CONSTRUCTION INDUSTRY COUNCIL
建 造 業 議 會

BIM – Management Training

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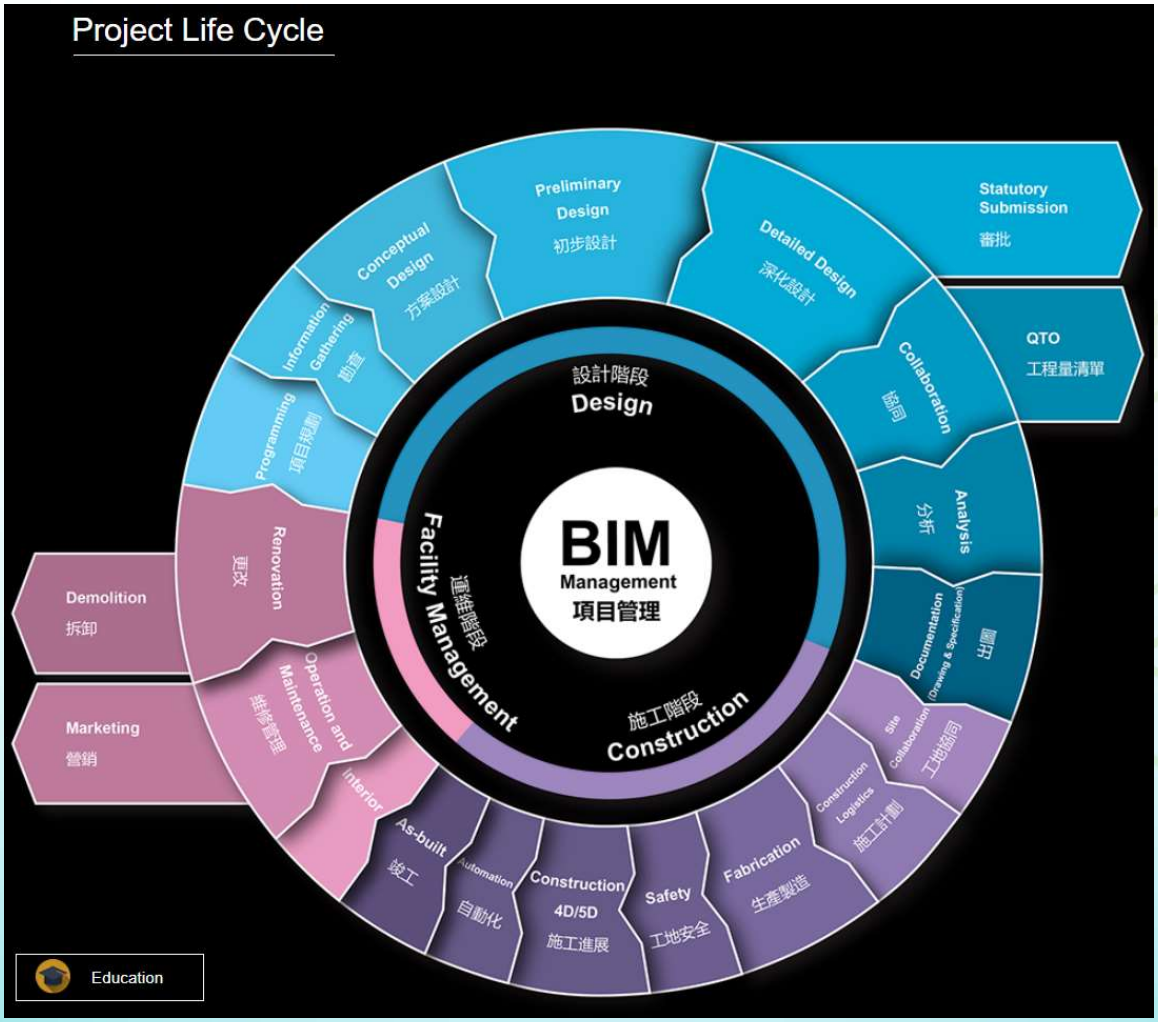
July 2018

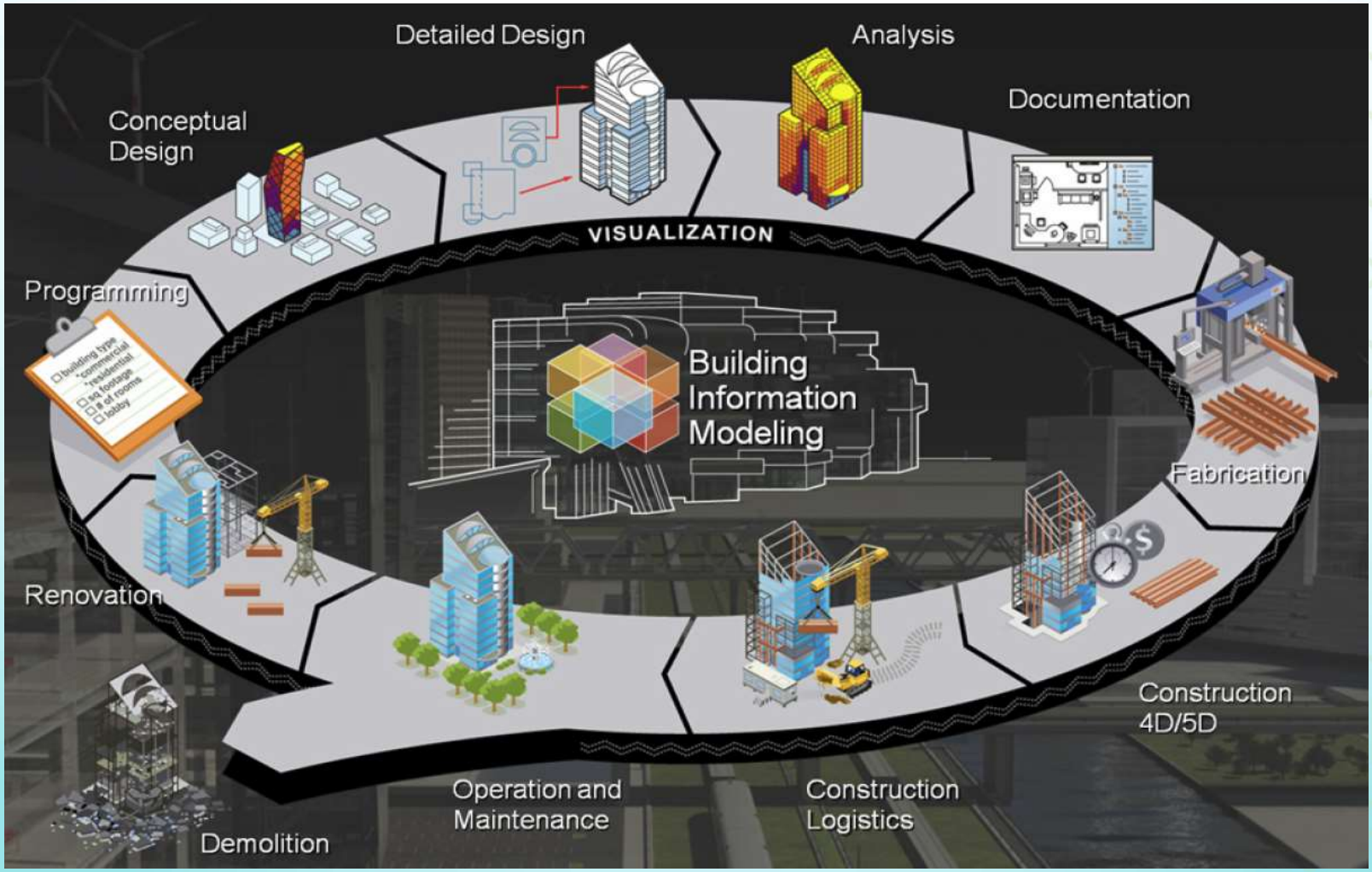
Day 1 - Introduction (Full Day)

1. Correct Concept of BIM



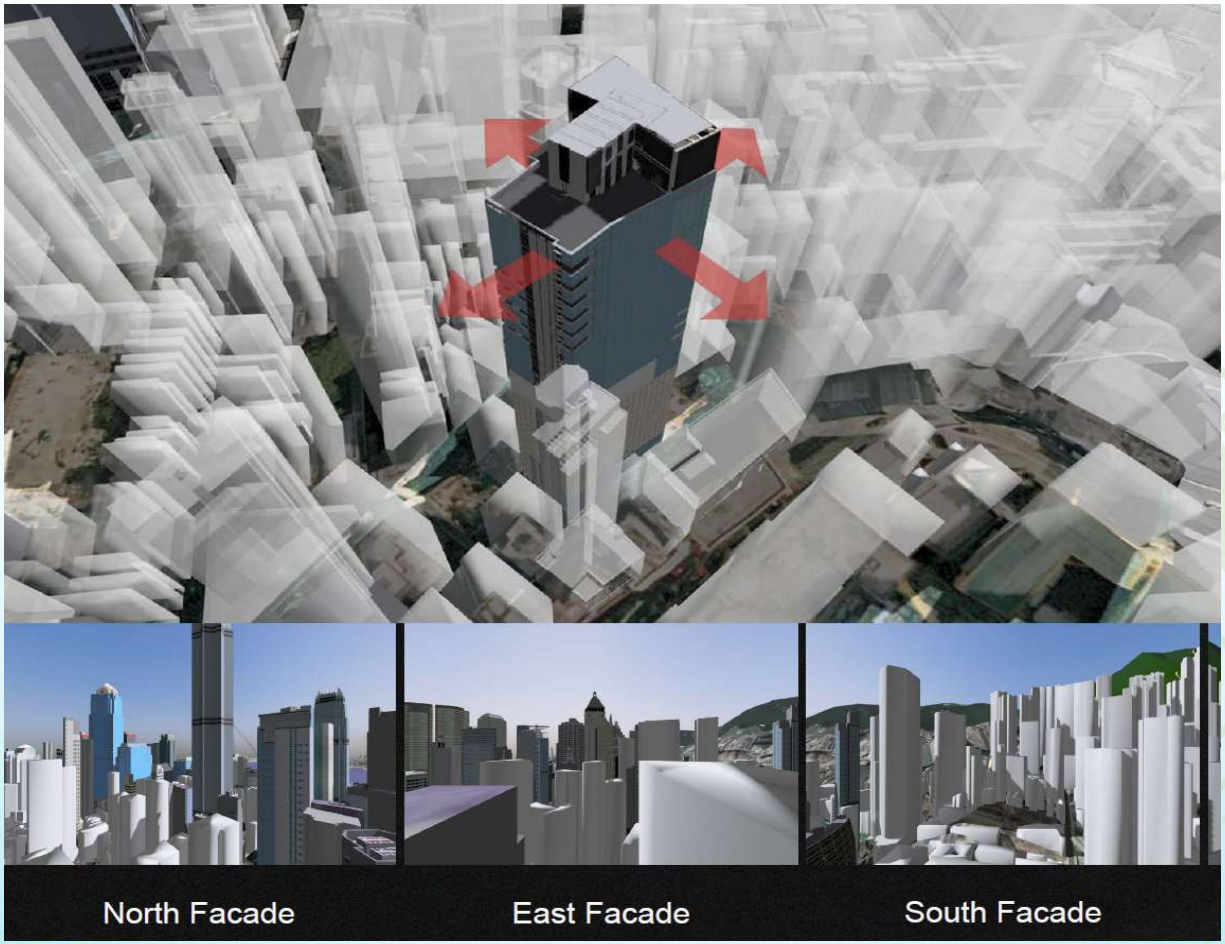
An Information Flow throughout Project Life Cycle

2. What is BIM?



About Life Cycle, Information management method

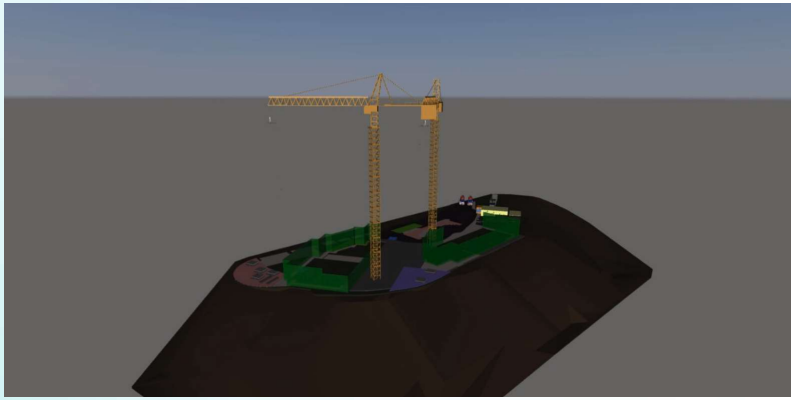
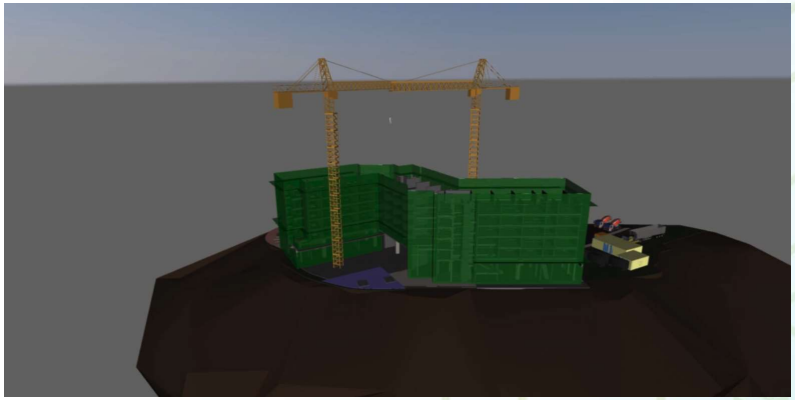
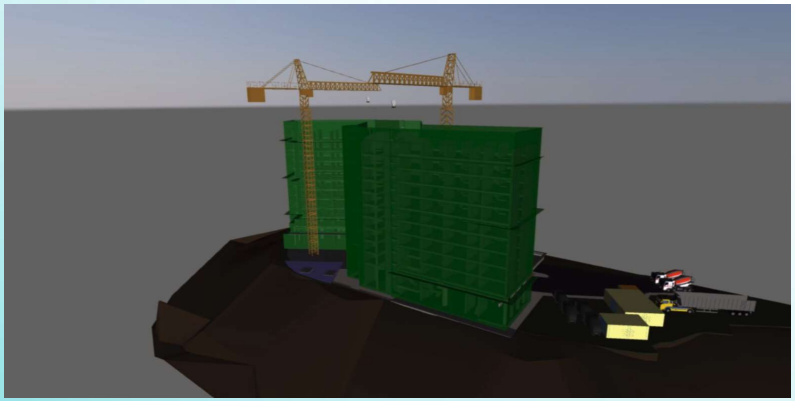
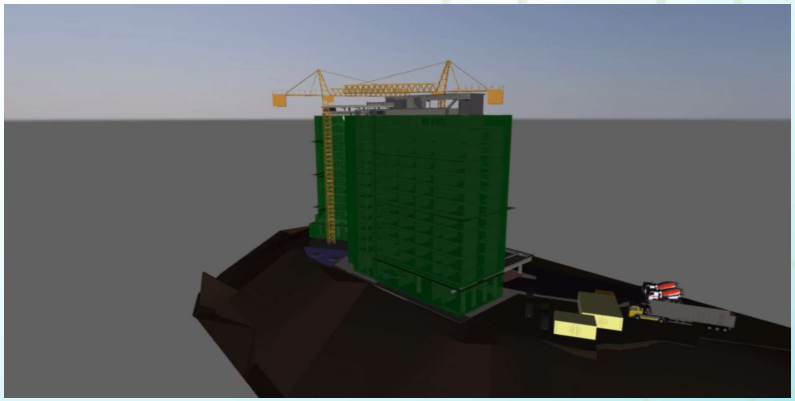
3. What is BIM?



About Rehearsal in the Virtual World

- To simulate surrounding environment for sightline, weather, traffic analysis
- To design a building / complex within a virtual environment with information

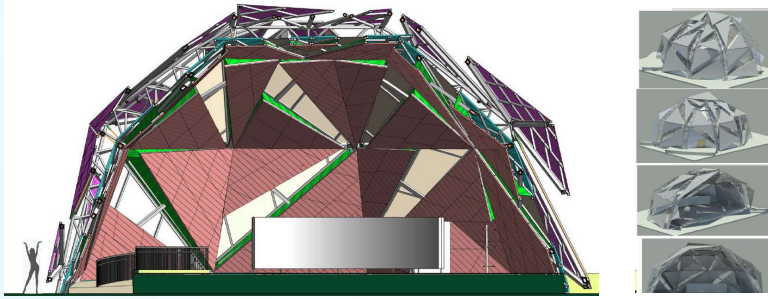
4. What is BIM?

