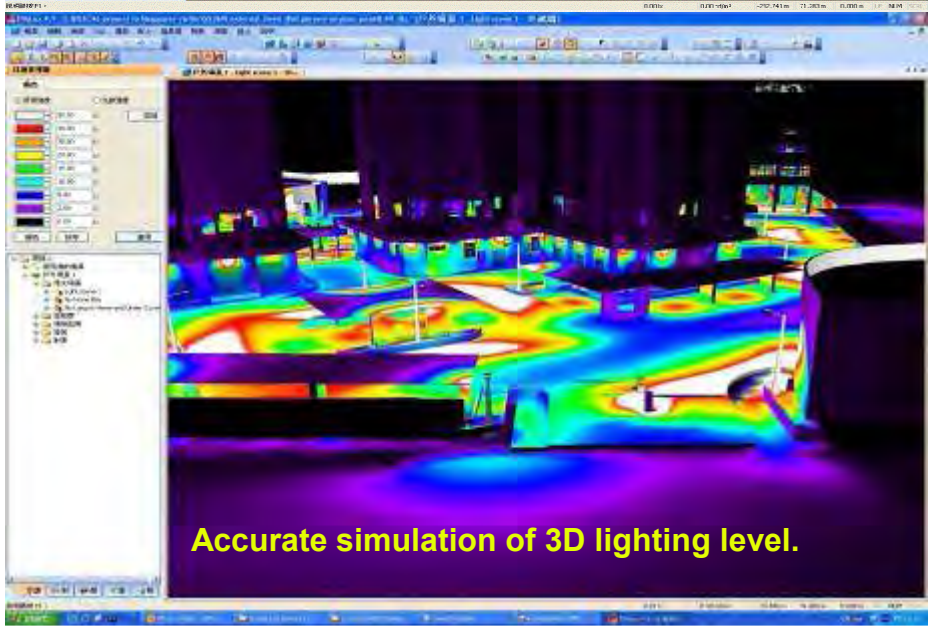


BIM Virtual Model



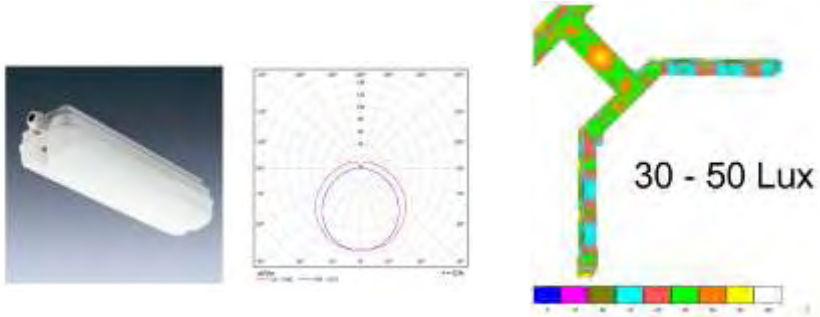
Optimize Lighting Design for Energy Saving

Integration of neighborhood, building and surrounding lighting contribution to achieve optimum site lighting design.

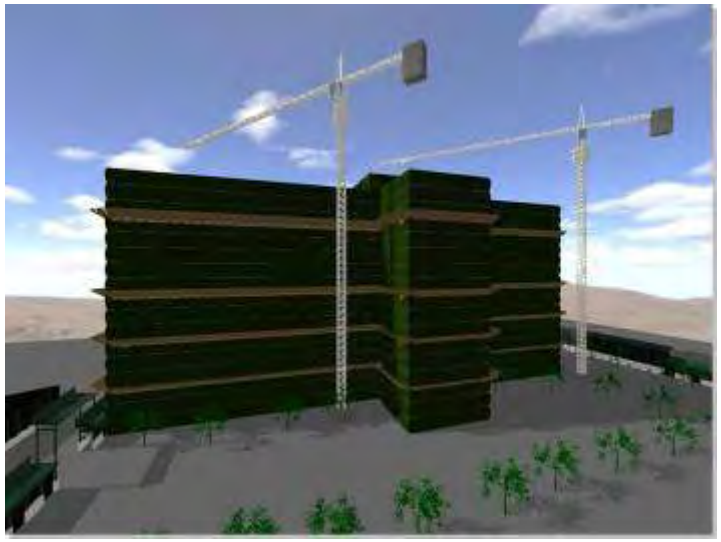


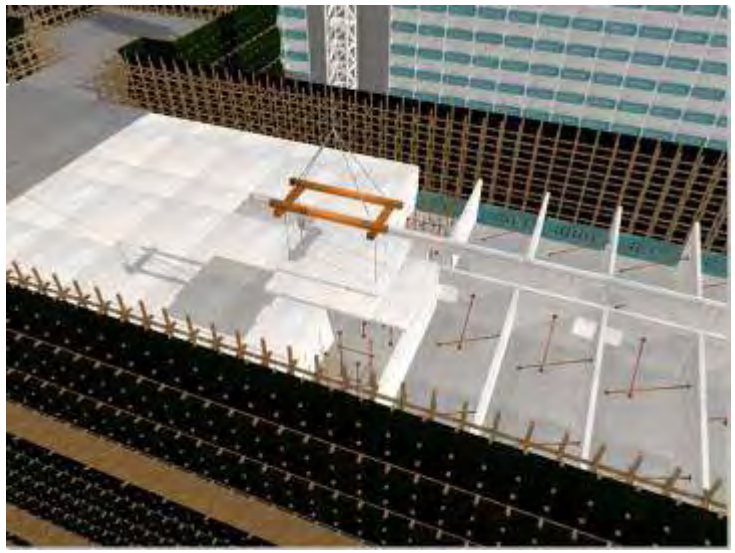
Accurate simulation of 3D lighting level.

Development of more energy efficient lighting operation mode.

