

## TECHNICAL NOTE 005

# Construction Technology: Building Information Modelling Contractors' Application



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### Keywords

BIM, MEP clash detection, construction phasing, bills of material, dressed rehearsal

### Synopsis

In Hong Kong, Building Information Modelling (**BIM**) in the construction industry has been popularised through its use by corporate Clients, Developers, Architects, Engineers (Civil, Structural & MEP) and Contractors. In some recent projects, the use of BIM has been driven from the clients' level for the whole life benefits of their projects from design, construction to maintenance stage. This note gives a brief introduction of BIM and its potential applications from Contractors' perspective.

### 1.0 Introduction

The origin of BIM can be traced back to the 1980s when most manufacturing industries first adopted 3D modeling and digital representations. In simplest terms, BIM represents a design in a 3D environment. Construction elements such as beams, slabs, columns, windows, doors, air ducts, cable trays, etc are all modelled as 3D objects (not drawn in conventional 2D lines). These 3D objects are machine readable, spatial conflicts in a building model can thus be checked automatically. Because of this capability, at both the design and shop drawing levels, errors and change orders due to internal errors are greatly reduced.

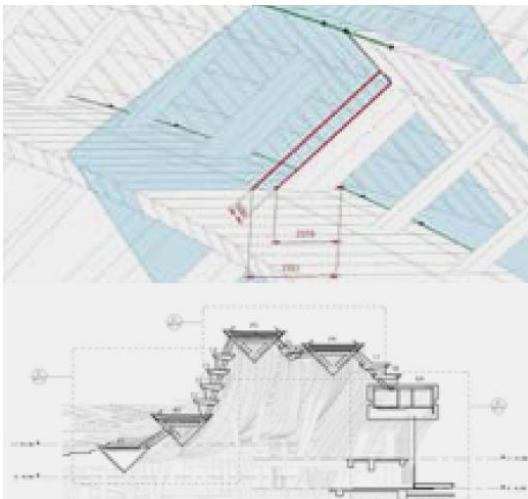


Image from Aedas

### 2.0 Benefits of BIM

The benefits of BIM have been extended substantially beyond creation of beautiful 3D images for visualisation. Its prime benefits are listed below.

- MEP clash detection
- Construction phasing / Dressed rehearsal
- Consistent and coordinated drawings
- Automated bills of material / quantity
- Coherent cost estimation

In overall terms, BIM models can save costs, save construction time, and support better building performance and control. It can beneficially impact all parties in the construction process – designers, engineers, contractors, fabricators, facility operators as well as owners.

### 3.0 BIM Users in Hong Kong

BIM has been used in Hong Kong for a while. Some of the users are listed below.

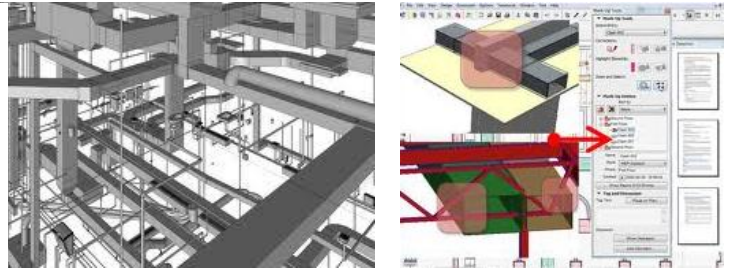
- **Corporate Clients / Government Departments:**  
MTRC, HK Housing Authority; Cathay Pacific Airways, Disney WDI, HK Science & Technology Park, HK PolyU
- **Developers:**  
Sun Hung Kai, Henderson, New World, Melco Crown Entertainment, Kerry Properties, Luk Hoi Tong Co, Hysan
- **Architects:**  
Aedas, HOK, RMJM, Rocco, etc
- **Engineers:**  
Mott MacDonald, URS, Arup, Meinhardt, WSP, etc
- **Contractors:**  
Gammon, China State, etc

### 4.0 Contractor's Position

It is commonly conceived that the usefulness of BIM is at its maximum in design phases. However, in recent projects, eg Cathay Pacific Air Cargo Terminal, Contractors were explicitly requested by the client to adopt BIM to facilitate construction. That is, the Contractors have to engage their own BIM team in order to work on this project. In the end, the as-constructed terminal building needs to be documented in BIM format and handed back to the client for operation and maintenance use.

In this light, we should explore the use of BIM so that we are equipped in meeting with this popular trend.

Clash detection analysis can be conducted for all MEP disciplines and between MEP and Structures. Clash reports are automatically generated for design coordination.



## 5.0 Contractor's BIM Application

Potential applications of BIM during construction are as follows:

### 5.1 MEP Clash Detection

Virtual overlay of the building structural and all disciplines in M&E systems allows conflicts and clashes to be detected at an early stage of construction. Clash reports can be produced so that the team is able to resolve design conflicts without delay.

### 5.2 Construction Phasing

By adding schedule dates to a 3D model, it is feasible to create a 4D building information model, which enables the team to review and respond to construction sequencing. This 4D model can be utilised for presentations to the public and government stakeholders.

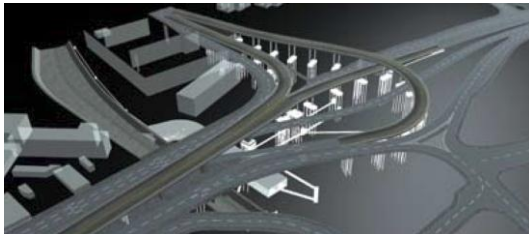


Image from Scott Wilson

### 5.3 Dressed Rehearsal of Complex Construction

In some complex construction/installation process where delay or mishap is costly, BIM could enable a dressed rehearsal of the entire process such that the work flow can be worked out and constraints identified.