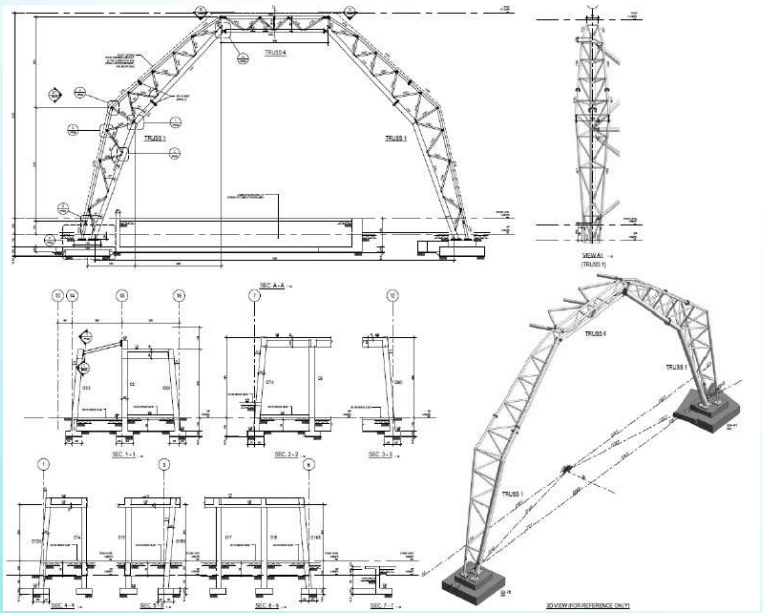





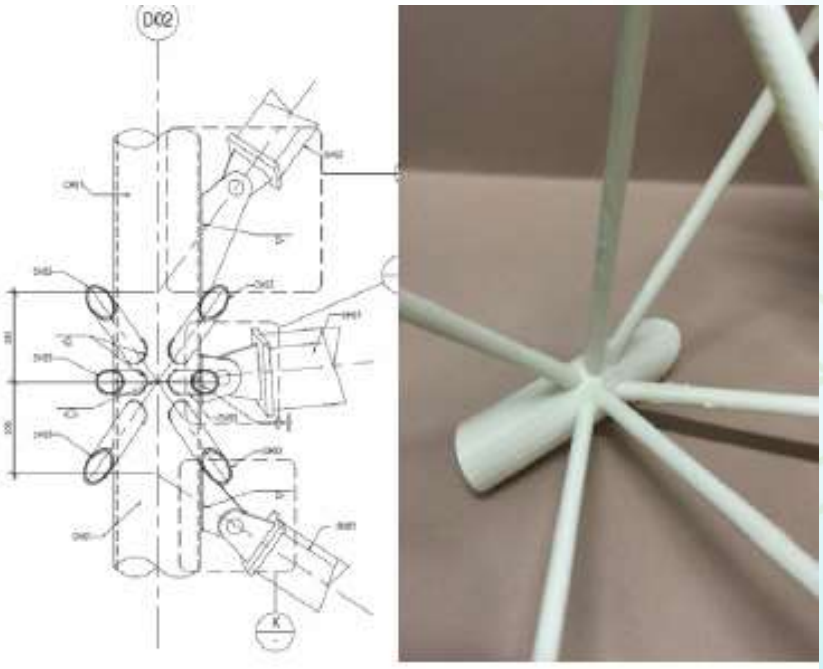
Rehearsal 3D, time, cost

- To review design in response to time management and construction sequence.
- A better way to resolve the discrepancy in the virtual world before construction.

5. What is BIM?



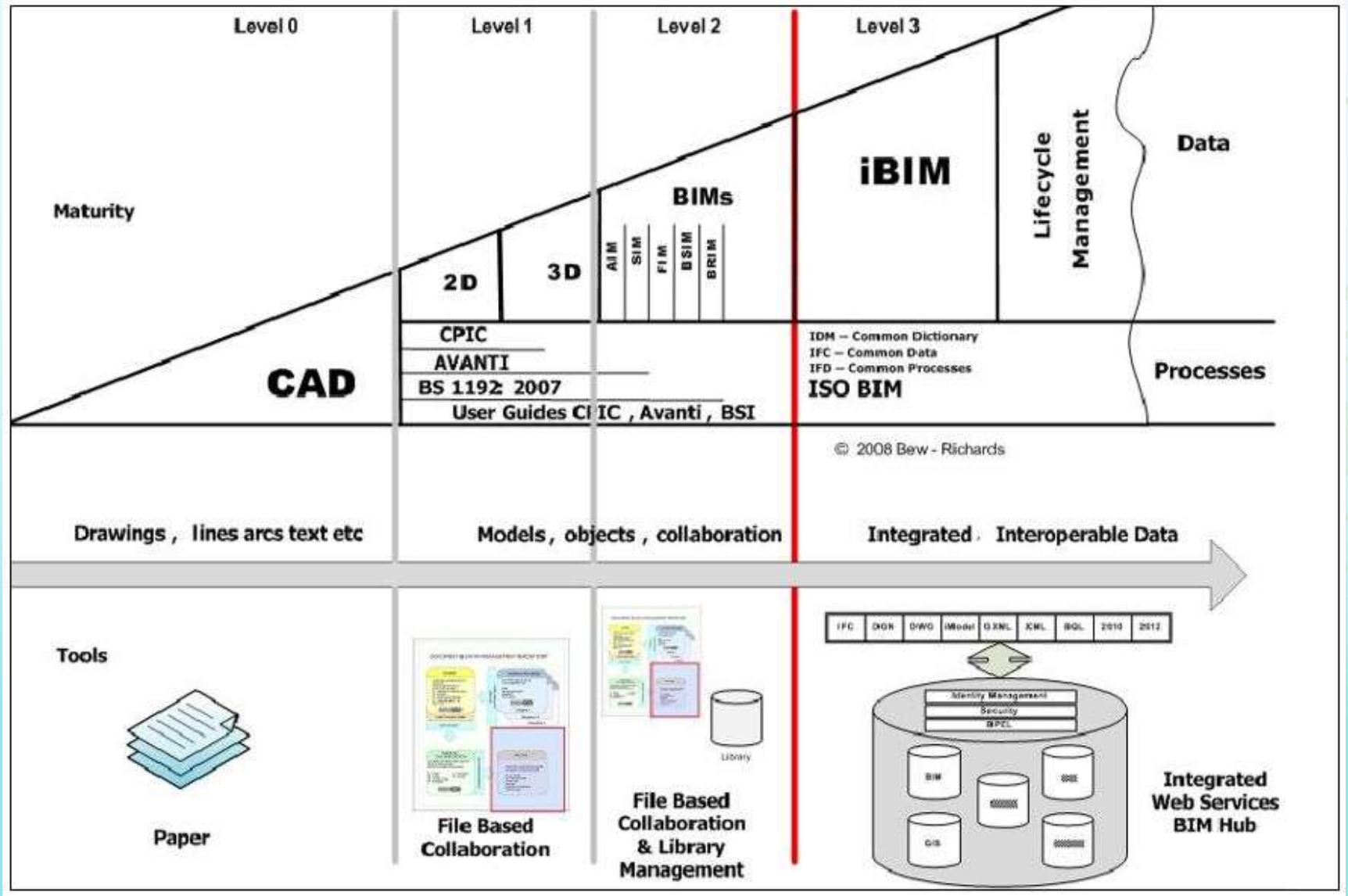




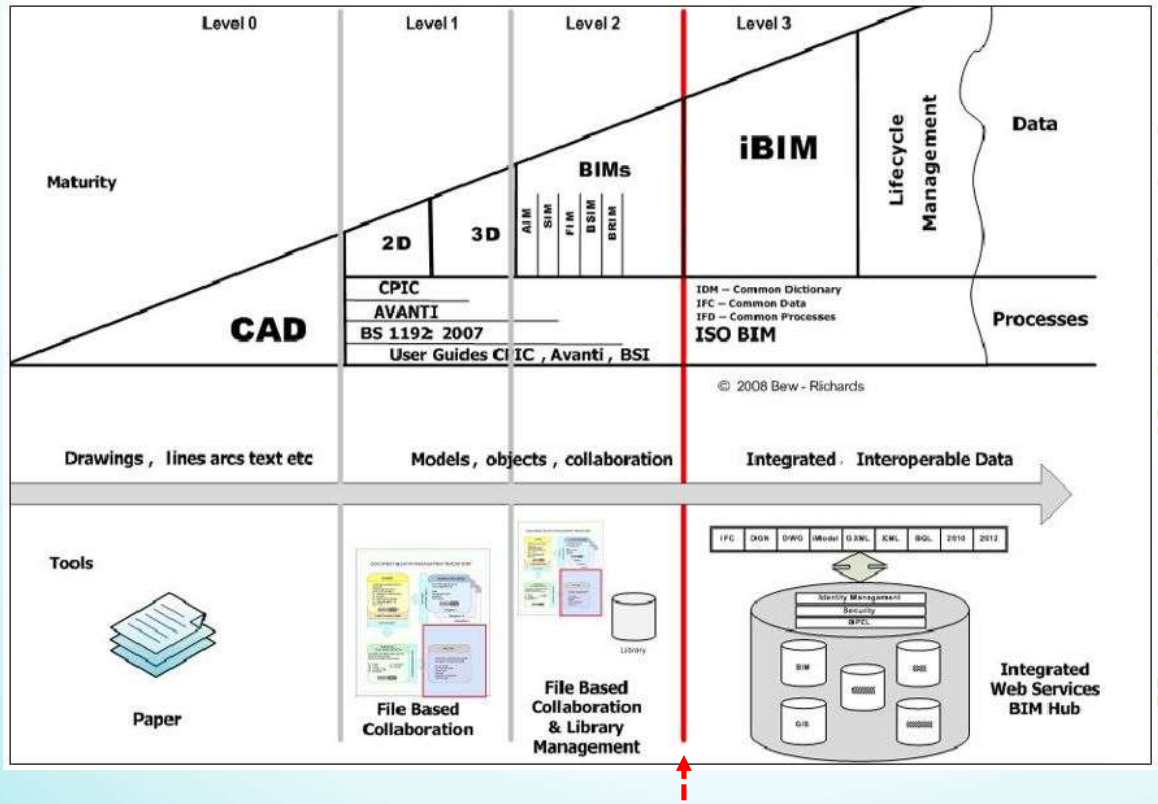
About Rehearsal Design, Details and Construction

- To develop the design from schematic to details in the virtual world with different discipline profession
- Single Source of Ture (SSOT) ensure the consistence during the project development

6. BIM Maturity?



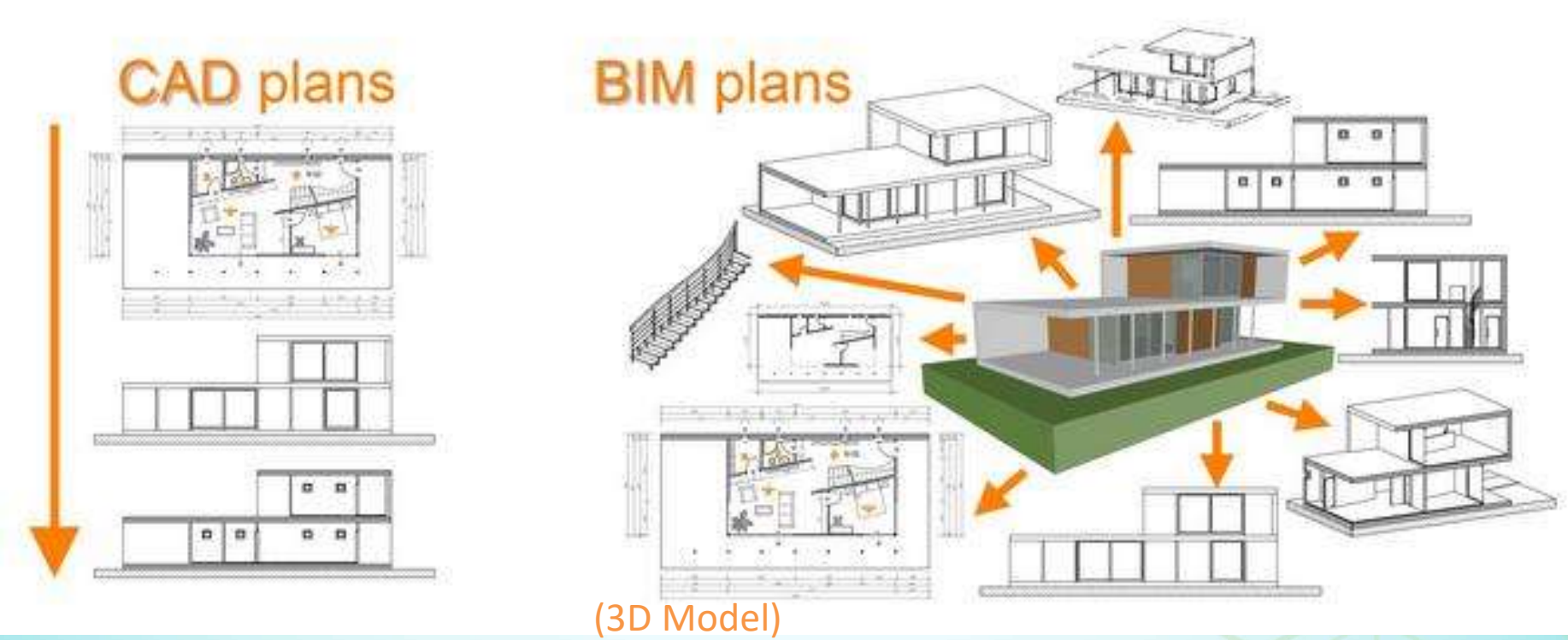
7. UK - PAS 1192-2



From CAD to BIM Level

- Level 0 – Drawings from CAD, line areas & text
- Level 1 – 2D & 3D basic element
- *Level 2 – 2D & 3D models, objects, collaboration (Currently in 2018)*
- Level 3 – with ISO BIM, use full of BIM

8. 3D CAD is BIM?



CAD

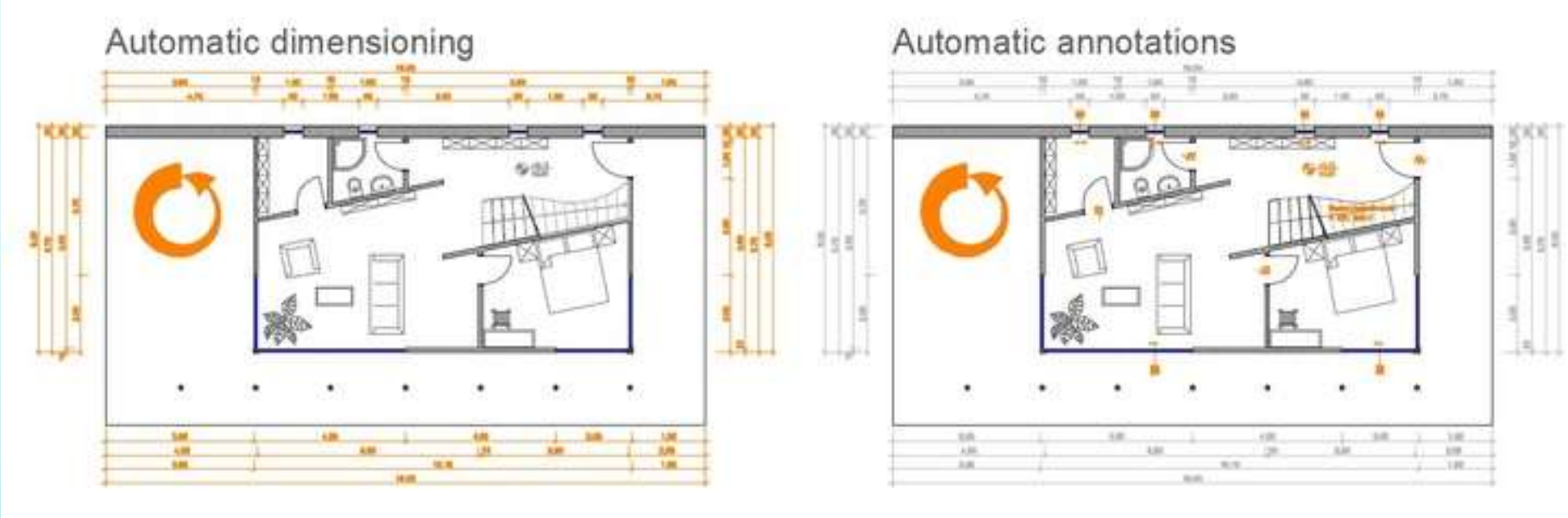
- Drafting in 2D
- No Information
- Many sources