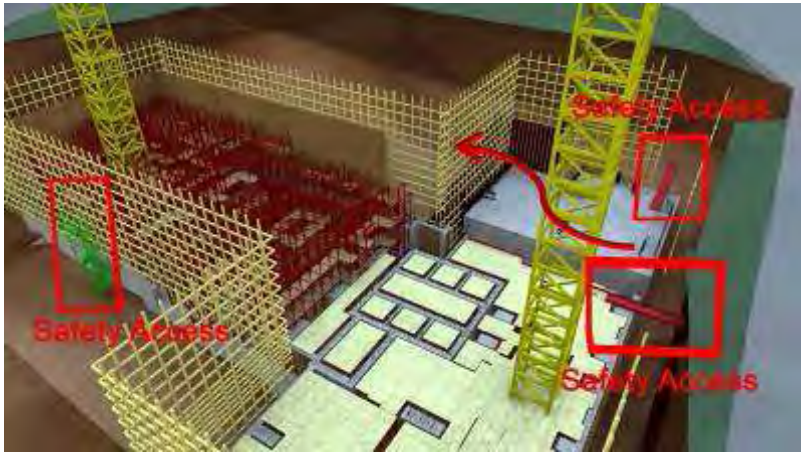


Site Safety Planning

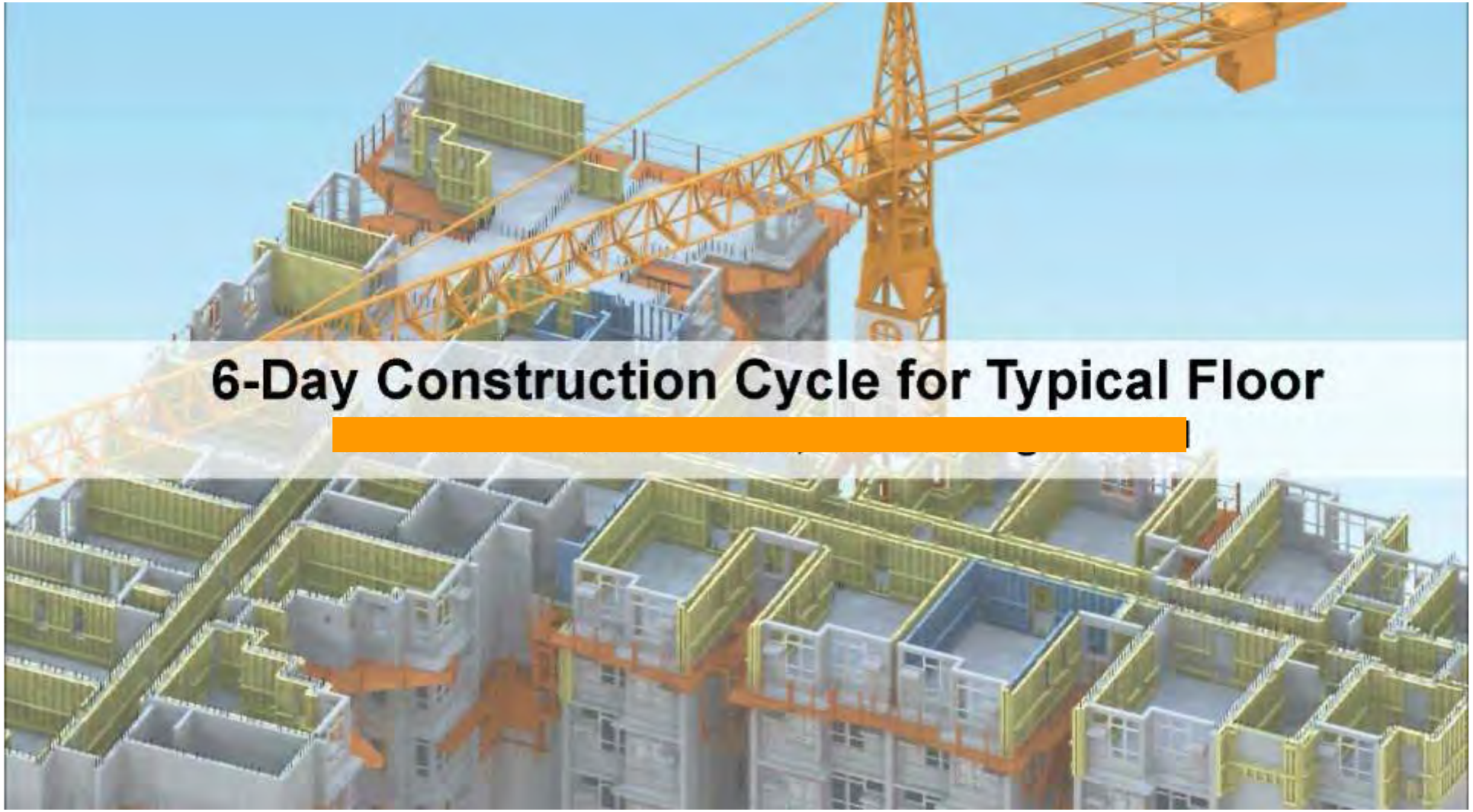




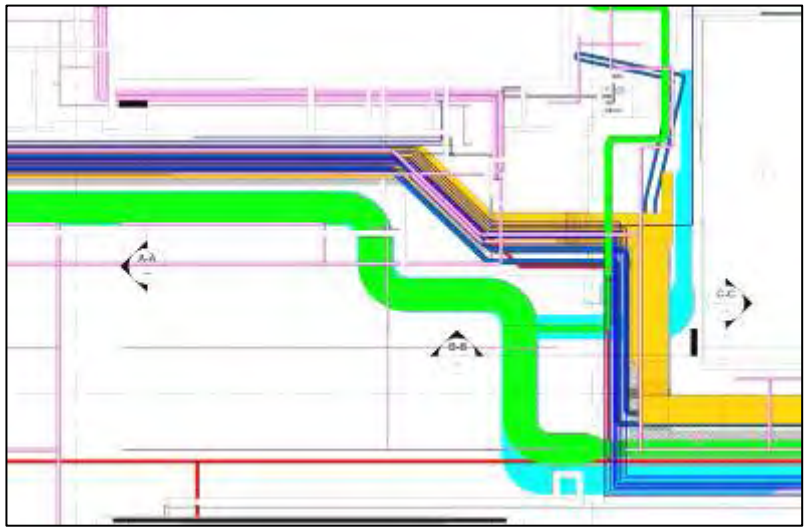
Construction Site Planning

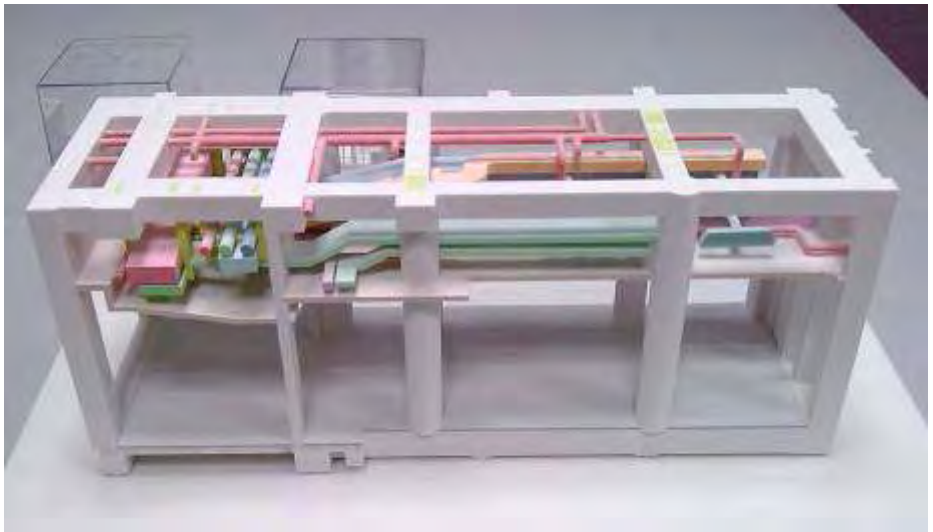


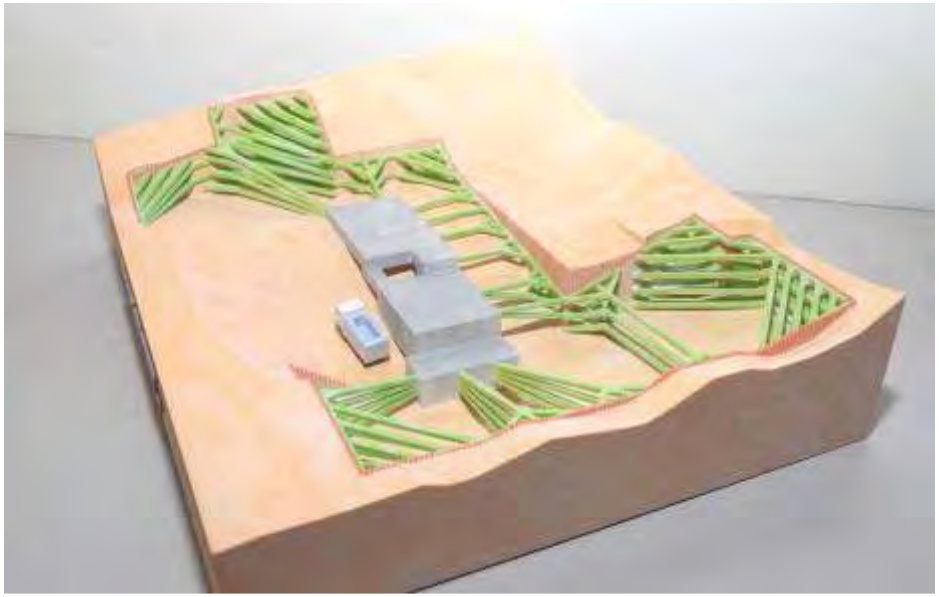
6-Day Construction Cycle



3D Printing Triggers Innovative Ideas

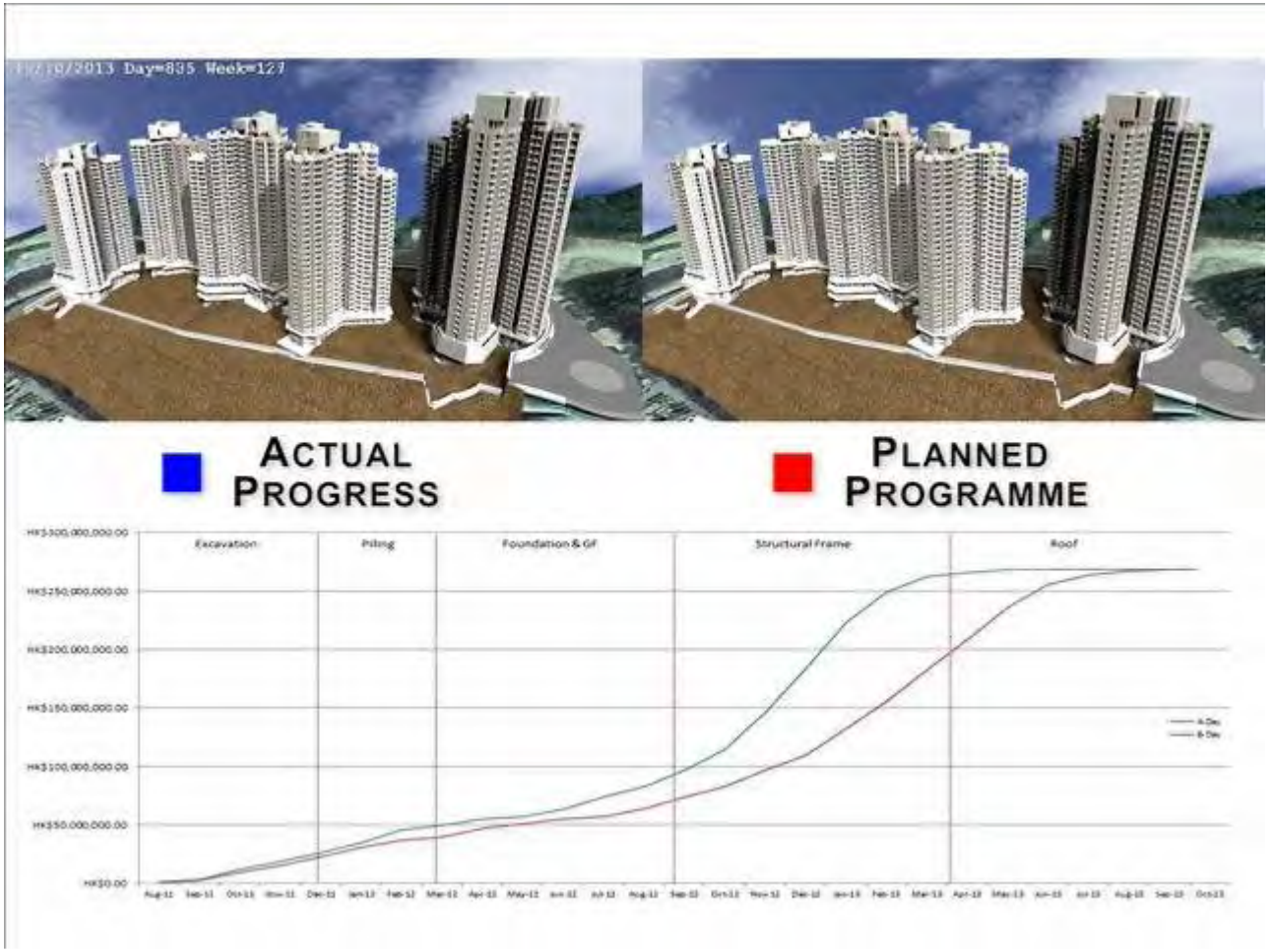






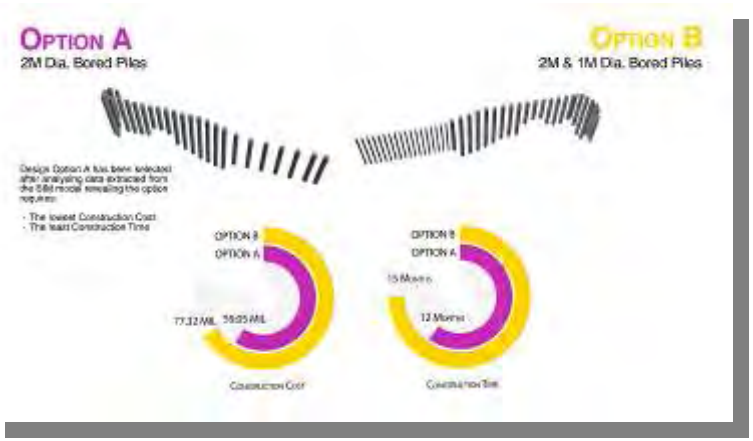
5D BIM Model

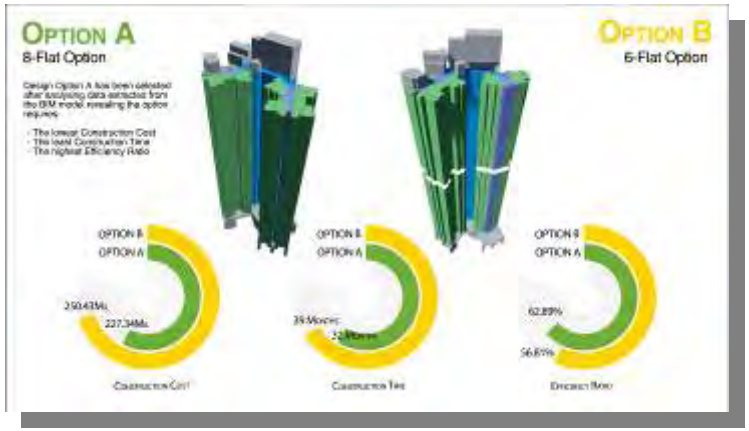
Cash flow simulation has been created by the integration of extracted quantities from BIM model, construction programme and cost information.

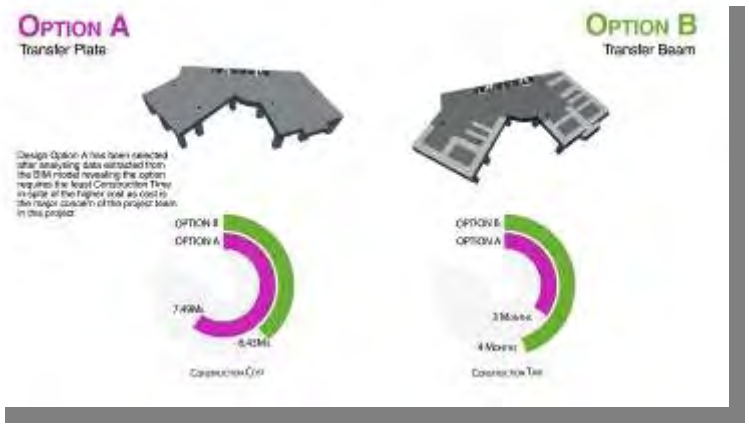


- ✓ Reveals actual and predicted cash flow of the project.
- ✓ Better understanding of project cash flow.