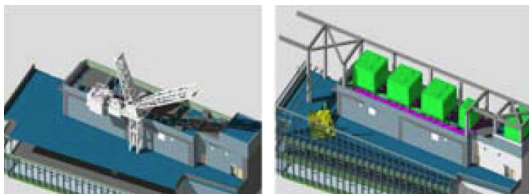


Image from Luk Hoi Tong

### 5.4 Bills of Quantities / Materials

Given that every 3D object in BIM models is machine readable, bills of quantity can be generated readily. These could be concrete volume, window and door schedules, surface area of walls for plastering, painting, etc.

## 6.0 BIM Examples

The selected examples below give some flavour of the use of BIM in the construction industry. With momentum being gathered at the current pace, the use of BIM would soon become an industry norm.

### 6.1 Hong Kong Housing Authority

There is a transformation of business practice within the Housing Authority (HA) involving in-house staff as well as stakeholders in the building industry through the use of BIM in the delivery of public housing. HA's vision is to implement BIM in ALL projects, having seen some fruits of success in enhancing design efficiency and cost effectiveness as evinced by the project at Tung Tau Cottage Area East (TTCAE).

- Refining Design Decision

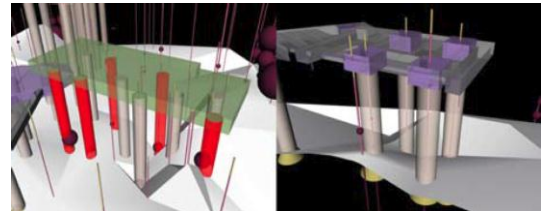


Image from HKHA

- Enhancing the Coordination between different systems

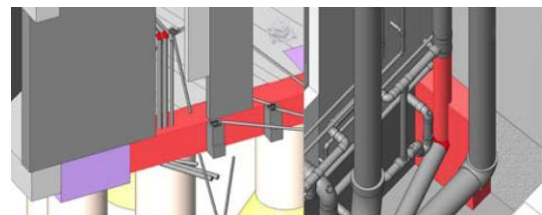


Image from HKHA

- Improving Constructability

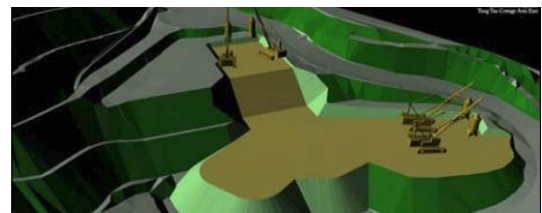
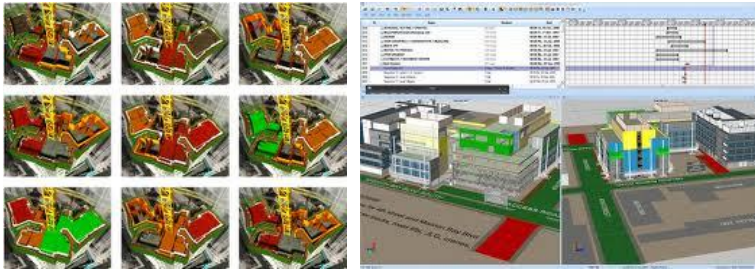


Image from HKHA



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**6.2 Gammon Construction Limited**

In the Hennessy Centre redevelopment project, the Gammon team is constructing a 40-storey retail/office building comprising a concrete basement for retail stores and parking facilities, a retail podium and a 20-level steel beam and deck system structure office tower. To coordinate between different disciplines under a tight timeline, the client, Hysan Development Company Limited, initiated the use of Building Information Modelling (BIM) for the project.



Image from Gammon / Hysan

- Gaining the Client's Confidence



Image from Gammon / Hysan

- Ensuring a Safe Construction Site
- Committing to a Sustainable Environment
- Enhancing the Request For Information (RFI) Process

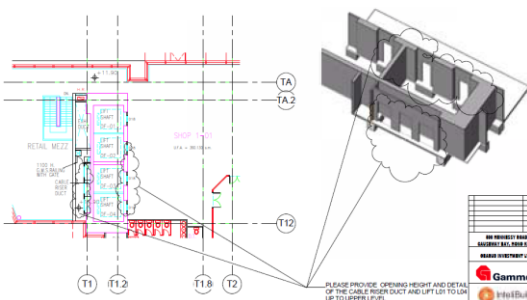


Image from Gammon / Hysan

**6.3 MTR Corporation Limited**

The preliminary design of the Shatin to Central Link (SCL) involves the design of different underground and above ground stations and a stabling sidings. Each of which comes with different design options. The MTR Corporation design team made good use of BIM technology to assist in the design of such a large-scale project.

- Simplifying Complex Procedures
- Standardizing the Components
- Improving Design Quality and Presentation Style
- Optimizing Environmental Conservation

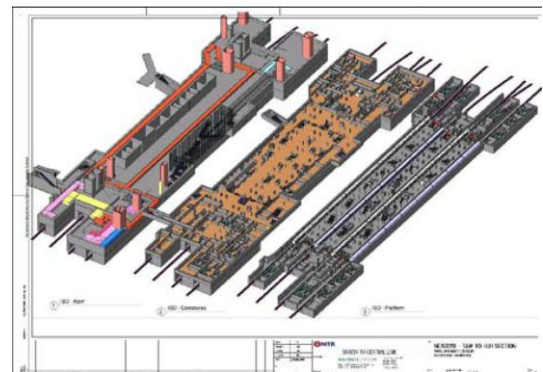


Image from MTRC – Working drawings created directly from BIM

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