BIM

- In 2D and 3D
- Information contained
- Single Source of Truth (SSOT)

http://www.cadtobim.com/what-is-bim.html

9. BIM with Information?

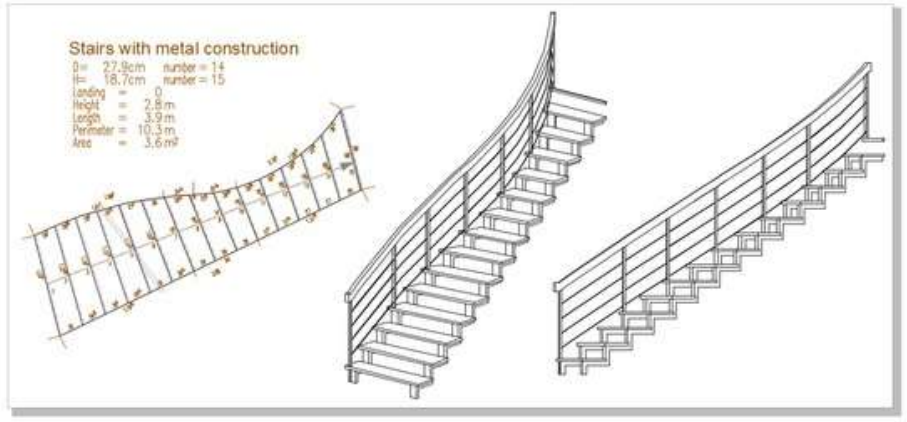


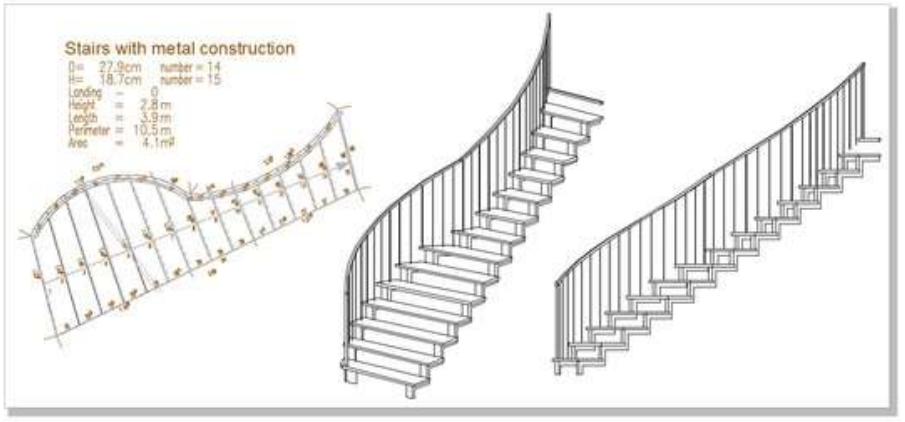
SSOT with Automation

- All element contain information
- Eg. Dimension and annotations can be automated
- Windows and doors are divided in different family with information which can be automated within the same model

http://www.cadtobim.com/what-is-bim.html

10. BIM as Design Tools





SSOT with Model Information

- Change of design will be synchronized at one source
- Eg. Dimension and annotations can be automated
- All Plans, section & elevation will be synchronized at the same time

http://www.cadtobim.com/what-is-bim.html

11. BIM as Virtual Simulation Tools

SSOT with Simulation

- The location of model contained weather information
- Eg. Sunlight Analysis, solar gain

http://www.cadtobim.com/what-is-bim.html

12. BIM Software Overview Experience

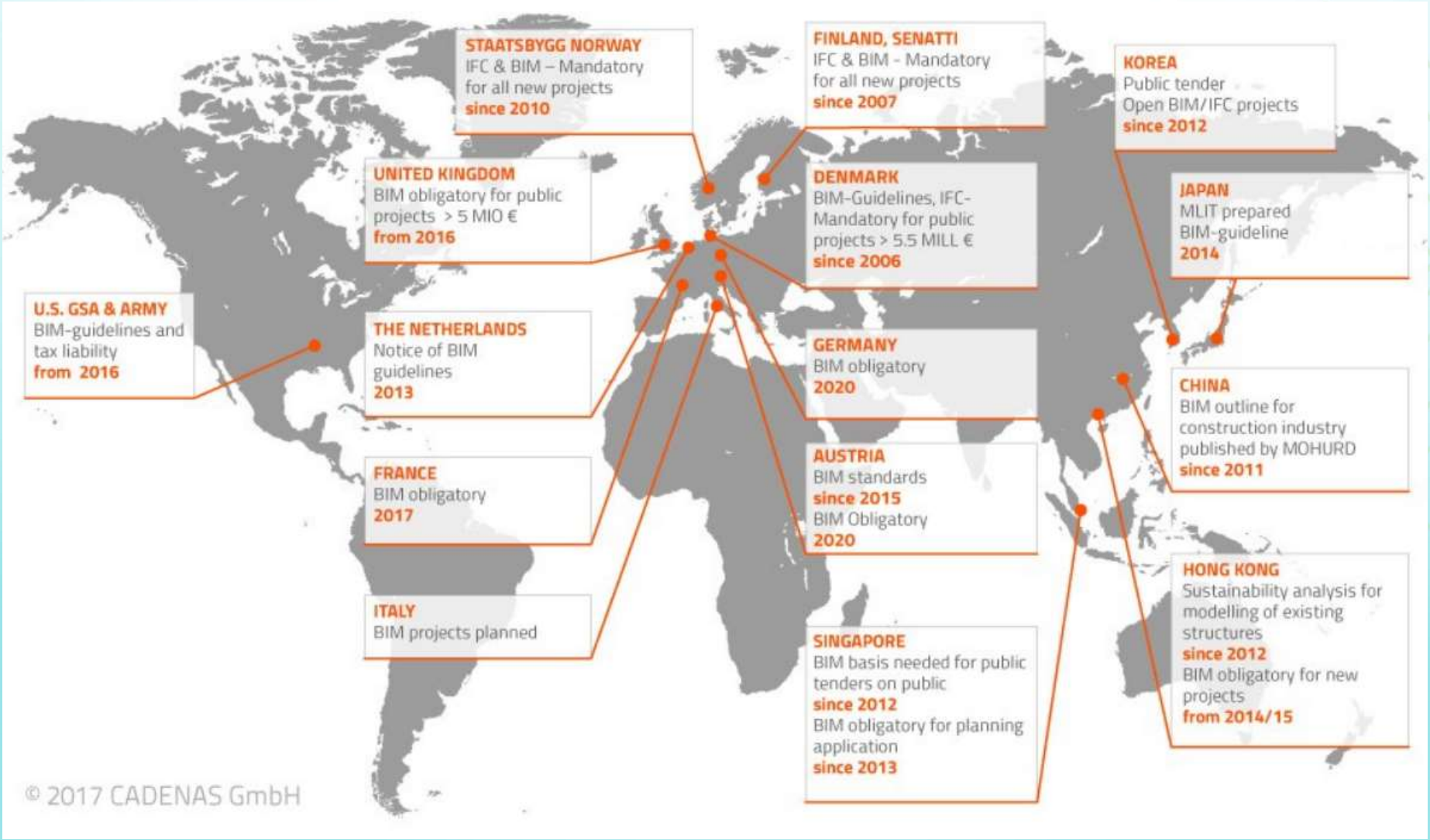
Autodesk Revit

AUTOCAD CIVIL 3D

Aecosim Building Designer

Graphisoft ArchiCAD

13. Global BIM & Development



14. BIM Development

Hong Kong
2002 / 10
Autodesk Revit Launch

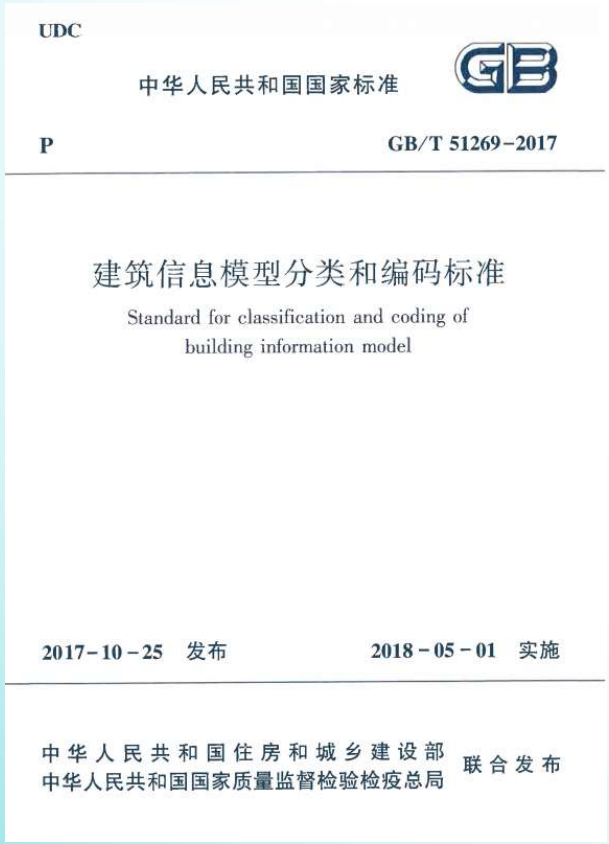
Beijing BIM trip
2005 / 06

15. BIM Development

Seoul BIM Talk
2007 / 04
Hong Kong BIM Delegates

Singapore BCA
2011 / 08
Singapore Delegates visit to HK

16. BIM Development



UDC

中华人民共和国国家标准

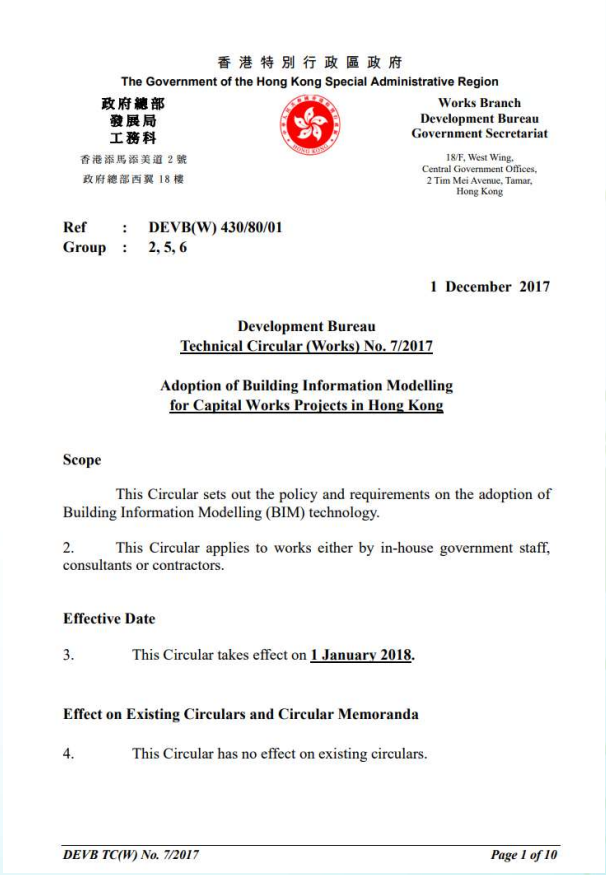
P GB/T 51269–2017

建筑信息模型分类和编码标准

Standard for classification and coding of building information model

2017–10–25 发布 2018–05–01 实施

中华人民共和国住房和城乡建设部
中华人民共和国国家质量监督检验检疫总局 联合发布



香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

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Development Bureau
Government Secretariat
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Central Government Offices,
2 Tim Mei Avenue, Tamar,
Hong Kong

Ref : DEVB(W) 430/80/01
Group : 2, 5, 6

1 December 2017

Development Bureau
Technical Circular (Works) No. 7/2017

Adoption of Building Information Modelling
for Capital Works Projects in Hong Kong

Scope

This Circular sets out the policy and requirements on the adoption of Building Information Modelling (BIM) technology.

2. This Circular applies to works either by in-house government staff, consultants or contractors.

Effective Date

3. This Circular takes effect on 1 January 2018.

Effect on Existing Circulars and Circular Memoranda

4. This Circular has no effect on existing circulars.

DEVB TC(W) No. 7/2017 *Page 1 of 10*

China Government

2017

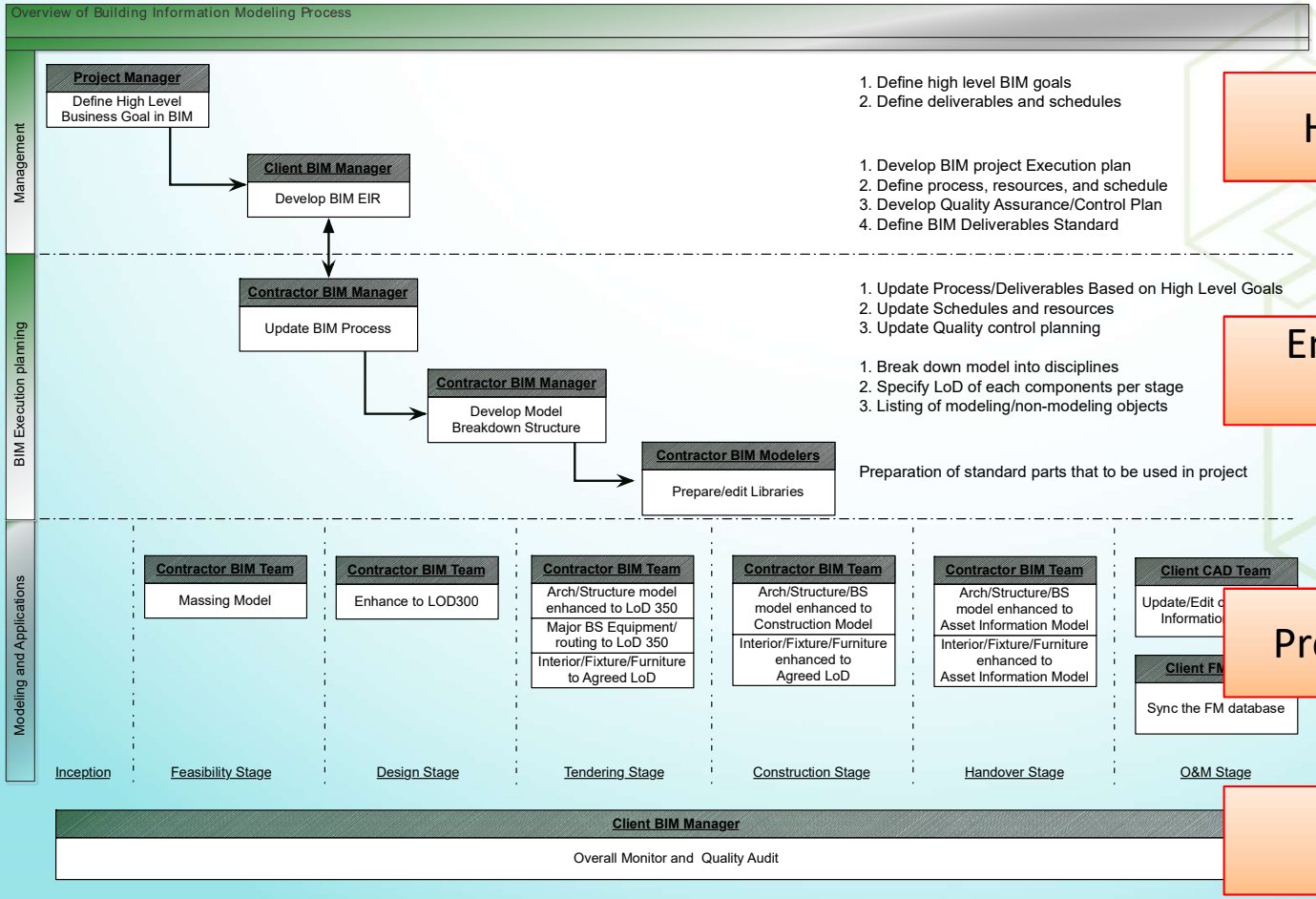
2020 BIM use in 90%

Hong Kong

2017 / 05

2018 January onward

17. BIM Execution Process



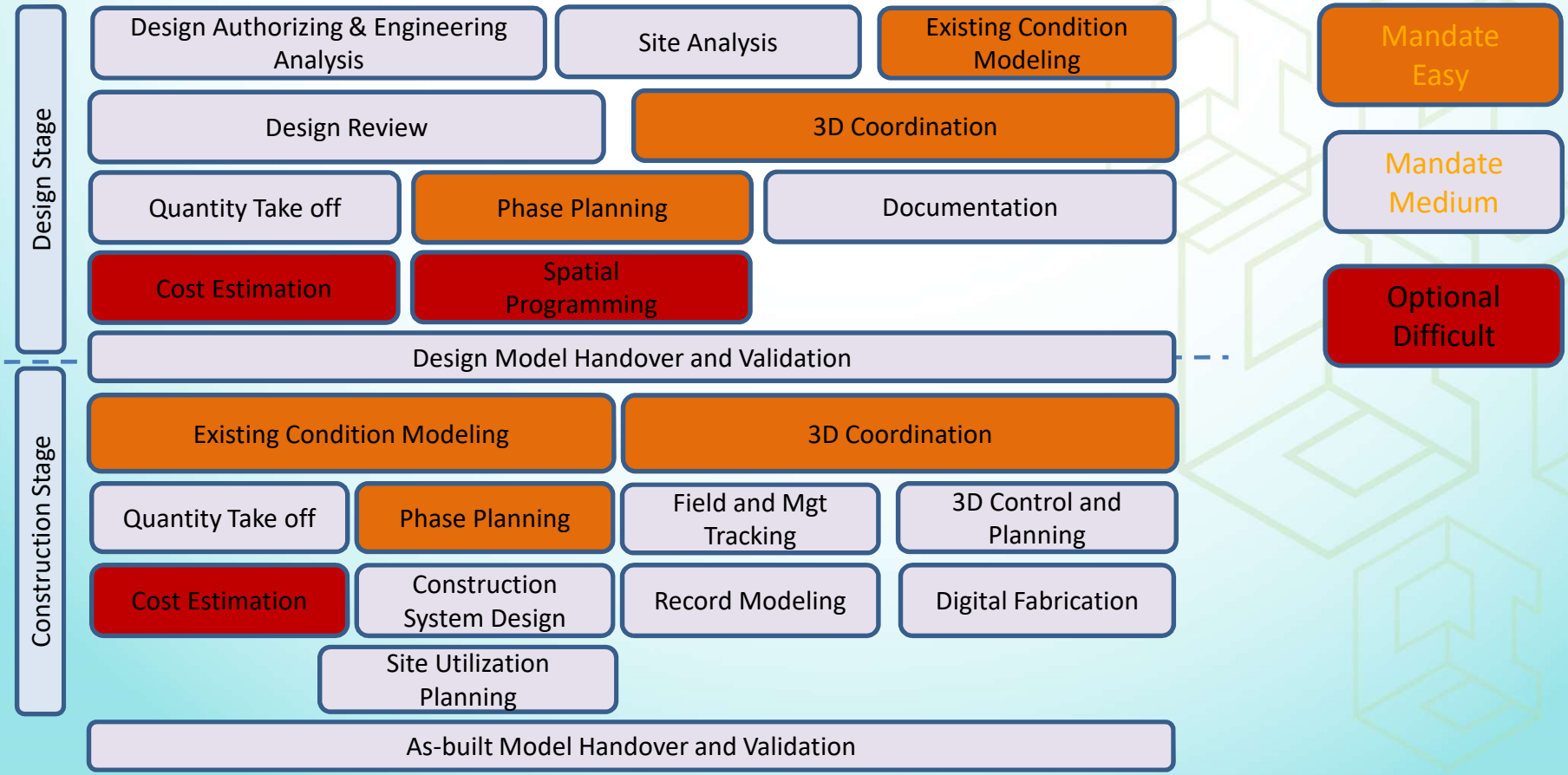
High Level BIM Goal

Employer Information Requirement

Process Re-engineering

Quality Audit

18. High level BIM Goals



19. Formulation of BIM strategy and standards

The Hong Kong Special Administrative Region of the People's Republic of China

The Chief Executive's 2017 Policy Address

繁體 | 简体 A A A Search

Policy Address | Speech | Policy Agenda | Highlights | Webcast | Press Releases | Videos | Other Publications | Archives | Contact Us | Sitemap

Policy Address

III. Diversified Economy

Construction and Related Professional Services Sectors

111. For the Hong Kong construction sector, the Belt and Road Initiative has brought visions while the Guangdong-Hong Kong-Macao Bay Area initiative has generated concrete opportunities and made it easier to achieve results.