BIM as a Value Management Tool

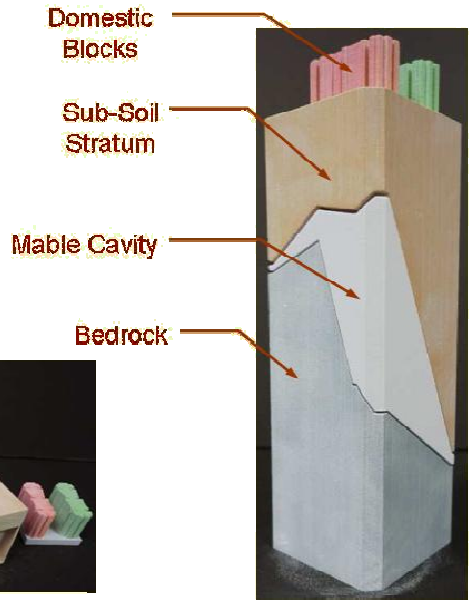




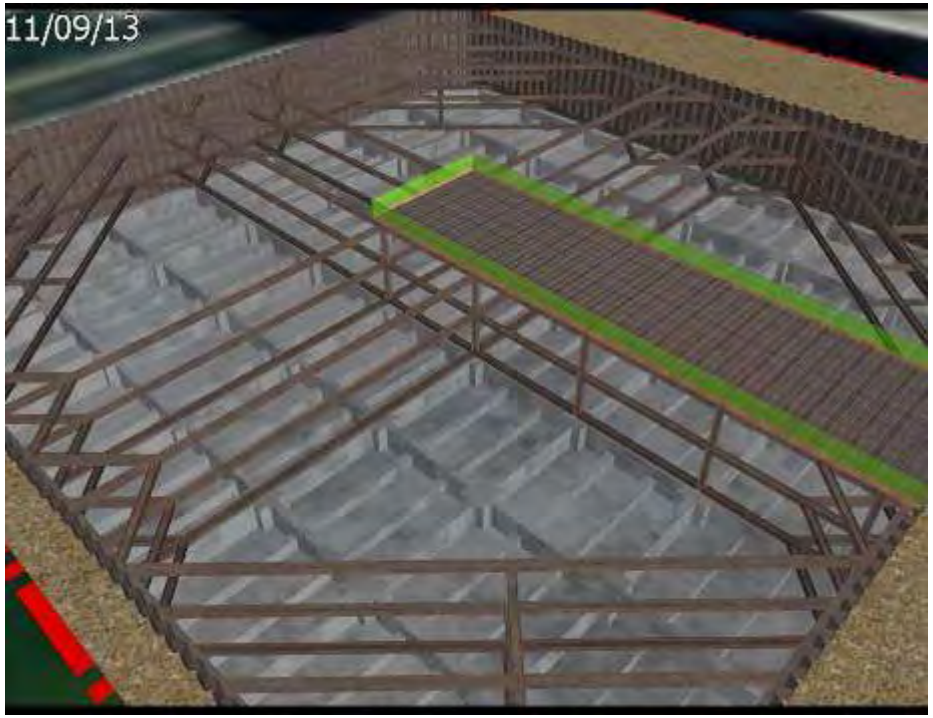


Geological Profile & 4D Model for ELS

3D Print-out of geological model of the site.



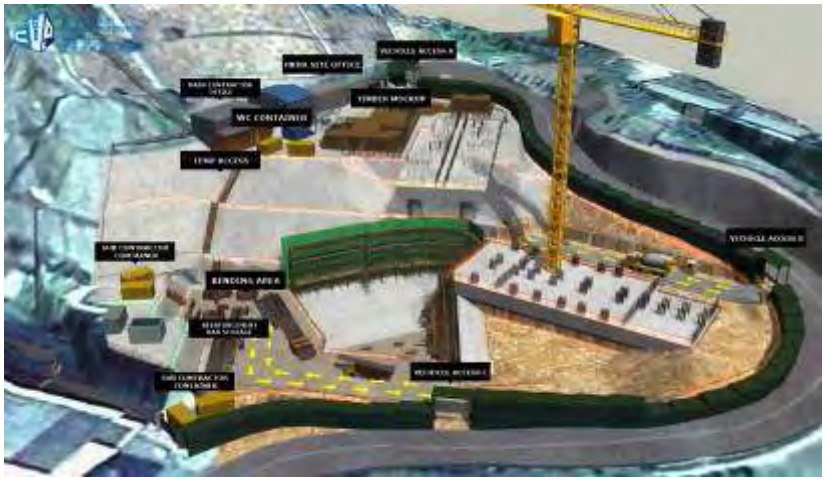
Illustrate Geological Profile of the Site



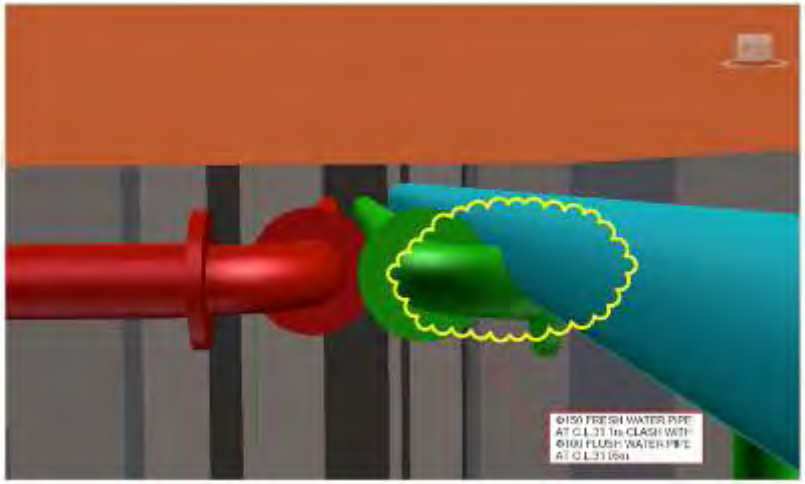
Simulate the Construction Sequence of ELSW & Buoyancy Raft

Contractor's Applications

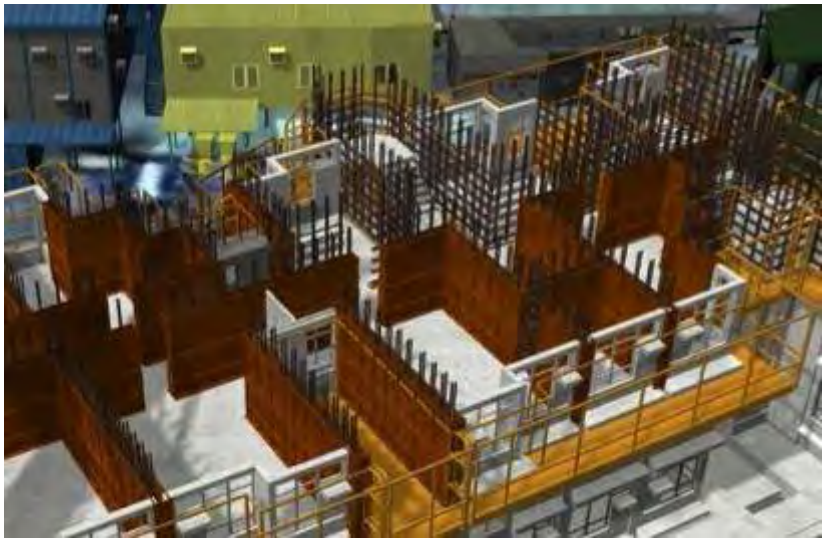
Site Layout Planning



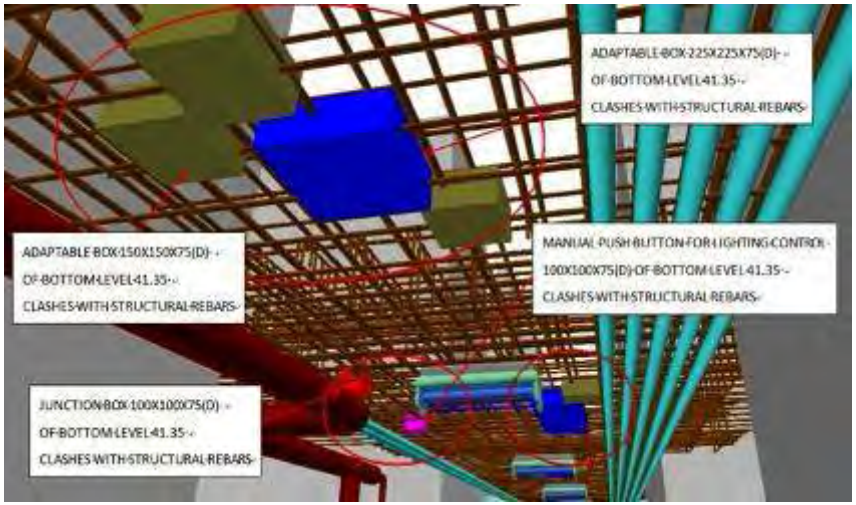
Clashes Study



Virtual Rehearsal : Six-day Cycle for Typical Floor



Rebars Fixing & Services Installation Collaboration



Integration of BIM and GIS

Development of Geographic Information System & Application in HA

Development & Construction Division

Estate Management Davison

2005

Desktop GPIS for Planning Studies

2009

Web based 2D GPIS for Planning Studies

2012

3D GIS for Feasibility Studies, & Design

2013

3D GIS for Facilities Manage-ment

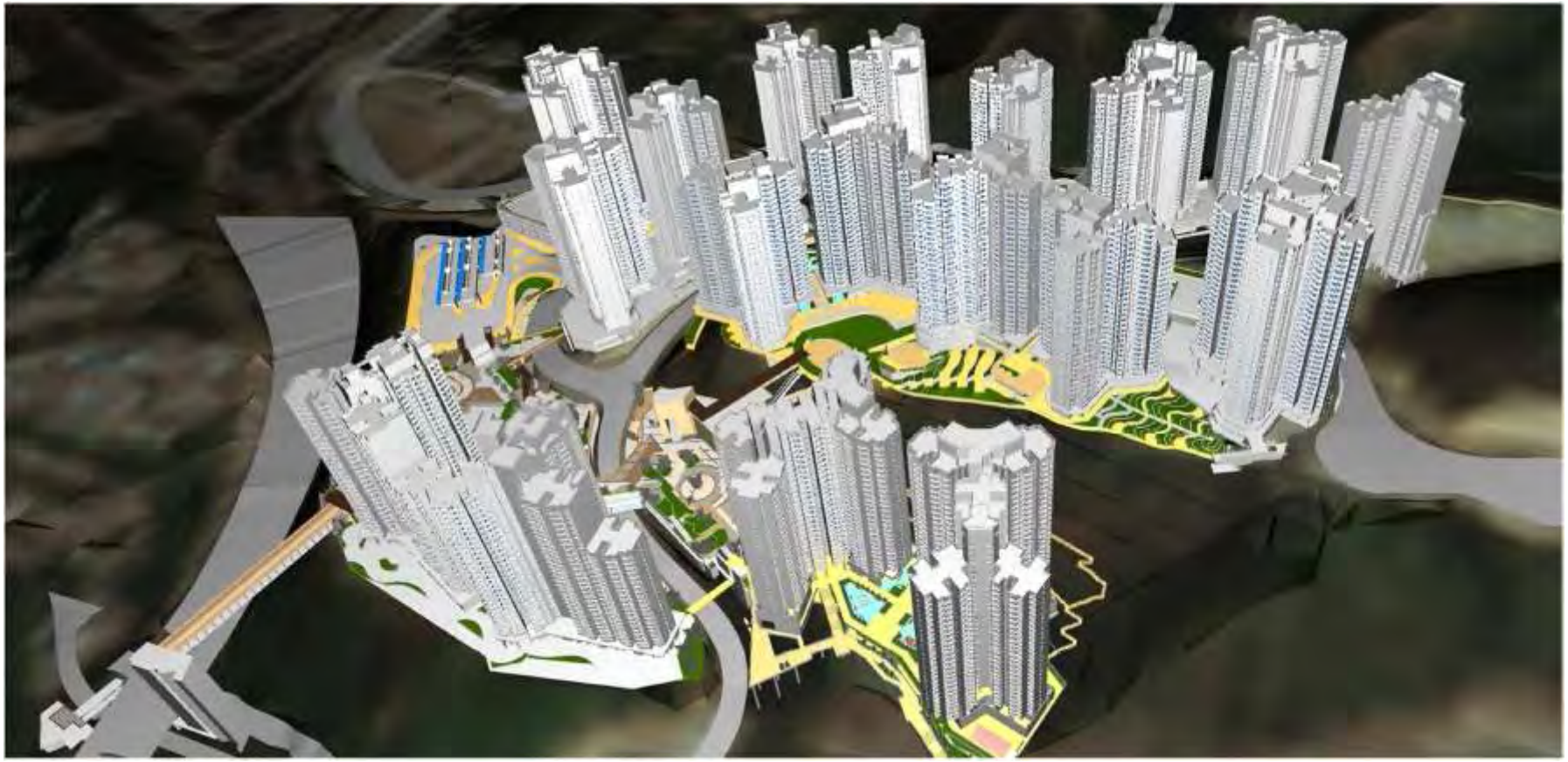
Site Feasibility Study

Terrain Modelling

Visual Impact Analysis (Sightline & Corridor)

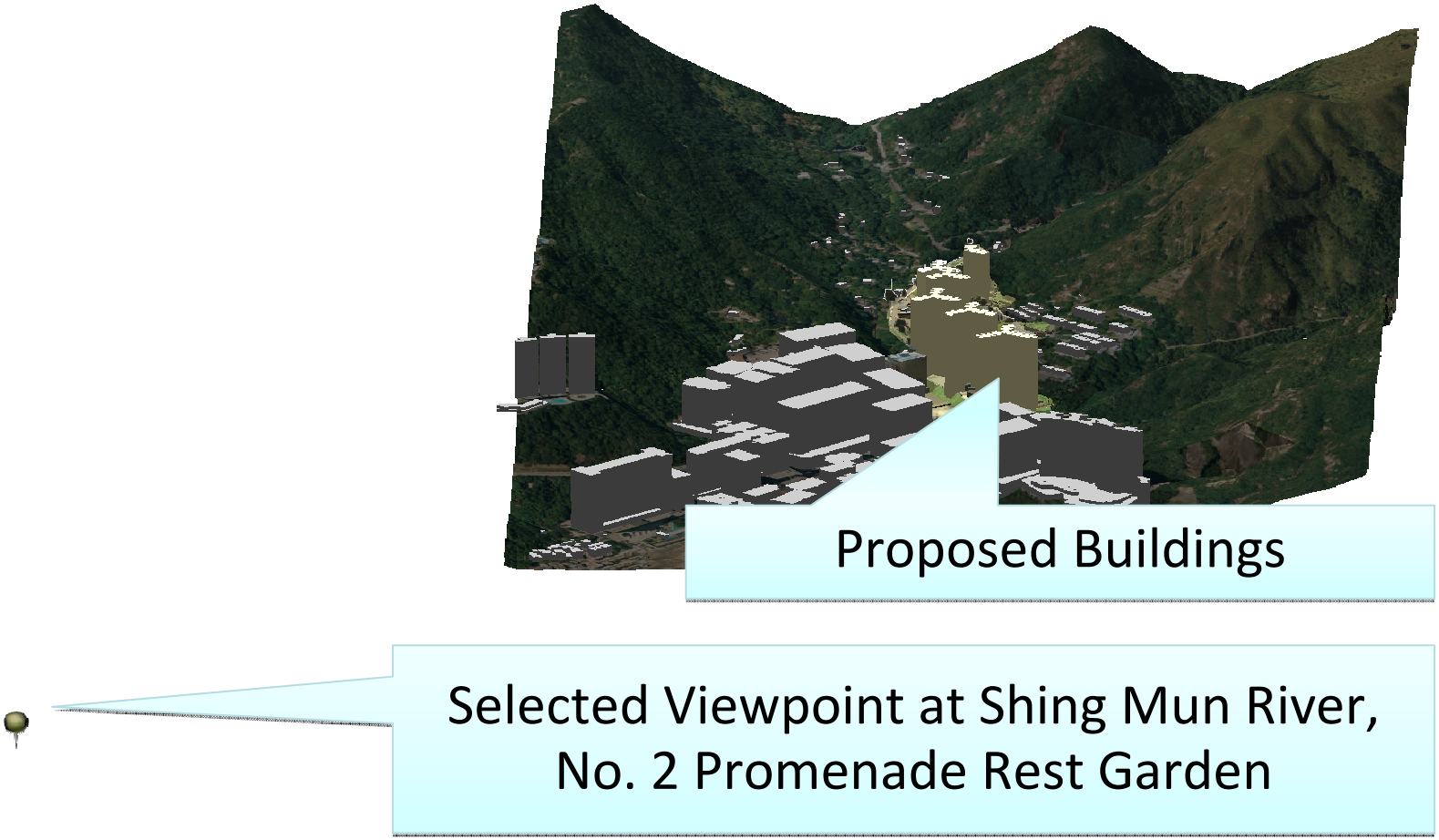
GIS Applications – Contextual Study

GIS Applications – Spatial Planning

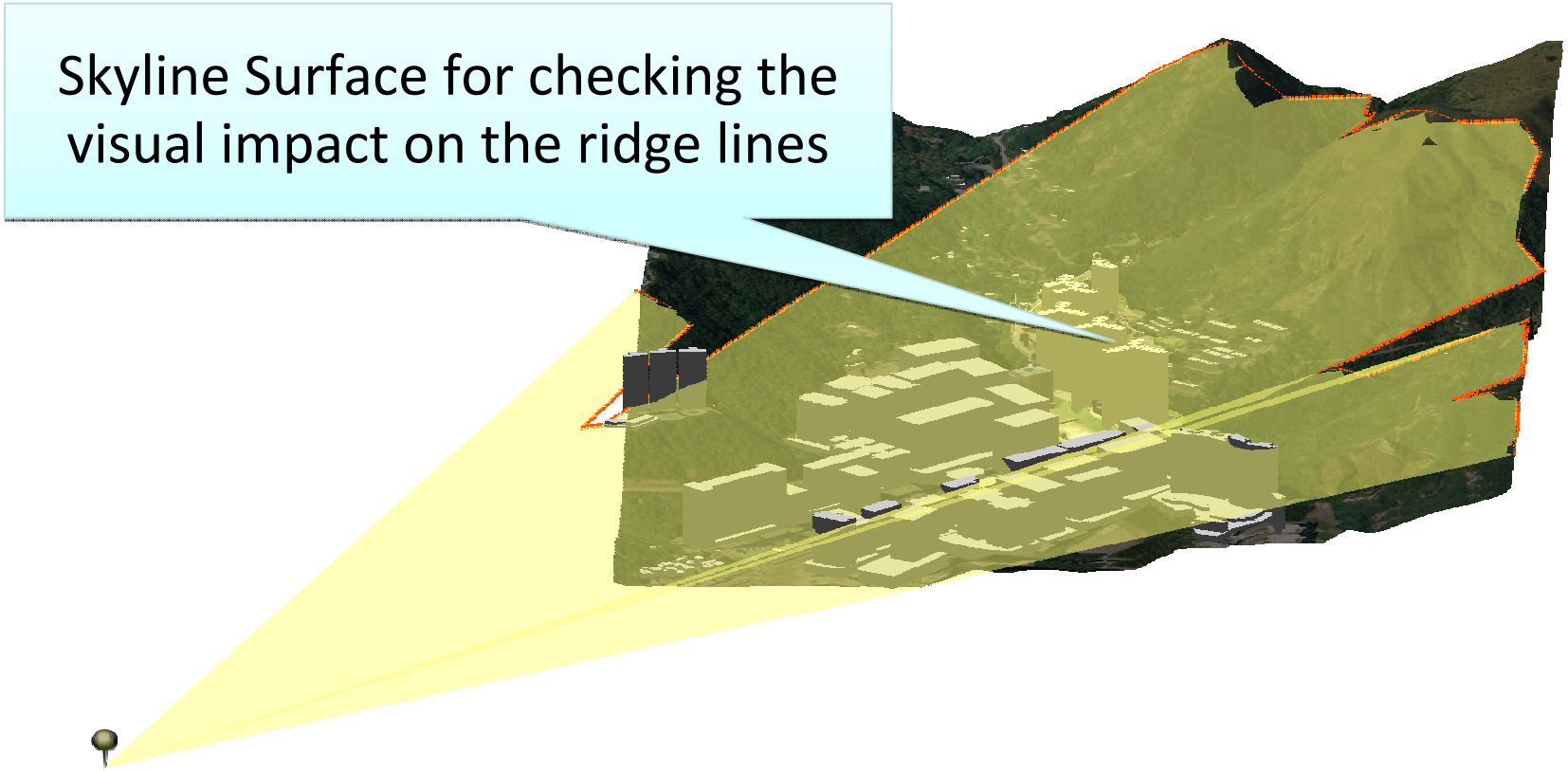


Study the connection between proposed buildings, external works, open space and landscape areas for the project

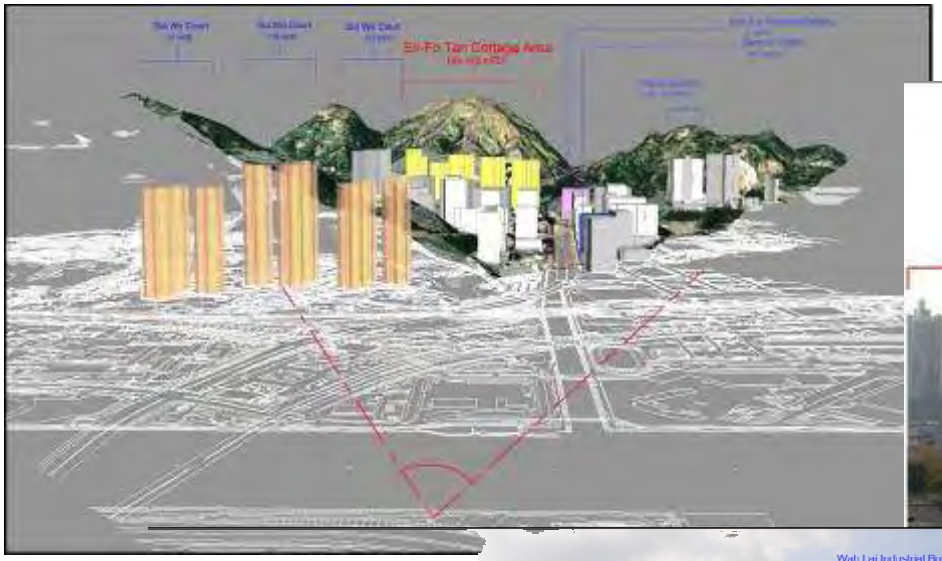
GIS Applications – Ridge Line Analysis

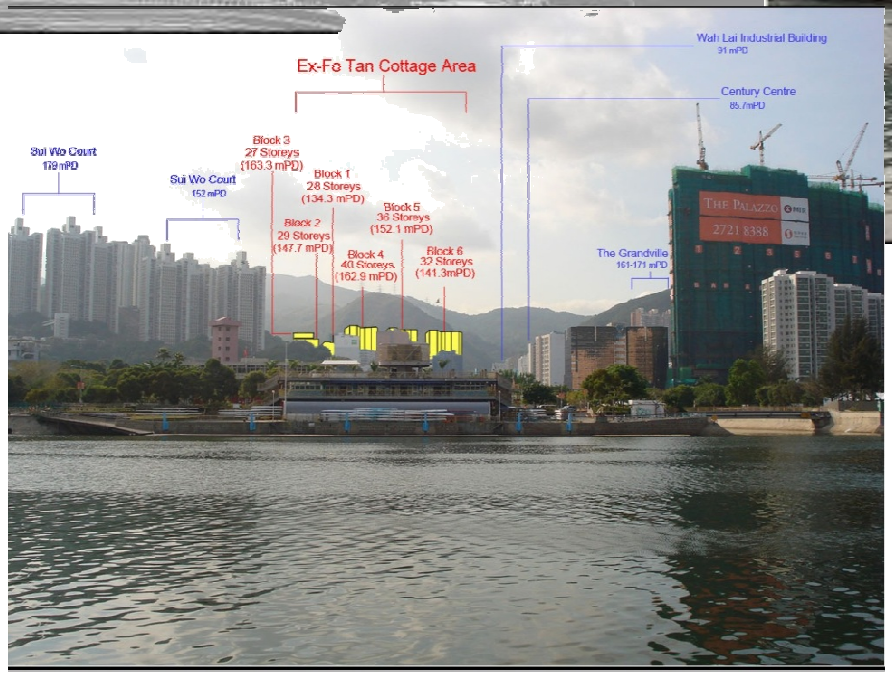


GIS Applications – Ridge Line Analysis



GIS Applications – Schemes Comparison



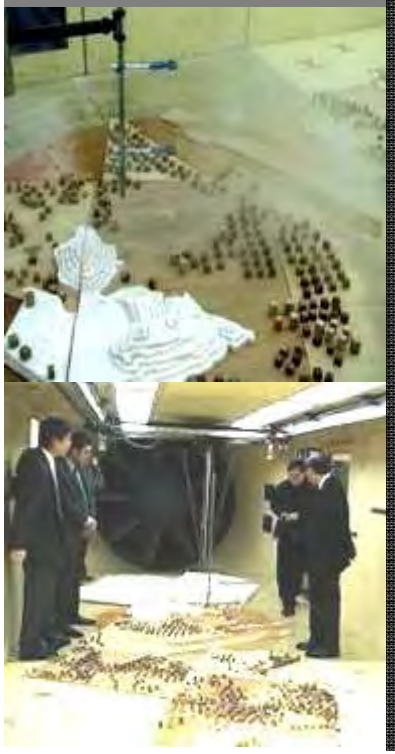


GIS Applications - Micro-climate Studies

- Determination of prevailing wind by Wind Tunnel Test
- Ventilation conditions of mid, high and low zones of domestic blocks are studied
- Enhancement to immediate neighbourhood