112. The Mainland and Hong Kong signed an Agreement on Economic and Technical Co-operation under the Closer Economic Partnership Agreement (CEPA) on 28 June 2017, which expressly supports Hong Kong's participation in the development of pilot Free Trade Zones. The Government will capitalise on the new opportunities and continue to assist the construction and related professional services sectors in their business development in the Mainland. The Government will also deepen the co-operation with Qianhai, Hengqin and Nansha in accordance with the Agreement signed in June 2017. We will continue to discuss with the Mainland various issues such as mutual recognition of professional qualifications, rationalisation of the work of "professionals" and "practitioners", and promote the "Hong Kong management model" already adopted in Qianhai to other Free Trade Zones.

113. The construction industry has been facing the challenges of high construction costs and labour shortage in recent years. Hence, the Government is proactively promoting the adoption of technology and innovative construction methods to improve productivity and cost-effectiveness. For instance, the Government is assisting the industry in establishing large-scale and highly automated steel reinforcing bar prefabrication plants for the production of prefabricated steel reinforcement components for use in construction projects. We will also adopt Building Information Modelling technology in the design and construction of major government capital works projects that are scheduled to start in 2018, and promote the use of this technology in private construction projects. Besides, the new Construction Innovation and Technology Application Centre of the Construction Industry Council will be in operation by the end of this year to provide the latest information on local and overseas construction technologies and to support their adoption by small and medium enterprises.

香 港 特 別 行 政 區 政 府

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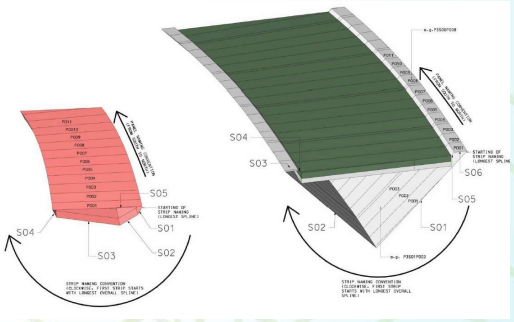
20. Details Design

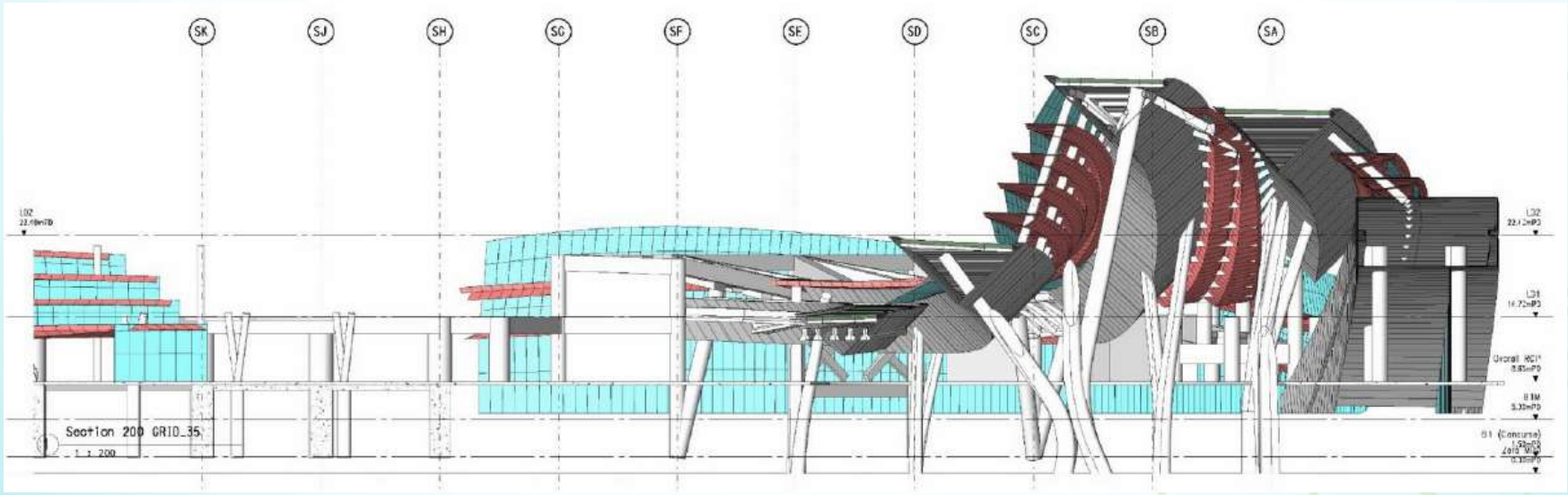


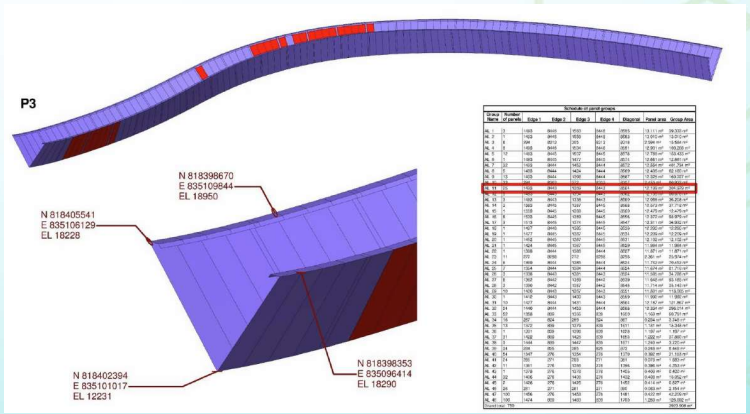
- Each panel contained information including size, location & coordinate

SSOT to improve detail design

Project : West Kowloon Station

21. Details Design

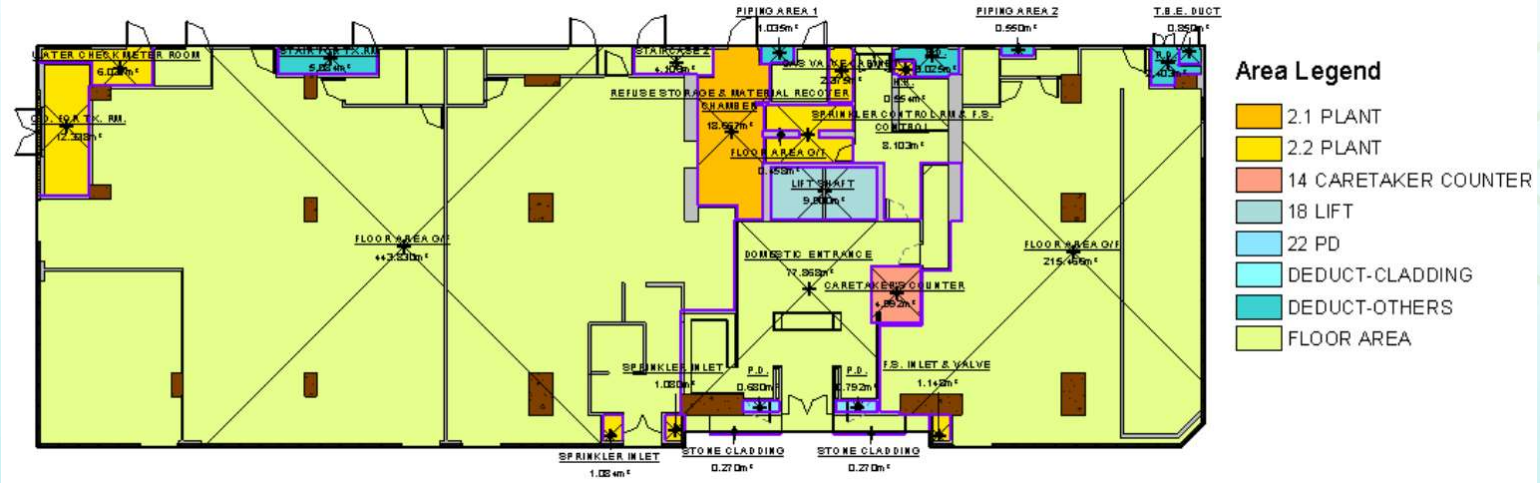




SSOT to improve detail design

Project : West Kowloon Station

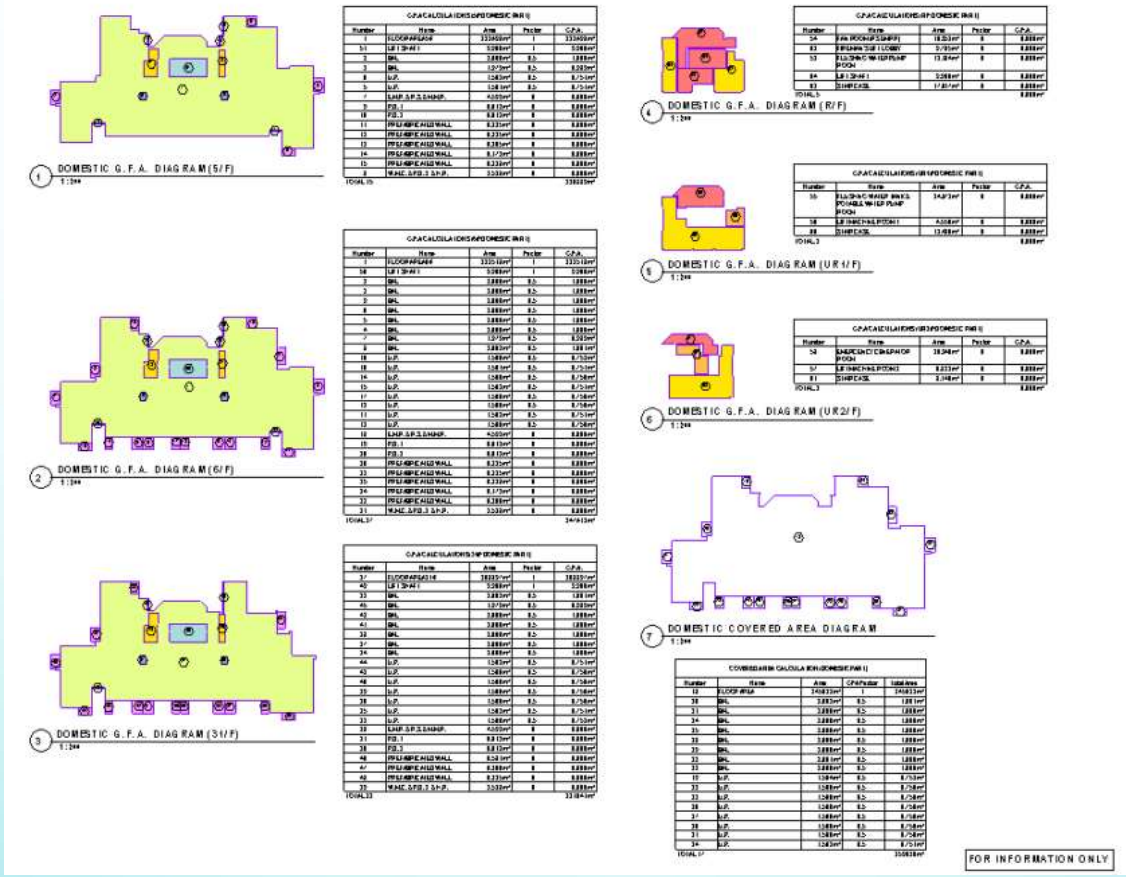
22. General Buildings Plan Submission



SSOT to improve GBP Submission

- Information Modeling enhance the consistency of the project
- Time saving for project operation

23. General Buildings Plan Submission



SSOT to improve GBP Submission

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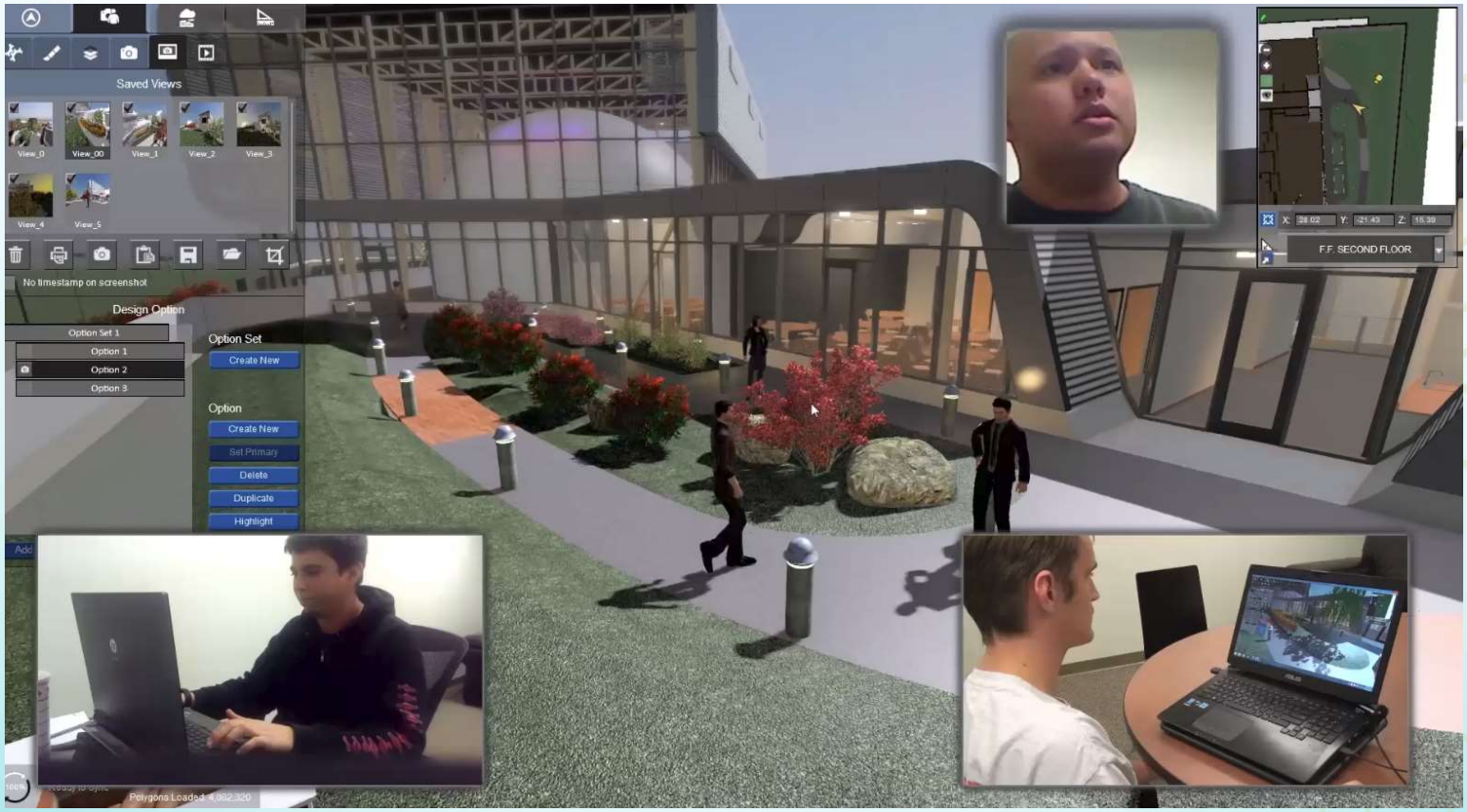
- Time saving for project operation