Wind Corridor Design

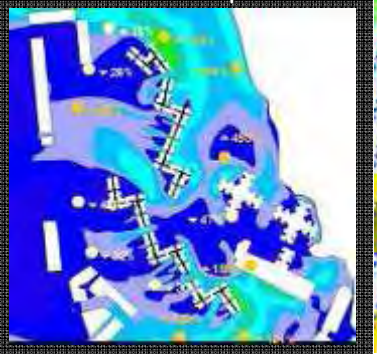
Wind Tunnel Test



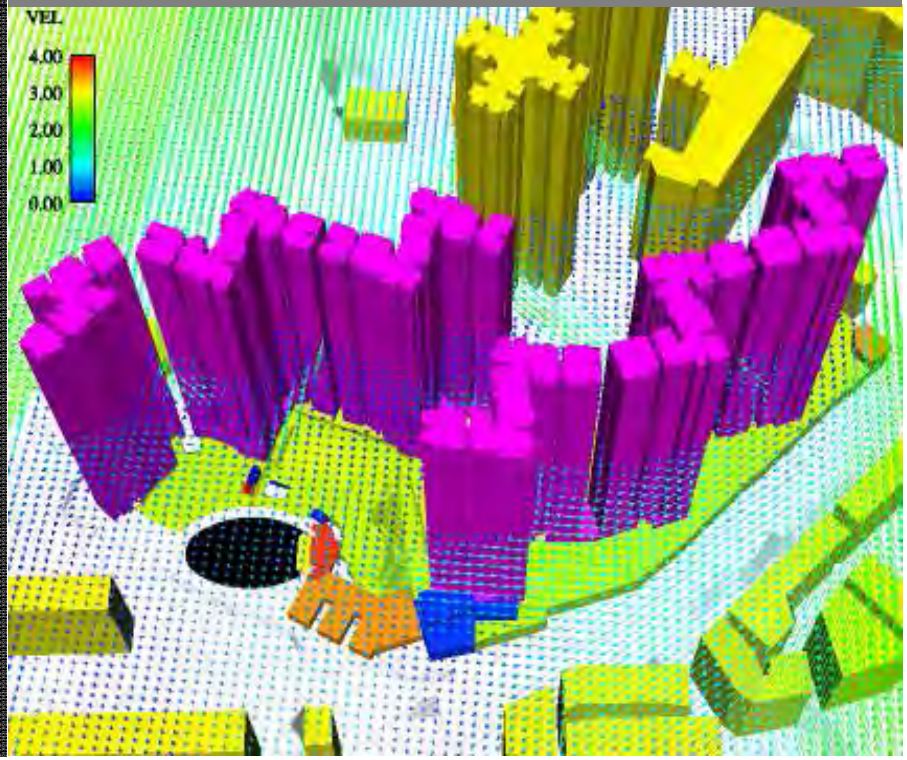
Wind Environment

Before Redevelopment

After Redevelopment



CFD simulations



BIM (Graphics & Attributes) INTEGRATION GIS

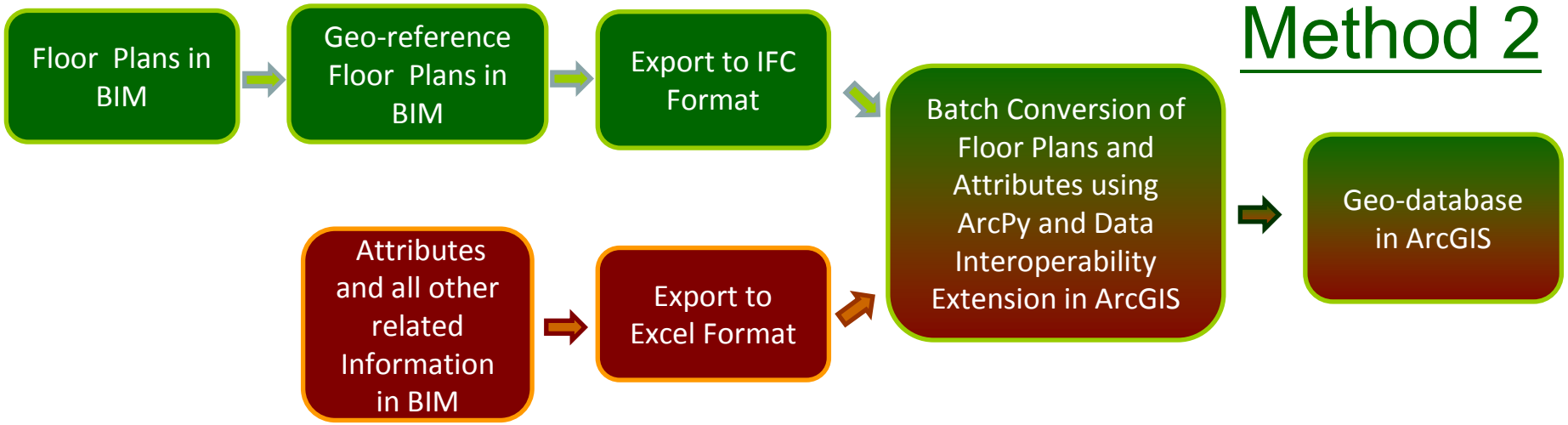
Autodesk Revit

FME

BIMserver & BIMsurfer (Viewer) with JRE Update 7

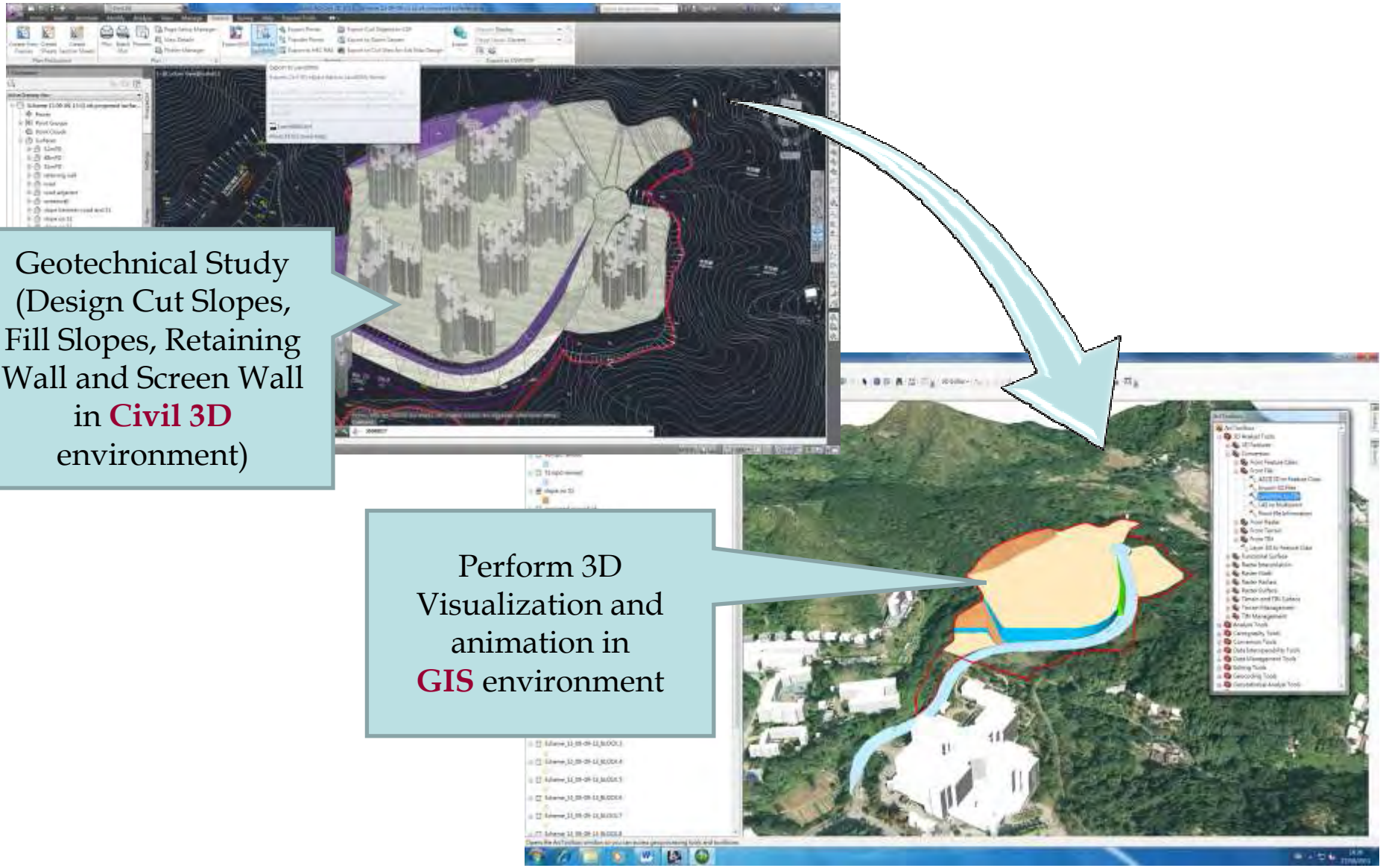
Method 1

Method 2



GIS +BIM Applications –
Colour Scheme Study

GIS +BIM Applications – Geotechnical Study



Change Management

BIM is not just a tool,
it brings transformation
to construction industry…

Transformation Process

We transform ourselves in use of BIM

Technologies — BIM 3D modeling, Analysis, 3D printer, RFID, GIS, R&D

Organization — Tighter team formation, multi-disciplinary team, supporting team structure

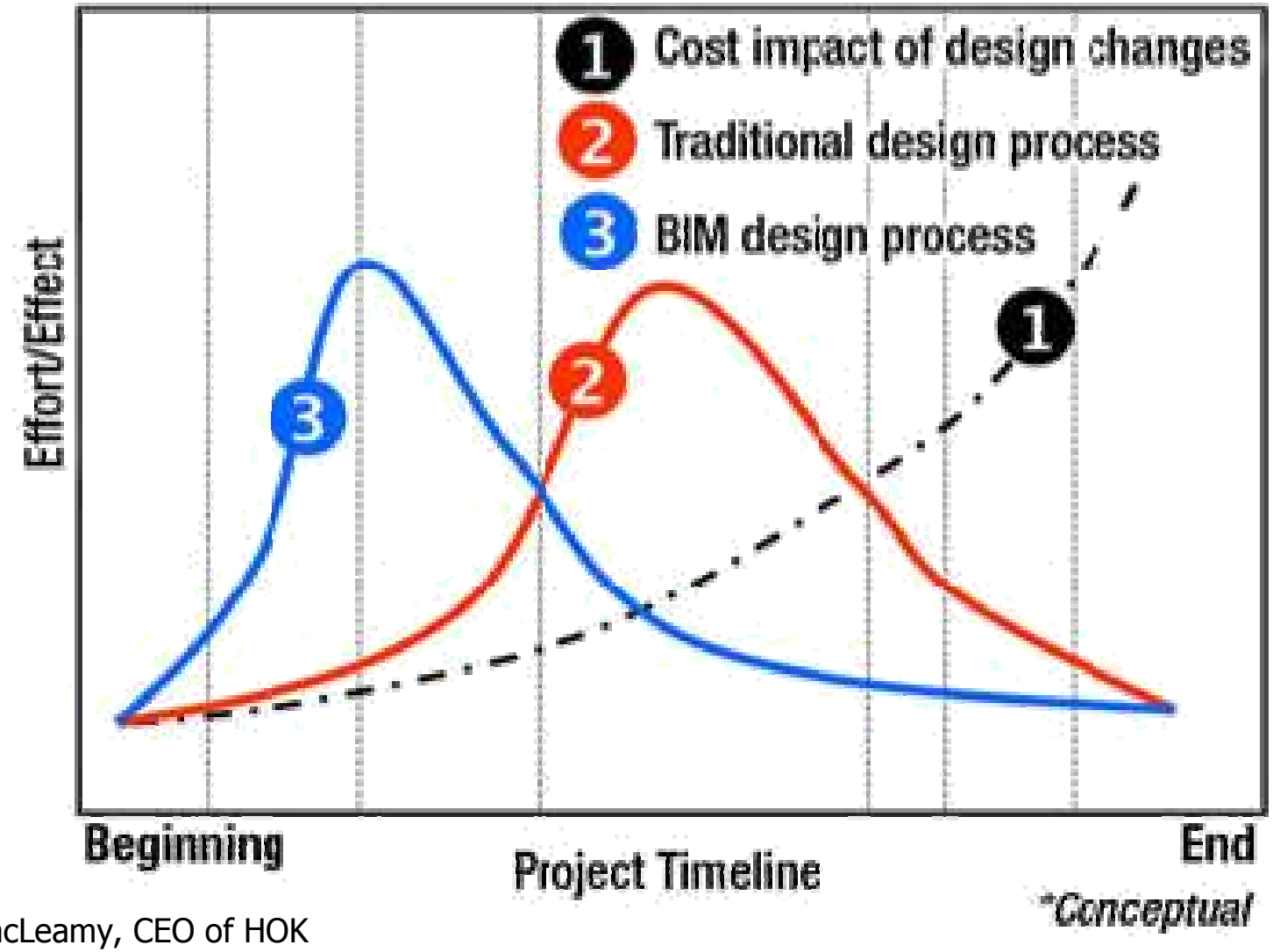
People — BIM skill, think ahead, teamwork, change management, industry practitioners, academia, workforce

BIM transforms our business

Processes — Upfront design process, re-engineering, office procedures, disciplines practices, industry practices

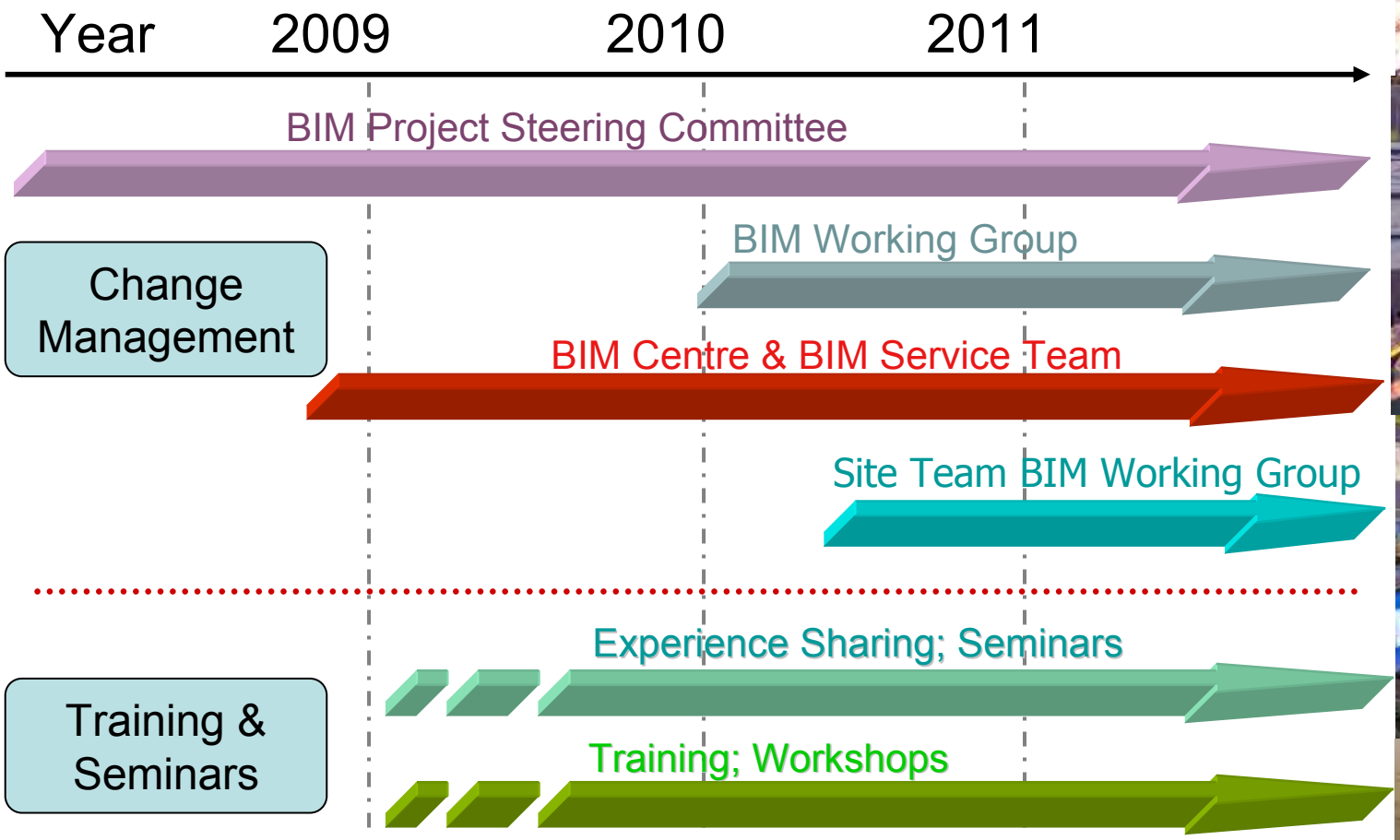
Partnership — Collaboration among project team, consultants, contractors and subcontractors.

Challenges - BIM Process Shifts the Design Curve



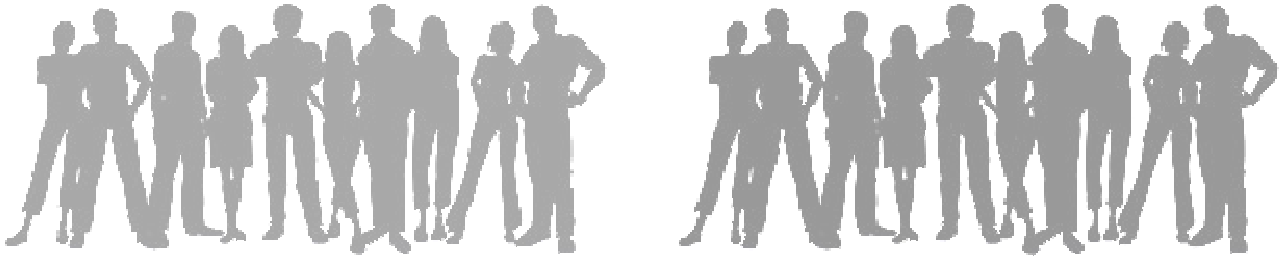
Patrick MacLeamy, CEO of HOK

Transformation – Organization & People



BIM Central Support - BIM Services Team and BIM Centre

Act as in-house consultant and support, collect feedbacks, training and skill exchange (~2000 users)