24. Design Review and 3D Coordination

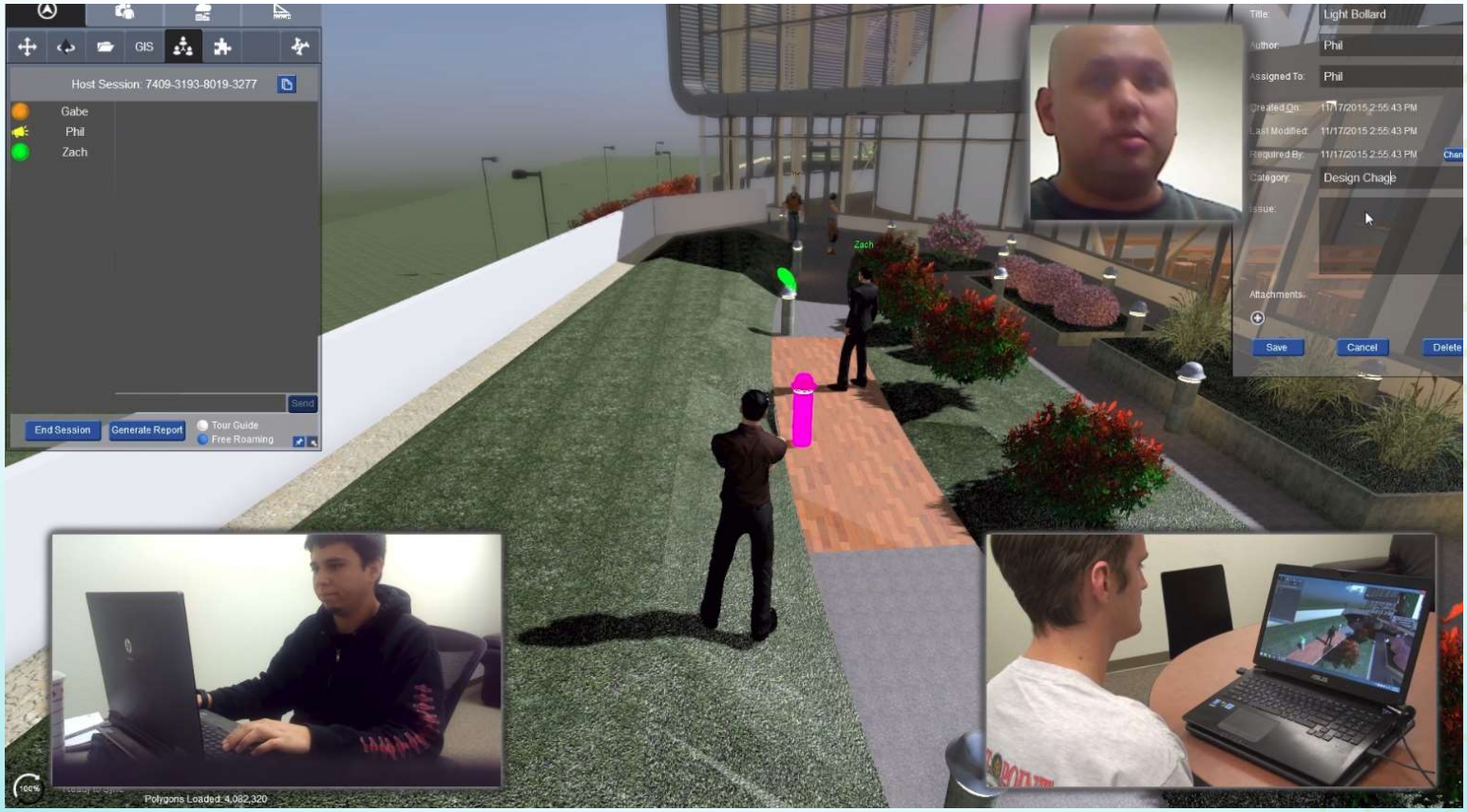


SSOT to improve Coordination

- Plugin software to simulate the virtual environment
- Different discipline can involve and revise the design at the same time

https://www.youtube.com/watch?v=DUwBQjjeVsQ

25. Design Review and 3D Coordination



SSOT to improve Coordination

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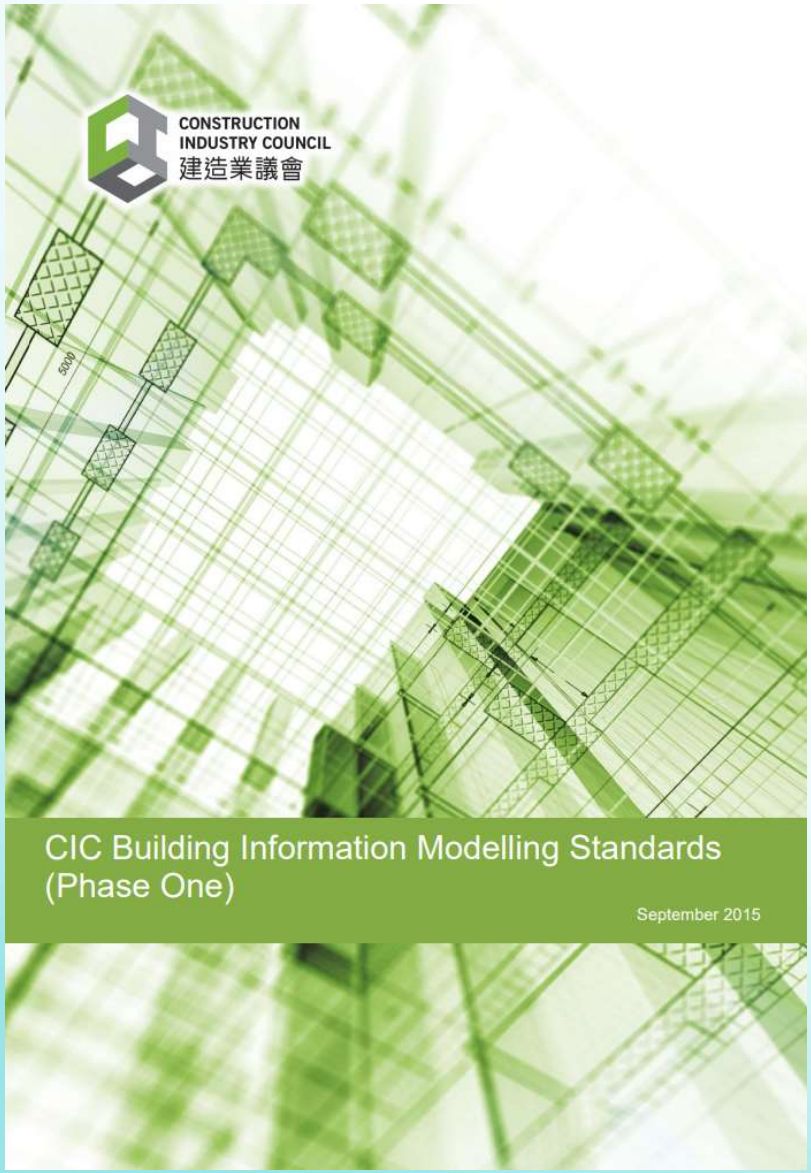
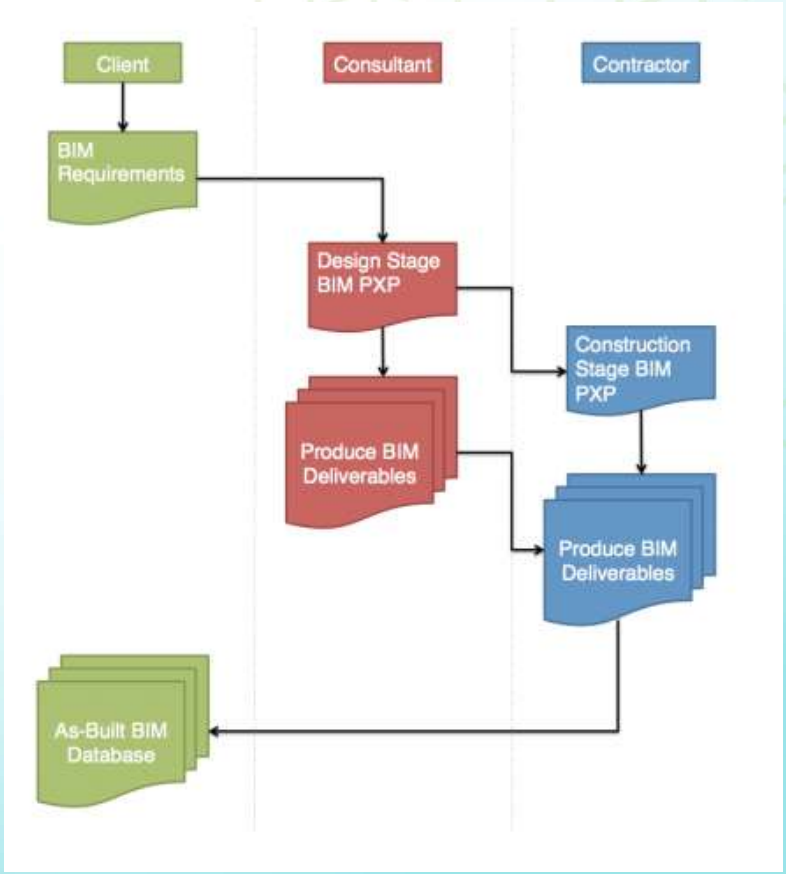
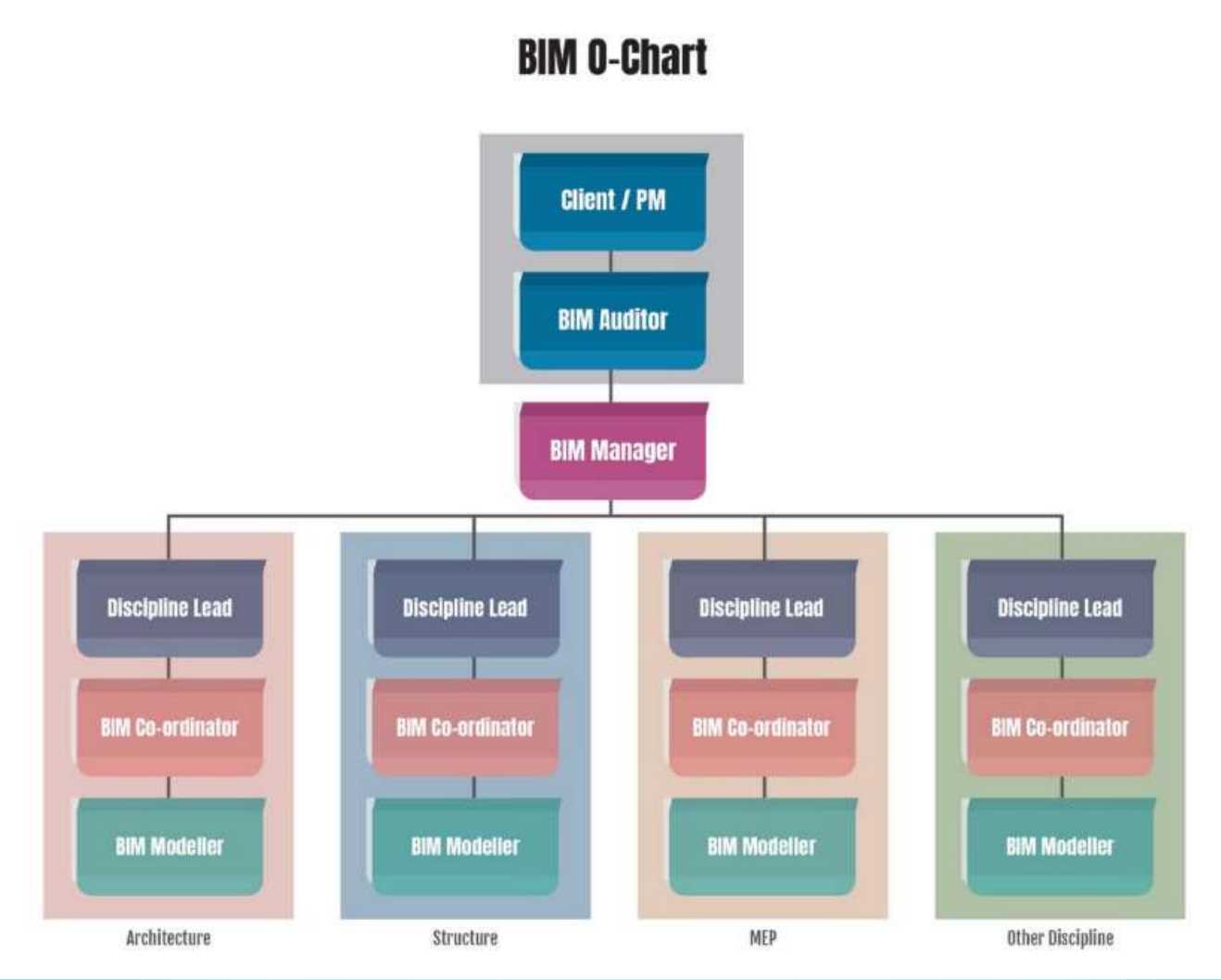
26. Introduction of CIC's BIM Standards

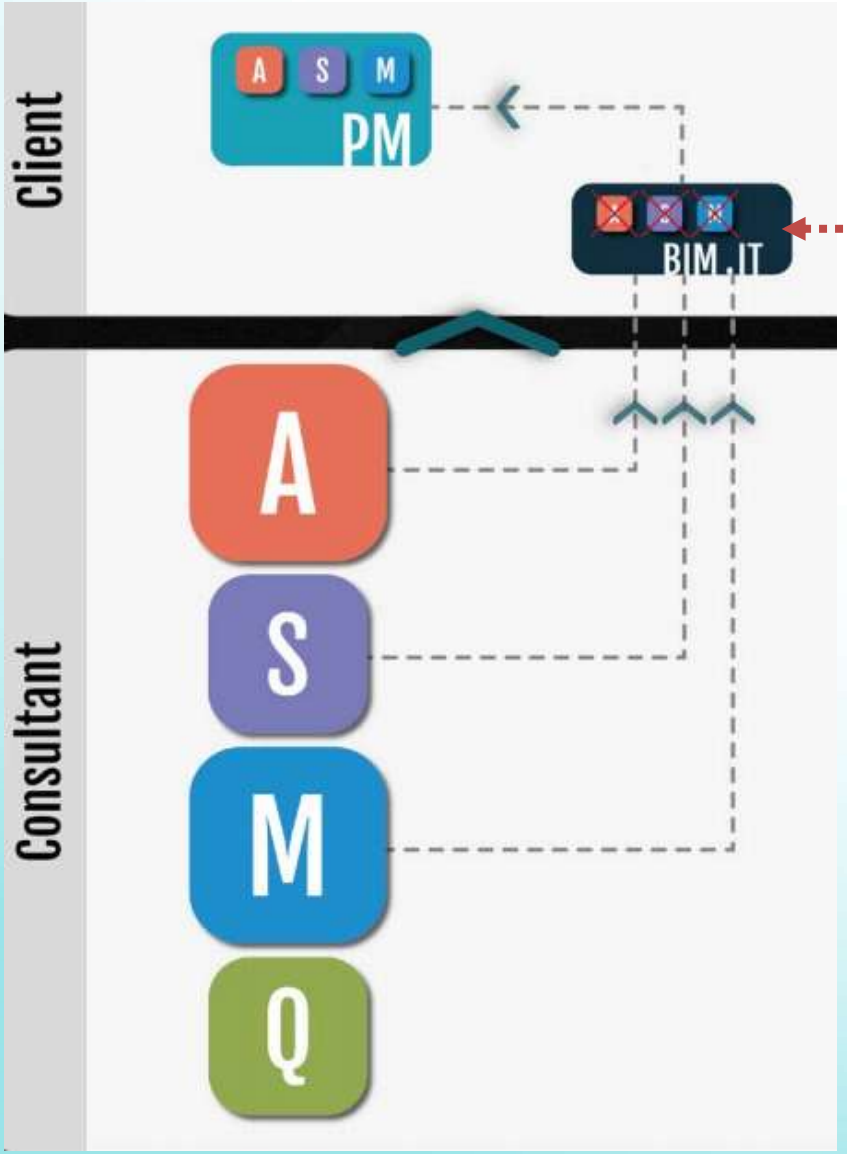




27. Introduction of CIC's BIM Standards



28. Low level BIM



Inefficient Workflow

- Architect, Structural Engineer & Buildings Services Engineer to produce drawings by CAD and deliver to BIM Consultants.
- BIM Consultants as a Modeler and Coordinator to handle all the architectural, structural and MEP as one body.

Inefficient Result

- Workload for Architect, Structural Engineer & Buildings Services Engineer have been duplicated from CAD to 3D.
- Most of the clash problem cannot be resolved since the modeler ae not professional body with no liability.
- The BIM result with no value for the projects.