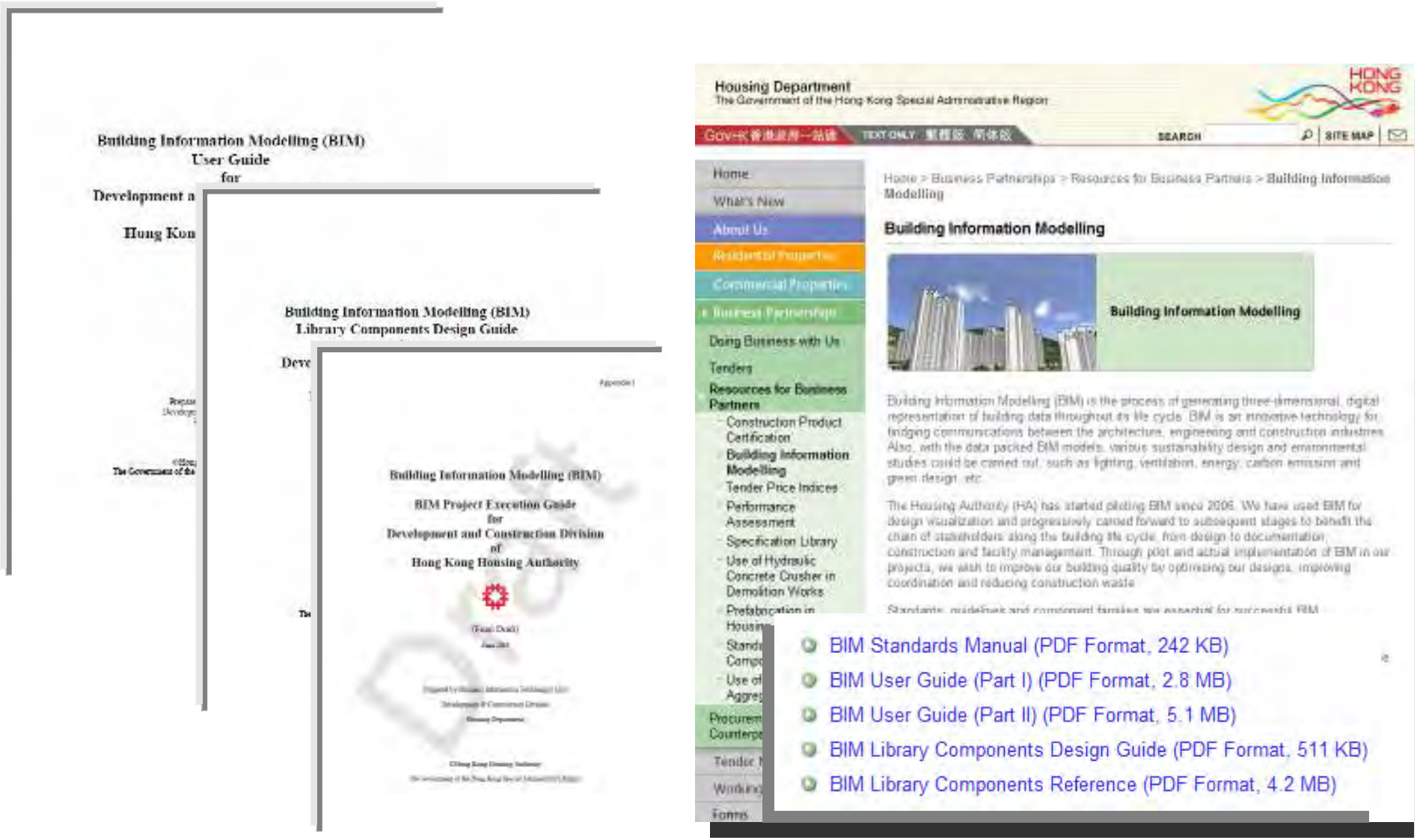
Centralized BIM Team

Training

Discussion

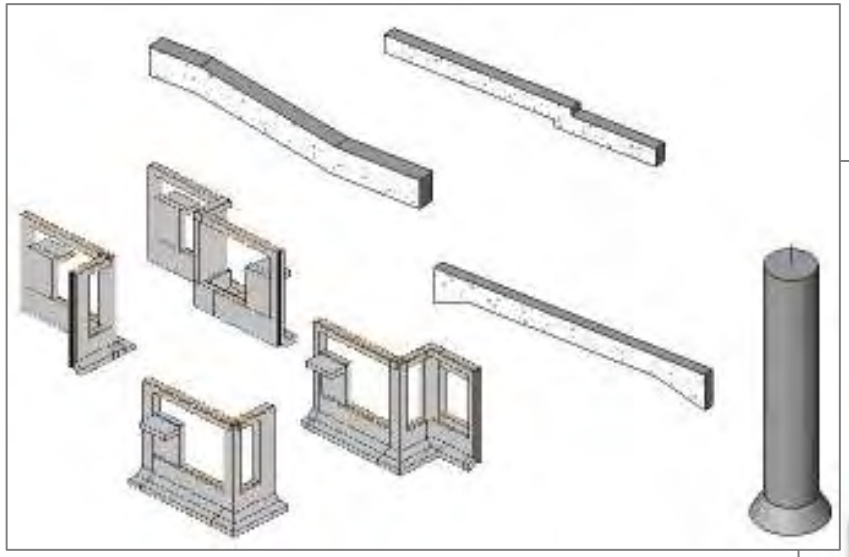
Hardware and software support

HA BIM Standards & User Guides

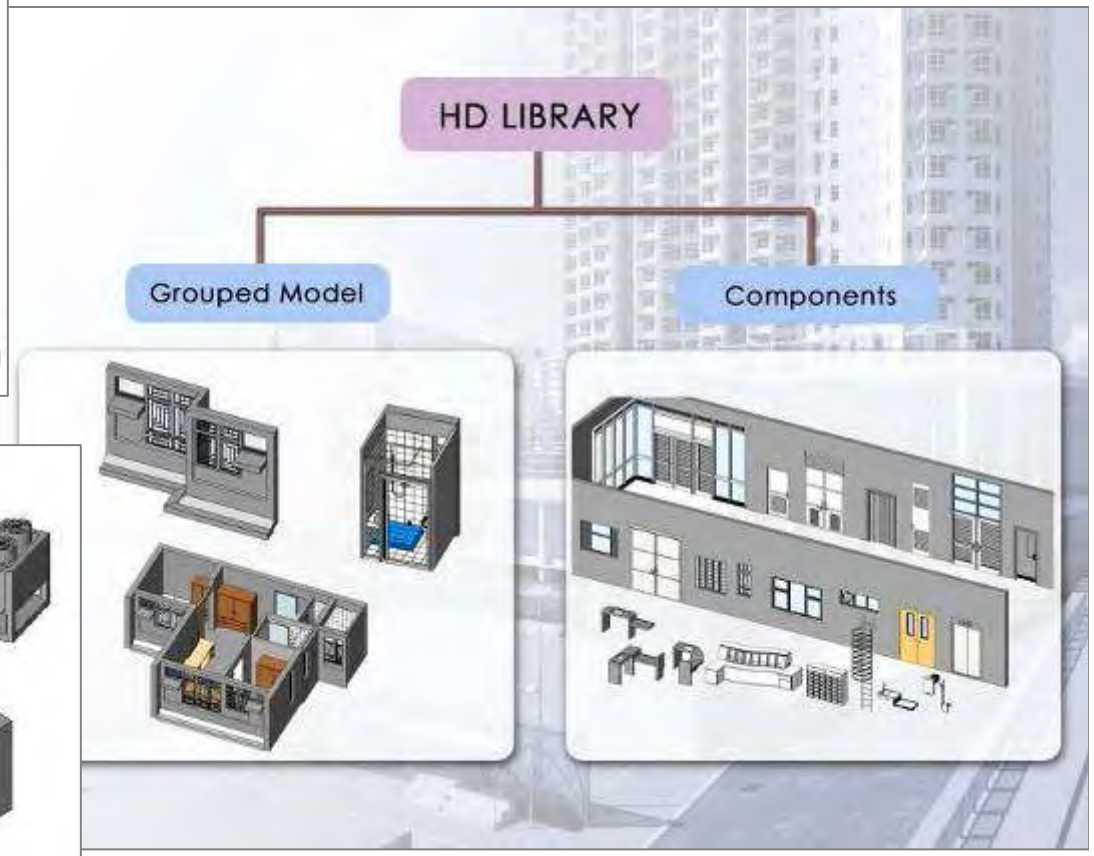


http://www.housingauthority.gov.hk/en/businesspartners/buildinginfomodel

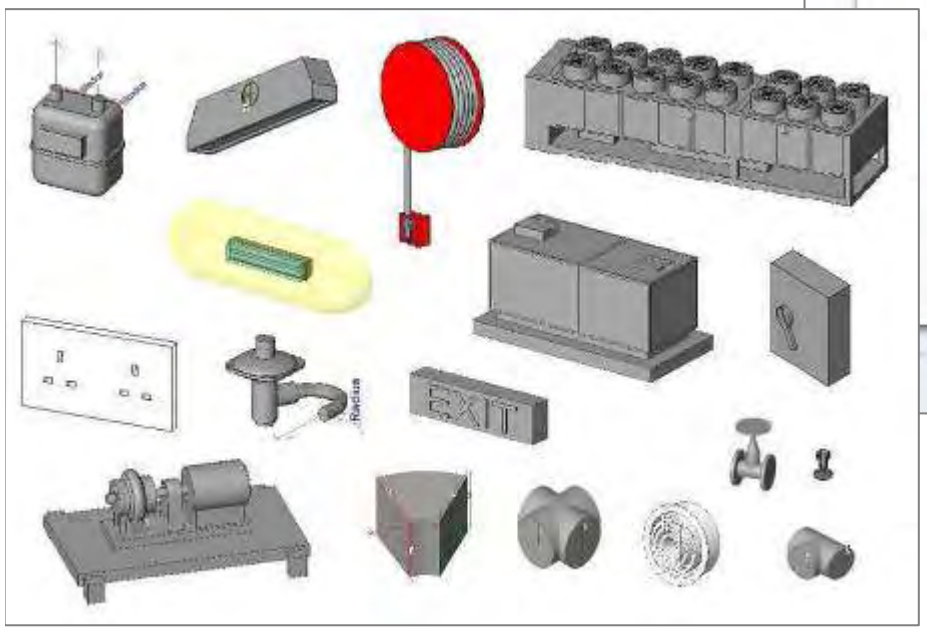
HA Standard Library



Revit Structural Families



Revit Architectural Families

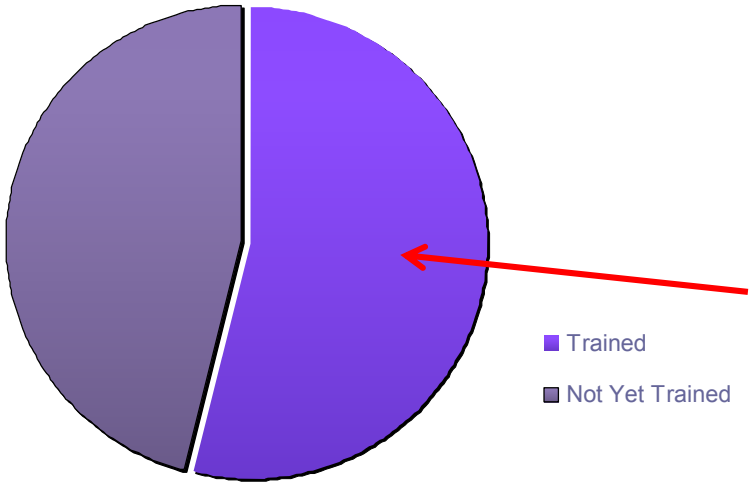


Revit MEP Families

Our Goal

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

Training to HA Staff (includes professionals & technical staffs)



About 1100 staffs (56%)*

- Architects
- Structural Engineers
- Building Services Engineers
- Civil Engineers
- Geotechnical Engineers
- Quantity Surveyors
- Planners
- Landscape Architects
- Land Surveyors
- Site Staff

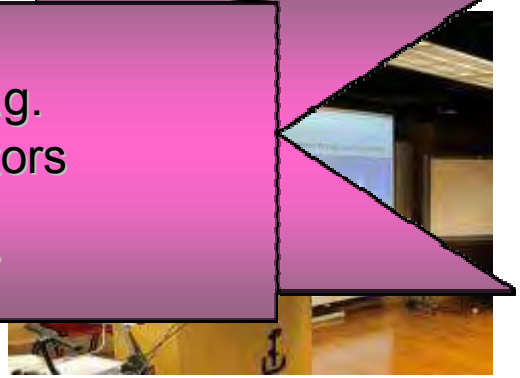
* As at the end of September 2013

Tentatively, it will become 70% at the end of Mar 2014 and more than 85% in 2015

We Walked the Extra Mile

Promote to our Professional Service Providers (e.g. architects, engineers & surveyors…) and contractors

Promote to academia e.g. HKU, PolyU, CityU etc.



Impact

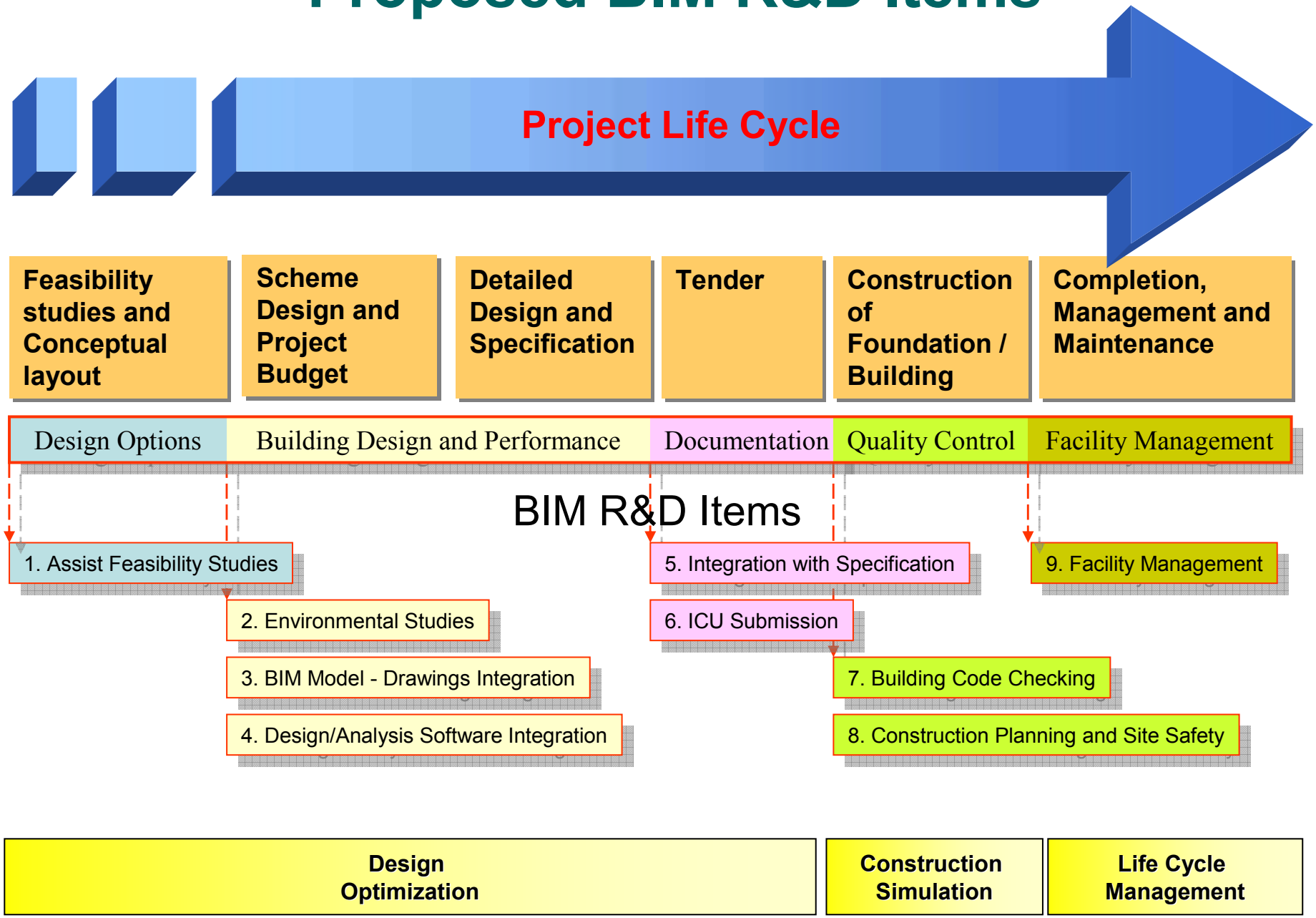
- **Local Universities & Academia**
  - Prevalent research topics.
  - BIM courses.