29. Low level BIM Quotation Example

2. BIM Modeling services

2.1 Architecture and Structure Modeling Package
- To develop Architecture and Structure BIM models based on CAD drawings provided by Client according to BIM Requirement Specification for clash analysis and constructability review.
- Modeling duration: 2 weeks
- Deliverable: Architecture and Structure model for the basement carparks (including B1/F and B2/F) and podium for clubhouse and residential entrance lobbies (including G/F and 1/F) in Autodesk Revit Format

2.2 Detail M&E Modeling Package
- To develop detail M&E BIM models for all areas based on CAD drawings provided by Client according to BIM Requirement Specification for clash analysis and constructability review
- Modeling duration: 2 weeks
- Deliverable: Detail M&E model for the basement carparks (including B1/F and B2/F) and podium for clubhouse and residential entrance lobbies (including G/F and 1/F) in Autodesk Revit Format

2.3 Update Architecture and Structure Modeling Package (Maximum 5 times)
- To update Architecture and Structure BIM models based on updated CAD drawings provided by Client according to BIM Requirement Specification for clash analysis and constructability review
- Modeling duration: 1 week
- Deliverable: Updated Architecture and Structure model for the basement carparks (including B1/F and B2/F) and podium for clubhouse and residential entrance lobbies (including G/F and 1/F) in Autodesk Revit Format

3. Project Management Services
- To manage BIM documentation systematically to ensure quality of data
- To provide BIM/ CAD manager off-site with the following scope of works
  - To develop BIM project execution plan
  - To develop clash analysis and constructability review matrix
  - To develop systematic procedures for quality assurance, BIM model review and inspect information flow, BIM modeling process, clash analysis process and technical query reporting process.
  - To perform clash analysis based on clash analysis and constructability review matrix
  - To prepare 2D views for example 2D section(s), 3D section(s) from integrated BIM model as requested by Client
  - To prepare technical query of clashes detected and report to the Project team
  - To coordinate with Project team to resolve the clashes detected
  - To attend meetings when request by client and coordinate with Project team in the meetings
  - To assess, control and assure the quality of BIM deliverables
  - To report on project progress and issues
  - To deliver BIM deliverables such as BIM models, Technical Query, Model Progress Report, CSD, CBWD in Autodesk Revit Format and other relevant documents to the main contractor for smooth transition of the information and models.

Drawings produced by CAD Base

- Workload for Architect, Structural Engineer & Buildings Services Engineer have been duplicated from CAD to 3D

Clash Analysis

- Most of the clash problem cannot be resolved since the modeler ae not professional body with no liability.
- The BIM result with little value for the projects.

30. UK BIM Standards

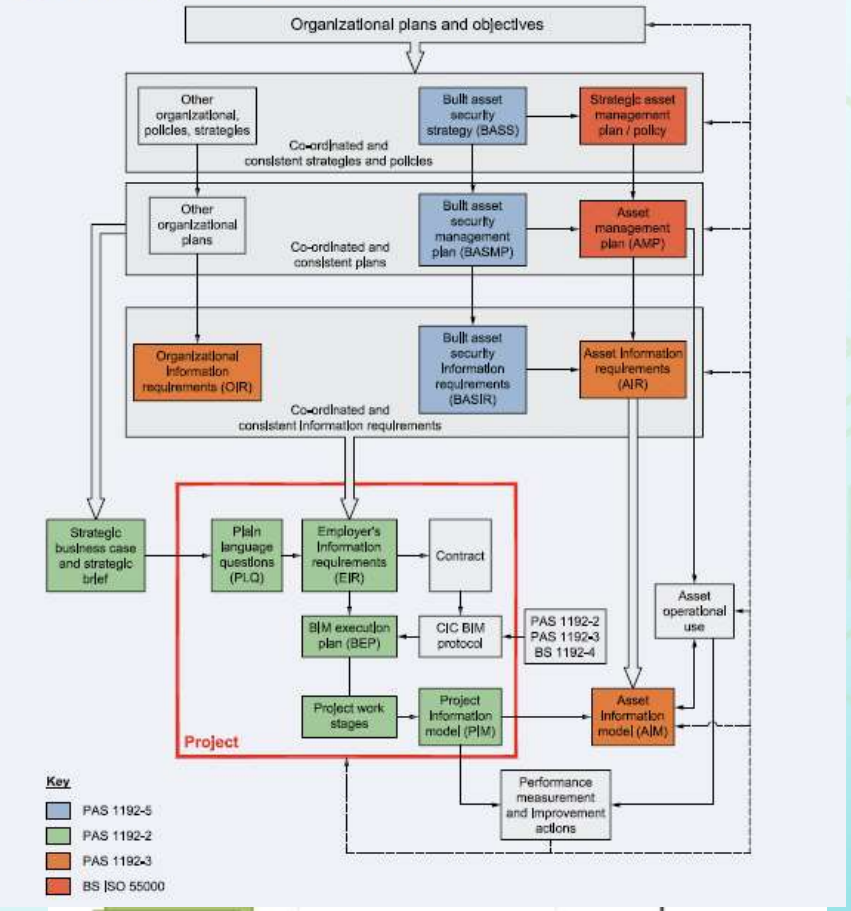
PAS 1192-5:2015

Specification for security-minded building information modelling, digital built environments and smart asset management

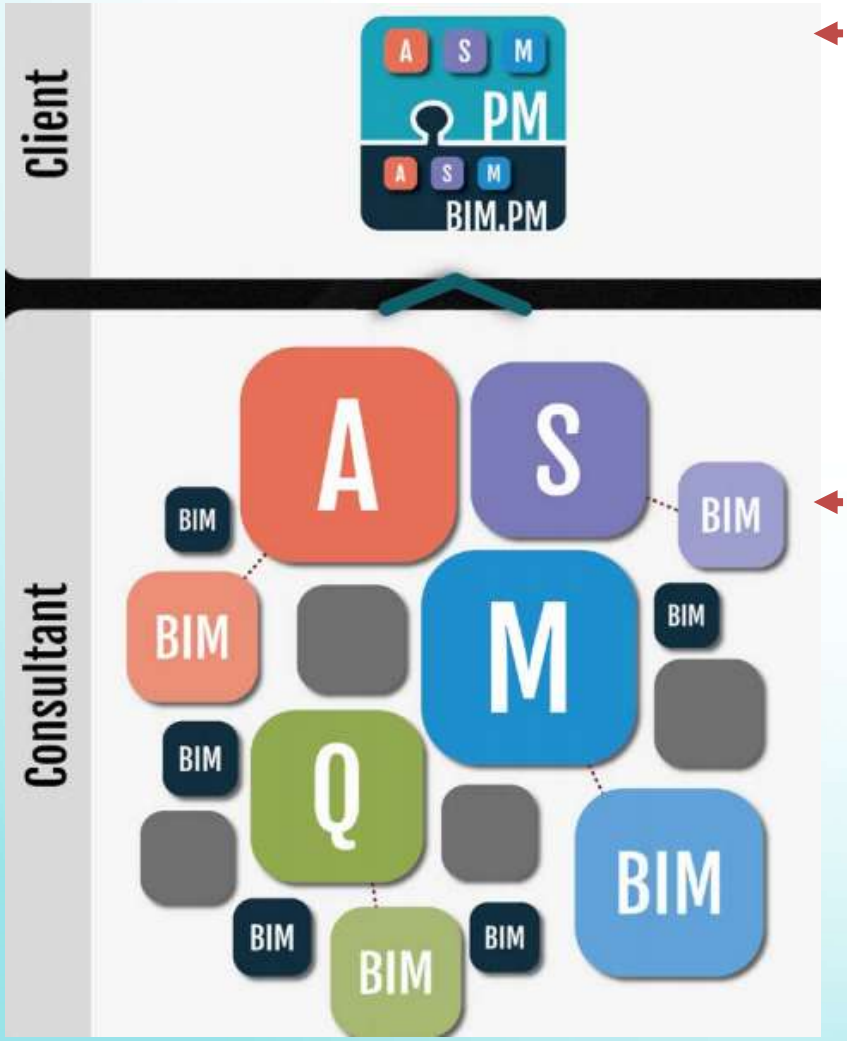
CPNI
Centre for the Protection of National Infrastructure

bsi.

Figure 2 – The integration of the security-minded approach



31. High level BIM



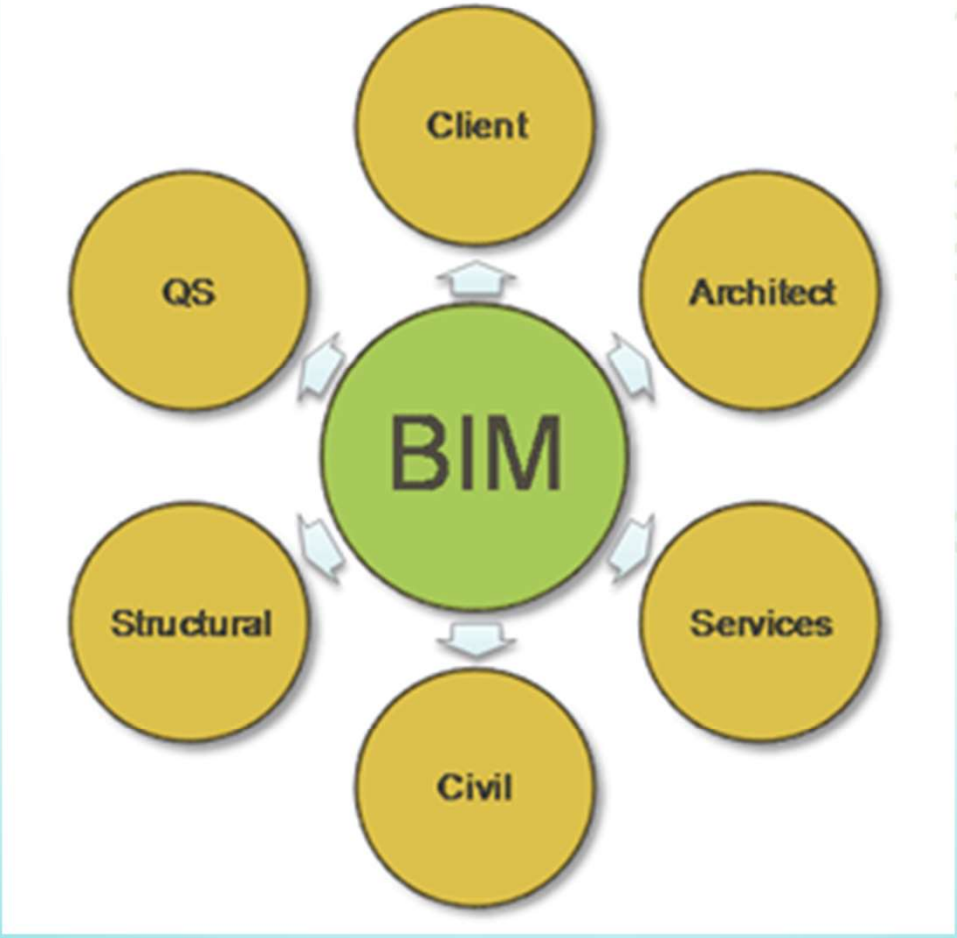
Better Result

- A BIM Manager to assess the BIM deliverable on each party time to time.
- Minimize the risk for variation order since all information are simulate in the BIM.

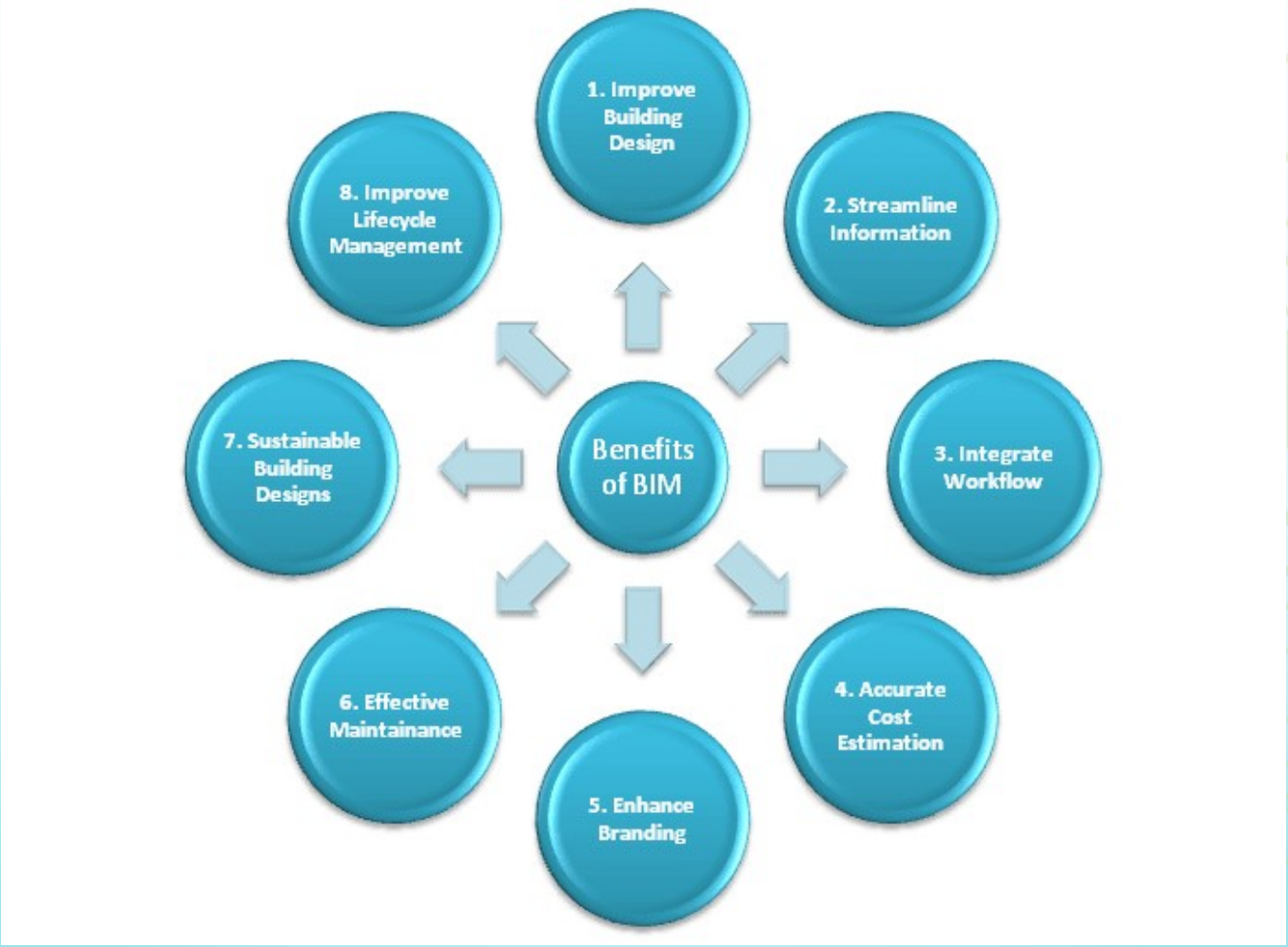
Efficient BIM workflow

- Architect, Structural Engineer, Buildings Services Engineer & QS to input in BIM directly in order to generate drawings, schedules and information.
- Each party have an independent BIM Coordinator to ensure the model is well coordinated.
- Clash result can be resolved during the details design process since all information is contained in earlier stage.

32. Basic concept, advantages and limitations of BIM design process



33. Basic concept, advantages and limitations of BIM design process



34. Basic concept, advantages and limitations of BIM design process

BIM ADVANTAGES

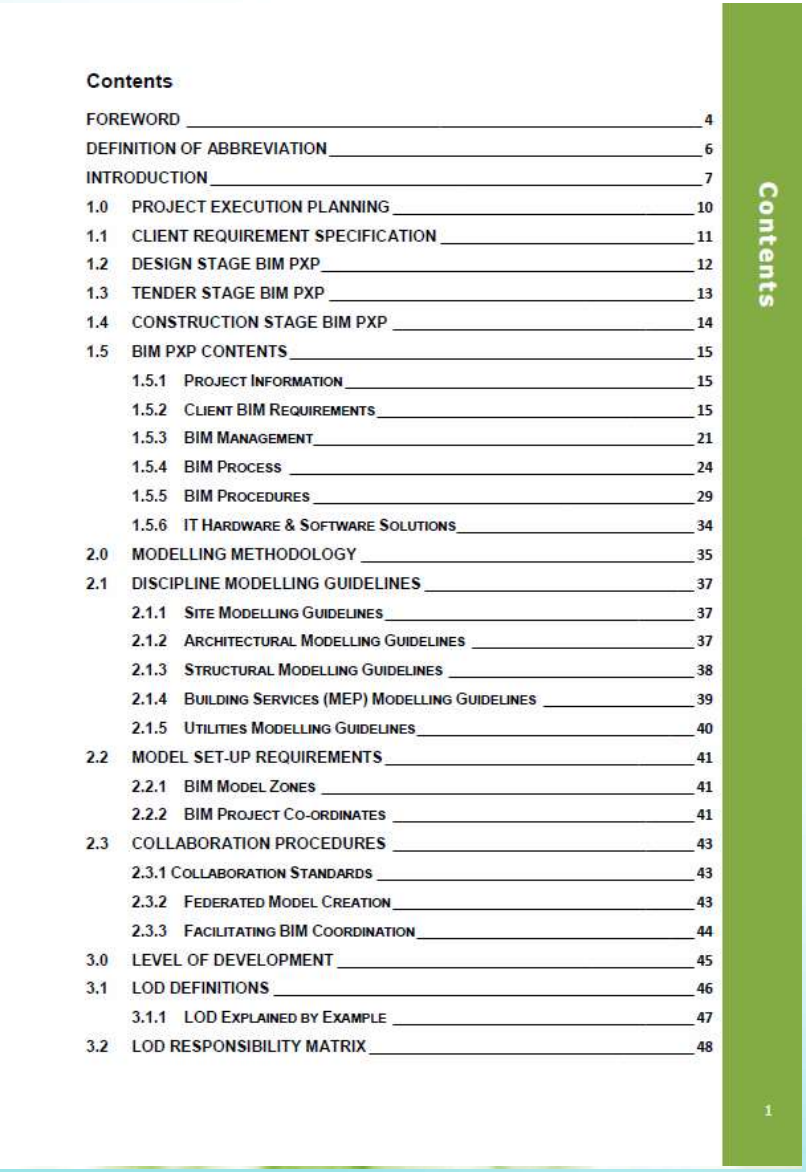
- 3D collaboration with all members of the team with automated detection of clashes. e.g. Is the service void designed by the architect sufficient for the M&E services.
- Visualization of projects to enable greater understanding of all members of the team. For example, it is far easier to schedule scaffolding requirements looking at a 3D model than in 2D.
- 4D visualization i.e. linking the 3D model to the programme to explore logistics.
- Faster to incorporate change into a Revit (3D) CAD layout as no need to update loads of individual drawings.
- 5D potential introducing costs into elements of model e.g electronic drawing take-off.
- Ability to incorporate additional information into model elements e.g maintenance and life span information for Facilities Management or sustainability information, etc

35. Basic concept, advantages and limitations of BIM design process

BIM DISADVANTAGES

- To be effective you need all major members of design team on significantly earlier than is often the case.
- BIM is more of a philosophy and not just a piece of software. Many people don't understand this. Construction is often slow to understand and embrace change.
- New protocols will be needed for managing information transfer and commenting, potentially new roles such as BIM Coordinators (much more than a document handler)
- Problems over information ownership and design responsibility within the model.

36. Introduction of CIC's BIM Standards



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1

Phase one included:

- Project Execution Planning
- Client Requirement Specification
- Design & Tender Stage BIM PXP
- Construction Stage BIM PXP
- BIM PXP Contents
- Modelling Methodology
- Discipline Modelling Guidelines
- Model Set-up Requirements
- Collaboration Procedures
- *Level of Development*
- *LOD Definitions*
- *LOS Responsibility Matrix*
- *LOD Speification*
- Component Presentation Style & Data Organisation
- Folder Structures
- Model Hierarchy & Data Structures
- Drawing Production
- Reference

37. Definition and requirements of LOD (Level of Development)

3.1 LOD Definitions

LOD notations are comprised of numbers from LOD 100 to LOD 500 and are defined as follows:-

LOD 100	The Model Element may be graphically represented in the Model with a **symbol** or other generic representation. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.
LOD 200	The Model Element is graphically represented within the Model as a **generic** system, object, or assembly with approximate quantities, size, shape, location, and orientation.
LOD 300	The Model Element is graphically represented within the Model as a **specific** system, object or assembly in terms of quantity, size, shape, location, and orientation.
LOD 350	The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and **interfaces with other** building systems.
LOD 400	The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, **fabrication, assembly, and installation** information.
LOD 500	The Model Element is a **field verified representation** in terms of size, shape, location, quantity, and orientation.

For LOD 200 to 500, Non-graphic information and data may also be attached to the Model Elements.

3.1 LOD Definitions

38. Model Subdivision and LOD

Project Specific Sub-division: O-Chart & File Size

ID	Disciplinary Model	Initial Model	Design Model	Coordinated Model	As-built Model	Sub Models
ES	Existing Site Model	200	200	250	250	4
ER	Road Model	250	300	350	500	7
BR	Bridge Model	250	300	350	500	34
UP	Underpass Model	250	300	350	500	11
BD	Building Model	250	300	350	500	27

Progressively Developed during project;
May not developed to same LoD

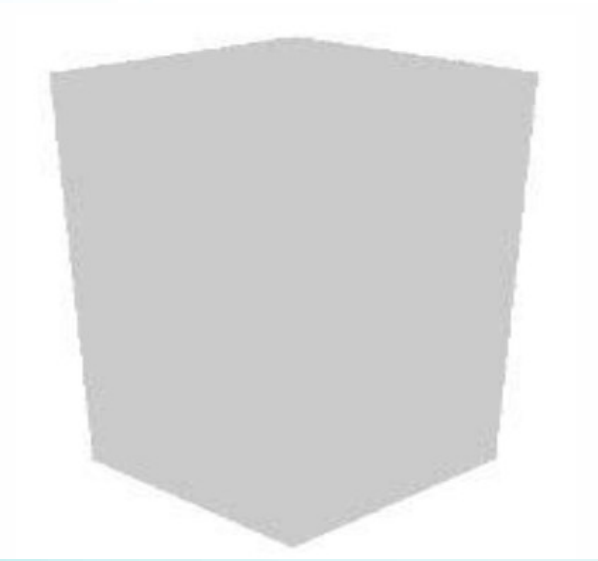
Further sub-division for operation and versioning

39. Geometric standard : Level of Development

LoD	Description
100	Graphically Represented as a **Symbol**
200	Graphically represented as a **Generic object**, with approximated size, shape, location, orientation
300	Graphically represented as a **Specific Object**, with accurate size, shape, location, and orientation Dimension can be directly measured from the model without referring to labels
400	Graphically represented as a specific object with **fabrication, assembly, construction joints, installation** information
500	Field verified representation with non-graphic attributes

40. LOD 100

LoD	Description
100	Steel Framing Columns as **Generic Column Element**

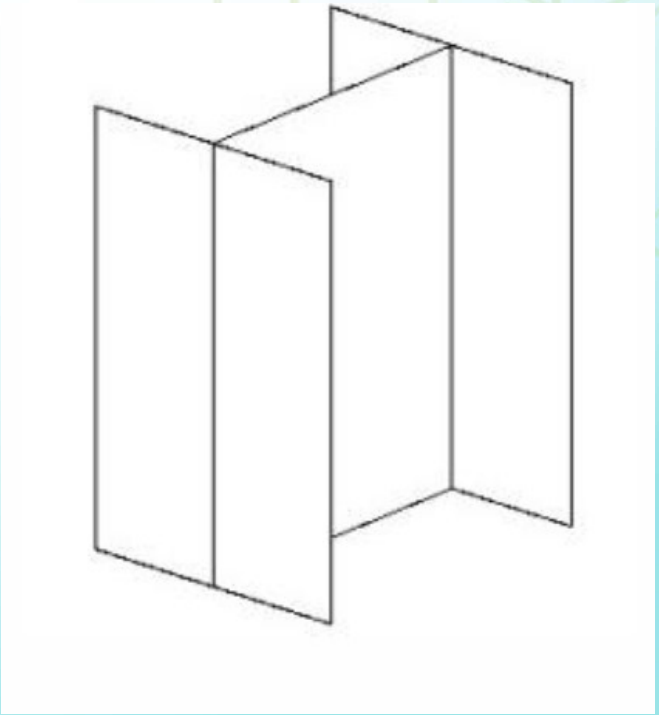


LOD in practice?

- Allow a design divide in different stages.
- A clear scope for consultant input
- Consultants can use the LOD standard to develop their design in different stages with a clear definition

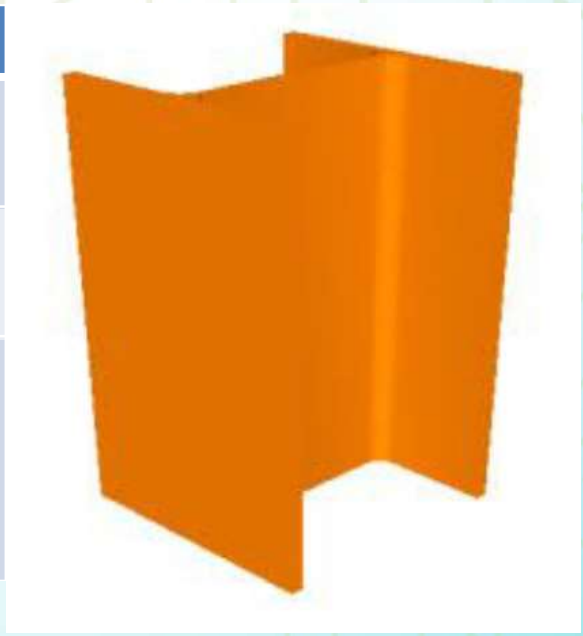
41. LOD 200

LoD	Description
100	Steel Framing Columns as **Generic Column Element**
200	Steel Framing Columns as **Generic Column** , with approximated size, shape, location, orientation



42. LOD 300

LoD	Description
100	Steel Framing Columns as **Generic Column Element**
200	Steel Framing Columns as **Generic Column** , with approximated size, shape, location, orientation
300	Steel Framing Columns with **Specific Sizes of Main Vertical Structural Members Modeled** per defined structural grid with current location and orientation.

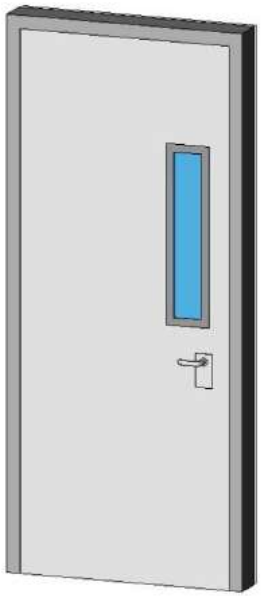


43. Level of Development – Steel Column

LoD	Description
100	Steel Framing Columns as **Generic Column Element**
200	Steel Framing Columns as **Generic Column** , with approximated size, shape, location, orientation
300	Steel Framing Columns with **Specific Sizes of Main Vertical Structural Members Modeled** per defined structural grid with current location and orientation.
400	Steel Framing Columns to include **welds, coping of members, cap pates, washers, nuts and all assembly elements, etc.**
500	Steel Framing Columns with **As-Built Information.**

44. Level of Development – Doors

Doors

LOD	Description	Data	Example Image
100	N/A		
200	Model doors with approximate dimensions in terms of location, size, count and type.		
300	Model doors accurately based on specific types. Ironmongery (handles, locks, hinges etc.) may be included as data for schedule output. Identify exterior and interior by type and by function. Each door shall have a unique ID based on the room or space which it is used to access.	Fire rating	
400	Update with specific manufacturers information.		
500	As-built door model.		

LOD in practice?

- The development can be carried out from consultants to contractor.
- All information can be contained and let the facility management team to operate the building with sufficient information.

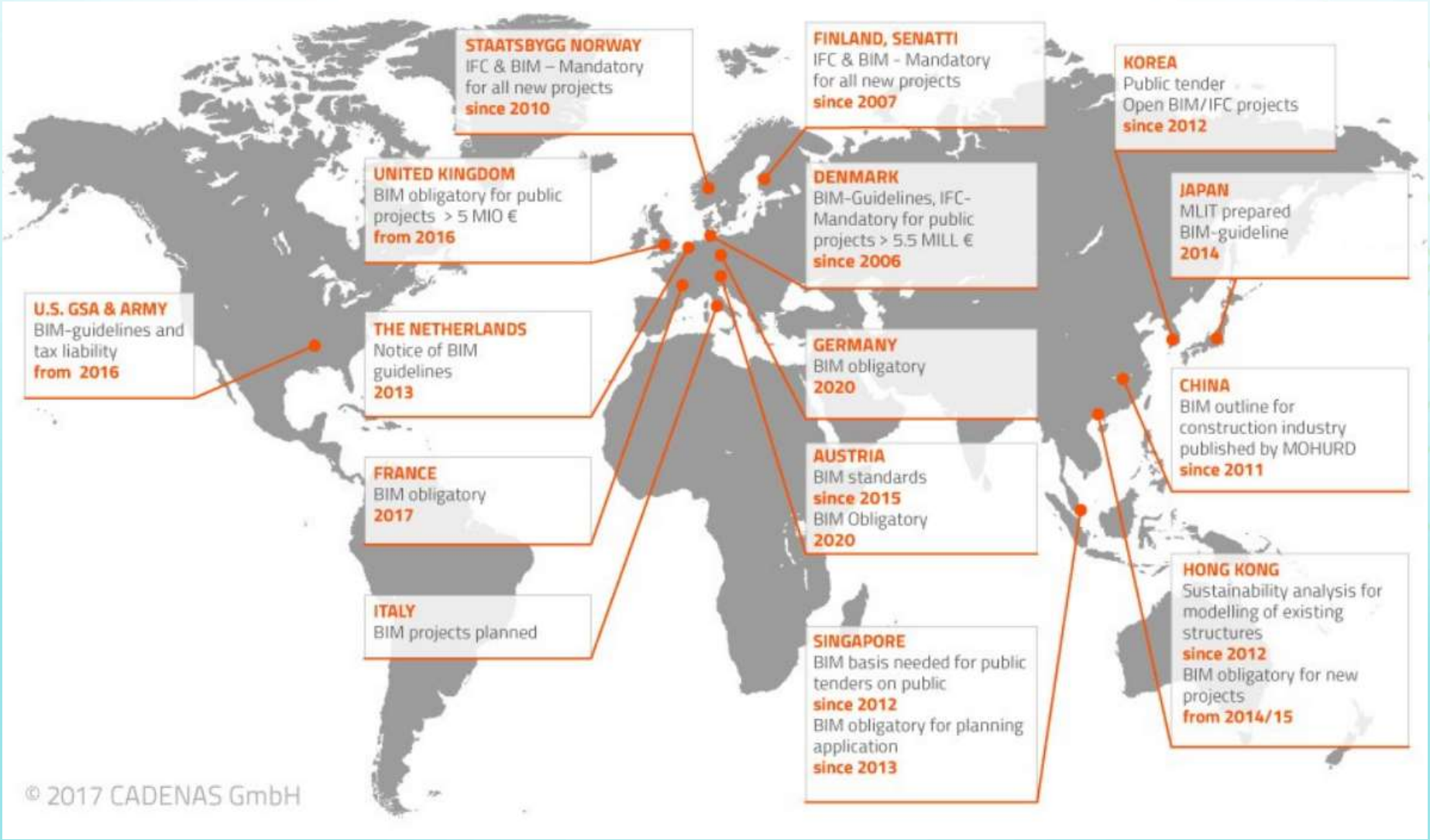
45. CIC Standard : Pavement

LOD	Description
100	Approximate alignment, width and spot levels of the paving surfaces
200	Element modelling to include approximate 3D alignment, shape and width of pavement
300	Element modelling to include: – Accurate size and geometry of every layer of paving components (frication course, wearing course, base-course, road-base, sub-base, etc.) that varies continuously along the road alignment – Accurate super-elevation and longitudinal fall of the pavement components Required non-graphic information associated with model elements includes: – Polygon Feature Type * – Surface Material Type * – Paver Type * – Headroom requirement (* to match HyD GIS requirement)
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints – Locations of Box-out Openings – Lane and Road markings Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay
500	A field verified as-built model with complete non-graphic information

LOD in practice?

- The development can be carried out from consultants to contractor.
- Contractor shall use the model to develop his Shop Drawings for approval which allow the Single Source of Truth (SSOT) is reflected in the model.
- All information can be contained and let the facility management team to operate the building with sufficient information.

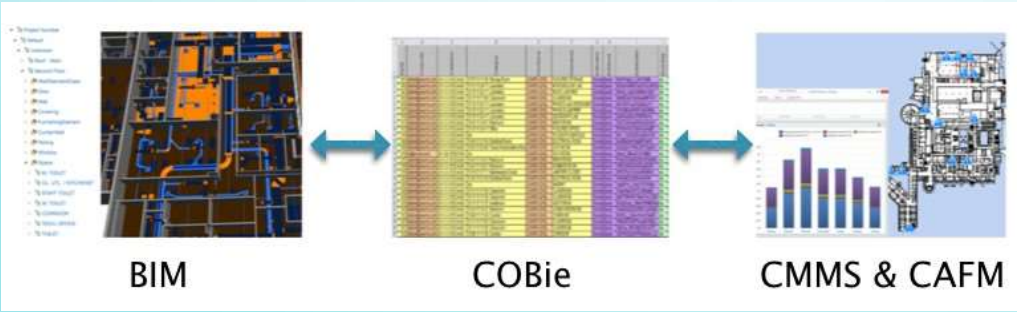
46. Recent development of BIM in various countries and the prevailing standards and requirements



47. Worldwide organizations and standards promoting BIM (CIC, IFC, COBie, etc.)

CONSTRUCTION INDUSTRY COUNCIL
建造業議會

buildingSMART
International home of openBIM



UDC

中华人民共和国国家标准

P GB/T ××××—201×

建筑工程信息模型应用统一标准

Unified standard for building information model application

（征求意见稿）

201×—××—×× 发布 201×—××—×× 实施

中华人民共和国住房和城乡建设部
中华人民共和国国家质量监督检验检疫总局 联 合 发 布

48. Identification of the uses of BIM

- Design authoring
- Design coordination
- Estimating and cost management
- 4D BIM for construction management
- 5D BIM i.e. 3D + time + cost - Environmental and engineering analysis
- Visualization
- Model federation and validation
- Site supervision and safety management

	BIM Use	Investigation, Feasibility and Planning	Design	Construction
1	Design Authoring	O	M	M
2	Design Reviews	O	M	M
3	Existing Conditions Modelling	O	O	M
4	Site Analysis	O	M	
5	3D Coordination		M	M
6	Cost Estimation	O	O	O
7	Engineering Analysis		O	O
8	Facility Energy Analysis		O	O
9	Sustainability Evaluation	O	O	O
10	Space Programming	O	O	
11	Phase Planning (4D Modelling)		O	M
12	Digital Fabrication		O	O
13	Site Utilization Planning			O
14	3D Control and Planning			O
15	As-Built Modelling			M
16	Project Systems Analysis			O
17	Maintenance Scheduling			O
18	Space Management and Tracking			O
19	Asset Management			O
20	Drawing Generation (Drawing Production)		M	M

Legend:

M – Mandatory BIM Use for the mentioned stage, including that carried forward from previous stage.