- **Professional Service Providers**
  - BIM models support submissions.

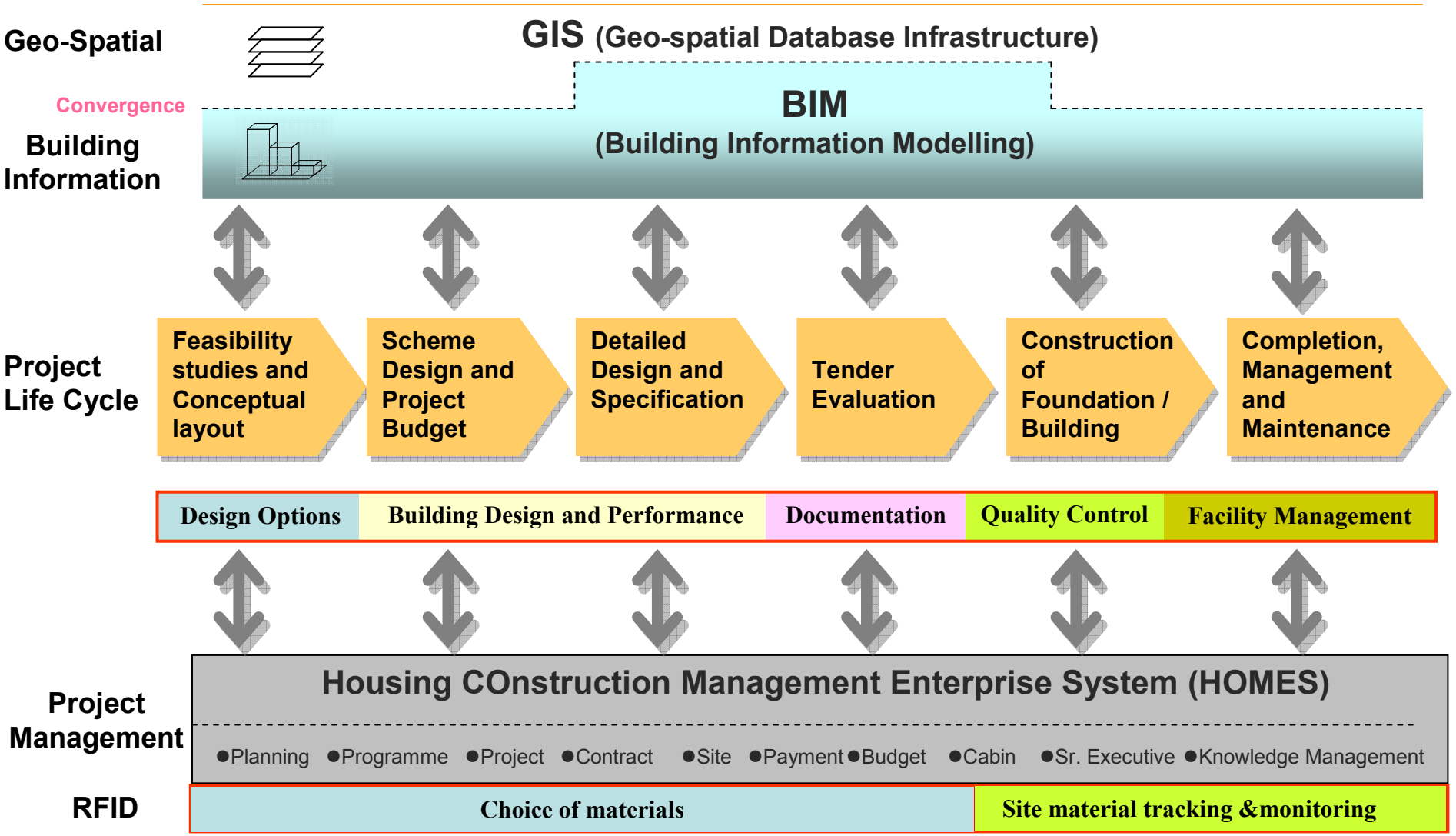
- **Construction Industry**
  - Enhance collaboration among design team, contractors, sub-contractors & suppliers.
  - Contractors have set up their own BIM working teams.
  - BIM Task Force in the ***Construction Industry Council*** of Hong Kong
  - ***Chaired by Ms. Ada Fung*** with members from academia, professional institutes, developers associations, government departments, etc.
  - Develop a BIM roadmap for HK Construction Industry

Way Forward

Proposed BIM R&D Items



Study on Integration of GIS, BIM, HOMES & RFID



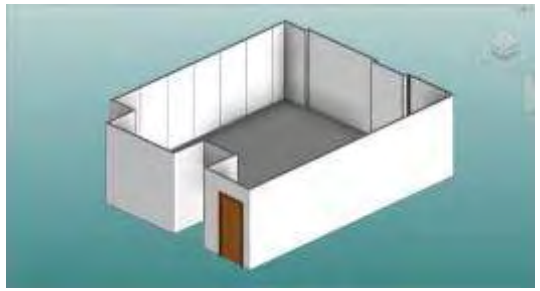
Enhancement of HOMES:
Integration of RFID into HOMES construction module

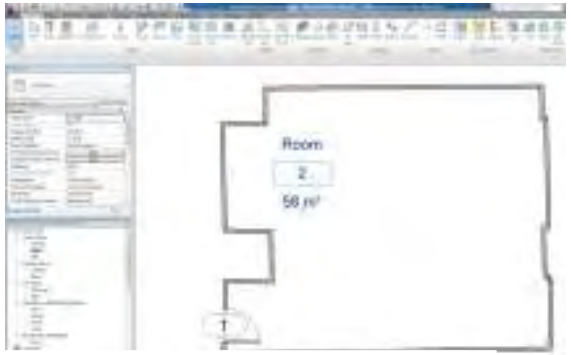
Import of Point Cloud to BIM

Indoor As-built Survey (From Point Cloud to BIM)

3D Realistic Point Cloud Model from Laser Scanning

Point Cloud→BIM System

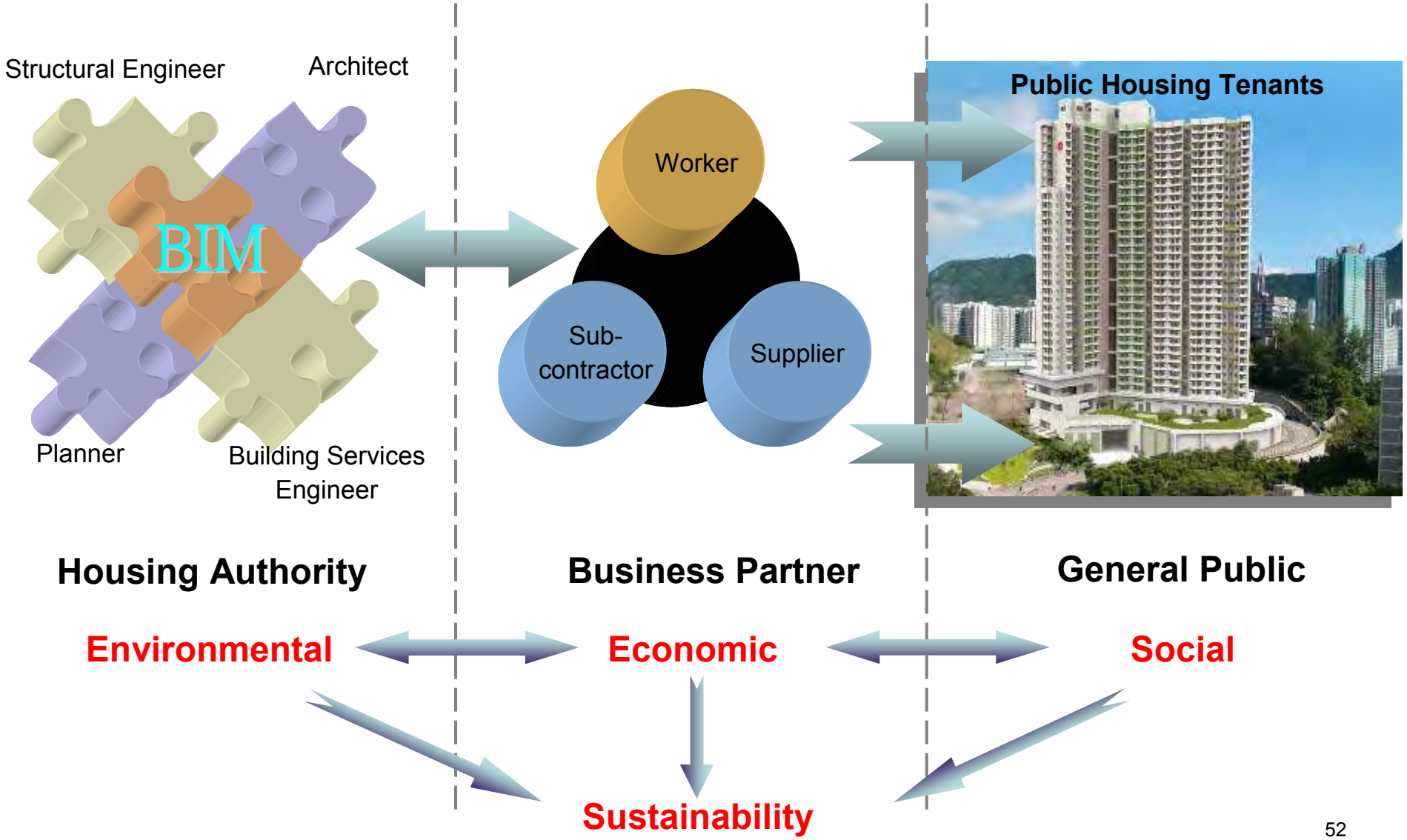




Floor / Area Plan

Conclusion

Who get the benefit?



BIM Awards

- HK BIM Awards for four consecutive years 2009 -2012
  - 2009: Towards Customization with Standard Modular flats in Mass Housing Design
  - 2010: Transforming the whole Delivery Practice
  - 2011: Versatile BIM / What You See is What You Can Do
  - 2012: Pioneering 5D BIM for Quantity Surveying
  - 2013: Fast-track HOS and Site Coordination in a PRH project.
- Meritorious award for Civil Service Outstanding Service Award Scheme 2011
- HK ICT Awards 2012 – Silver


Customer-
focused
顧客為本
Caring
關懷為本
Committed
盡心為本
Creative
創新為本

Thank You