O – Optional BIM Use

Day 2 - Project Execution Plan in BIM & Design Development Stage (Full Day)

1. Preparation and development of the BIM Project Execution Plan and compliant check of the BIM Project Execution Plan

What is BIM Project Execution Plan?

- Provide basic framework in respect of different phases and disciplines
- Setup framework from Design Authoring, Cost Estimating, Design Coordination, Detail Design and Documentation process
- The team shall follow and monitor their progress against this plan to gain the maximum benefits from BIM implementation

BIM PROJECT EXECUTION PLAN
VERSION 2.0
FOR
[PROJECT TITLE]
DEVELOPED BY
[AUTHOR COMPANY]

This template is a tool that is provided to assist in the development of a BIM project execution plan. The template plan was created from the buildingSMART alliance™ (bSa) Project "BIM Project Execution Planning" as developed by The Computer Integrated Construction (CIC) Research Group of The Pennsylvania State University. The bSa project is sponsored by The Charles Pankow Foundation (http://www.pankowfoundation.org), Construction Industry Institute (CII) (http://www.construction-institute.org), Penn State Office of Physical Plant (OPP) (http://www.opp.psu.edu), and The Partnership for Achieving Construction Excellence (PACE) (http://www.engr.psu.edu/pace). The BIM Project Execution Planning Guide can be downloaded at http://www.engr.psu.edu/BIM/PxP.

This coversheet can be replaced by a company specific coversheet that includes at a minimum document title, project title, project location, author company, and project number.

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PACE The Partnership for Achieving Construction Excellence
The Computer Integrated Construction Research Program

Pleas refer to 1PXP template.pdf

2. Preparation and development of the BIM Project Execution Plan and compliant check of the BIM Project Execution Plan

Pleas refer to 1PXP template.pdf

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING		DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS		DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
			3D COORDINATION		3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS		RECORD MODELING		RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABLITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

SELECTION OF BIM IMPLEMENTATION

PROJECT STAGES / PHASES

3. Compliant check of the PXP

What is Quality Control Checks?

- Team member should be responsible for performing quality control checks of their design, dataset, model properties and documentation.
- The BIM Manager should be the one to confirm quality of the model after the revisions were made.

QUALITY CONTROL CHECKS:

The following checks should be performed to assure quality.

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAM(S)	FREQUENCY
VISUAL CHECK	Ensure there are no unintended model components and the design intent has been followed			
INTERFERENCE CHECK	Detect problems in the model where two building components are clashing including soft and hard			
STANDARDS CHECK	Ensure that the BIM and AEC CADD Standard have been followed (fonts, dimensions, line styles, levels/layers, etc)			
MODEL INTEGRITY CHECKS	Describe the QC validation process used to ensure that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements and the reporting process on non-compliant elements and corrective action plans			

Pleas refer to 1PXP template.pdf

4. Compliant check of the PXP

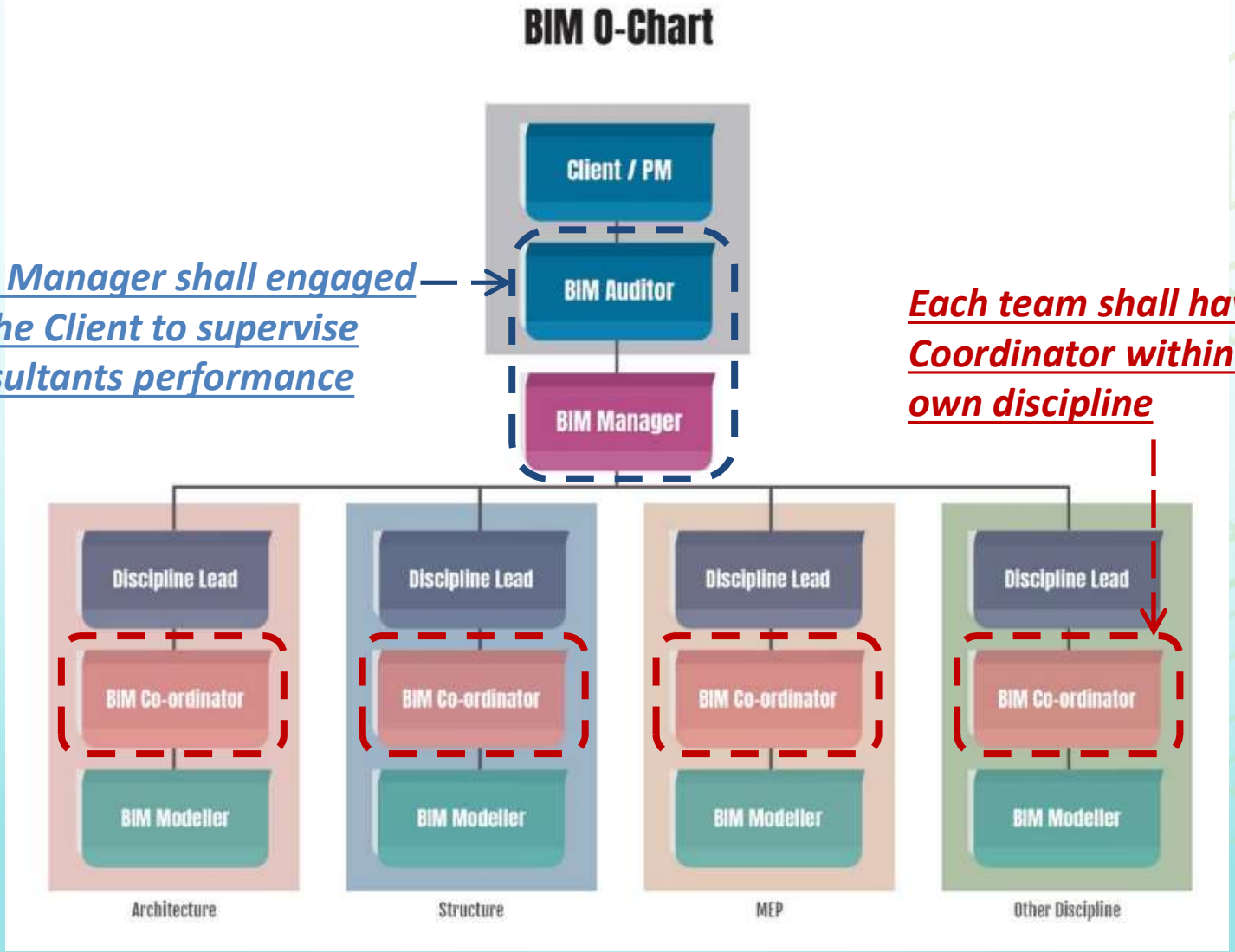
What is Quality Control Progress?

- The setup to be reviewed in different phases and users
- From Inception to Analysis across different parties
- Each party to report to the BIM Manager time to time

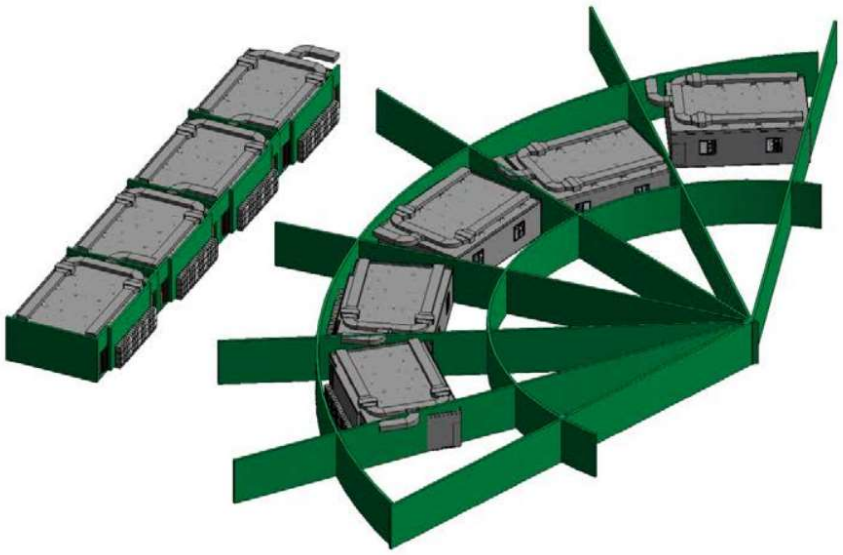
X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING		DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS		DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
			3D COORDINATION		3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS		RECORD MODELING		RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABLITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

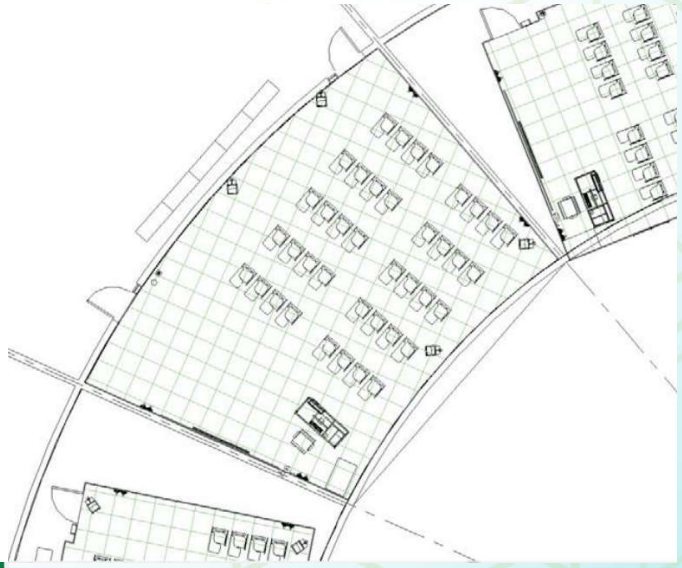
Pleas refer to 1PXP template.pdf

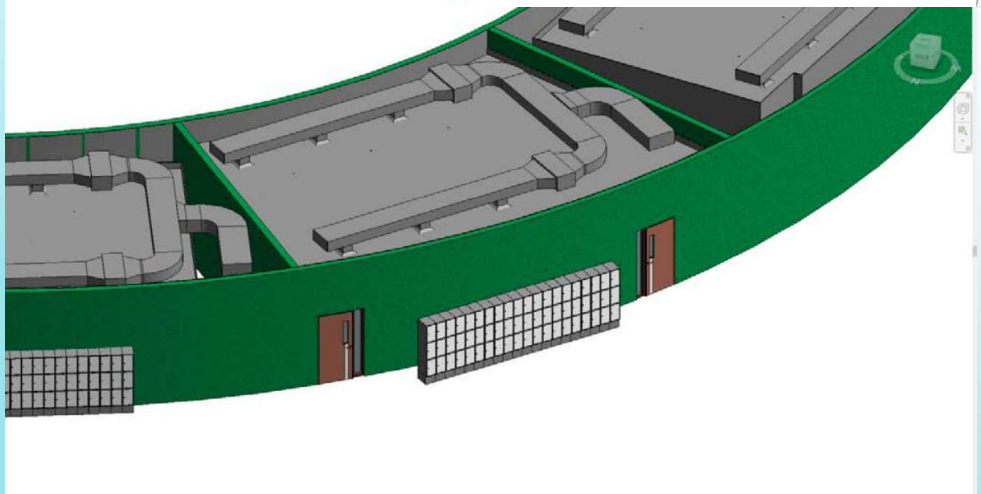
5. PXP Organization Structure



6. Development of conceptual design, mass modelling, area scheduling, outline cost plan







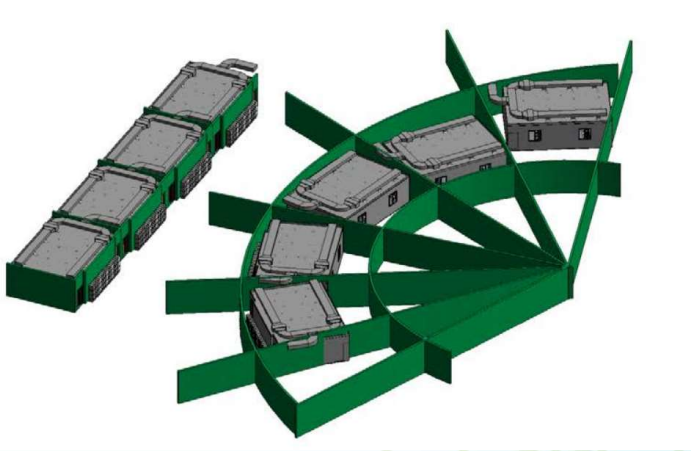
Conceptual Design in Modular by BIM :

- Design Modules shall imply into the design in early stage
- Initial cost can be calculated roughly base on the Information in BIM

7. Development of conceptual design, mass modelling, area scheduling, outline cost plan

<Wall Schedule>

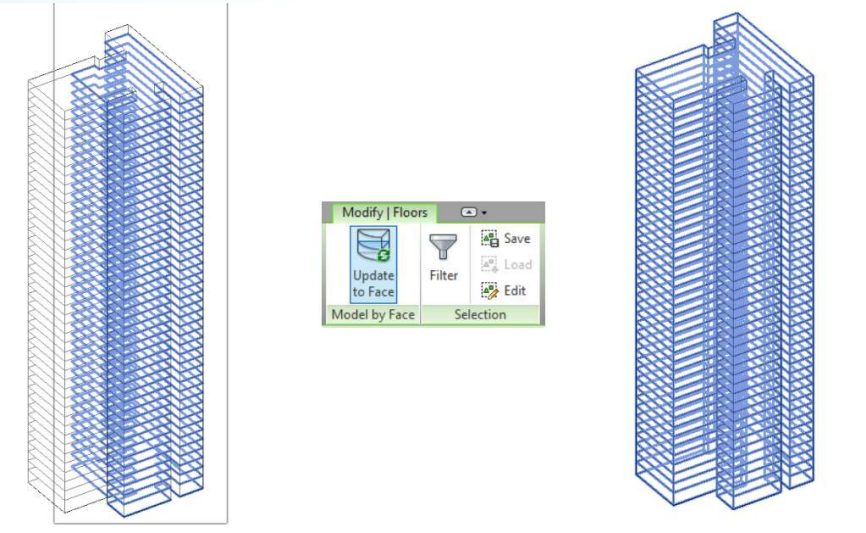
A	B	C	D	E
Type	Area	Volume	Cost	Total Cost
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$524.06
25mm Cement Sand Rendering + Paint Finish	27 m²	0.68 m³	HK$1000.00	HK$676.02
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$522.19
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	19 m²	0.47 m³	HK$1000.00	HK$472.50
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
AWL-CON-ACD-200mm-No Render	85 m²	17.00 m³	HK$2000.00	HK$34004.72
AWL-CON-ACD-200mm-No Render	80 m²	15.18 m³	HK$2000.00	HK$30328.32
AWL-CON-ACD-200mm-No Render	25 m²	5.03 m³	HK$2000.00	HK$10062.00
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$524.06
25mm Cement Sand Rendering + Paint Finish	27 m²	0.68 m³	HK$1000.00	HK$676.02
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$522.19
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.23
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	19 m²	0.47 m³	HK$1000.00	HK$472.50
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
AWL-CON-ACD-200mm-No Render	25 m²	5.03 m³	HK$2000.00	HK$10062.00
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$524.06
25mm Cement Sand Rendering + Paint Finish	27 m²	0.68 m³	HK$1000.00	HK$676.02
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$522.19
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.23
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	19 m²	0.47 m³	HK$1000.00	HK$472.50
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
AWL-CON-ACD-200mm-No Render	25 m²	5.03 m³	HK$2000.00	HK$10062.00
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$524.06
25mm Cement Sand Rendering + Paint Finish	27 m²	0.68 m³	HK$1000.00	HK$676.02
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$522.19
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.23
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	19 m²	0.47 m³	HK$1000.00	HK$472.50
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
AWL-CON-ACD-200mm-No Render	25 m²	5.03 m³	HK$2000.00	HK$10062.00
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$524.06
25mm Cement Sand Rendering + Paint Finish	27 m²	0.68 m³	HK$1000.00	HK$676.02
25mm Cement Sand Rendering + Paint Finish	21 m²	0.52 m³	HK$1000.00	HK$522.19
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.23
25mm Cement Sand Rendering + Paint Finish	1 m²	0.02 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	19 m²	0.47 m³	HK$1000.00	HK$472.50
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
25mm Cement Sand Rendering + Paint Finish	3 m²	0.07 m³	HK$1000.00	HK$66.75
AWL-CON-ACD-200mm-No Render	25 m²	5.03 m³	HK$2000.00	HK$10062.00
AWL-CON-ACD-200mm-No Render	25 m²	5.03 m³	HK$2000.00	HK$10062.00
AWL-CON-ACD-200mm-No Render	112 m²	22.36 m³	HK$2000.00	HK$44729.61
AWL-CON-ACD-200mm-No Render	23 m²	4.57 m³	HK$2000.00	HK$9144.00
AWL-CON-ACD-200mm-No Render	23 m²	4.57 m³	HK$2000.00	HK$9144.00
AWL-CON-ACD-200mm-No Render	23 m²	4.57 m³	HK$2000.00	HK$9144.00



Conceptual Design in Modular by BIM:

- Design Modules shall imply into the design in early stage
- Initial cost can be calculated roughly base on the Information in BIM

8. Development of conceptual design, mass modelling, area scheduling, outline cost plan



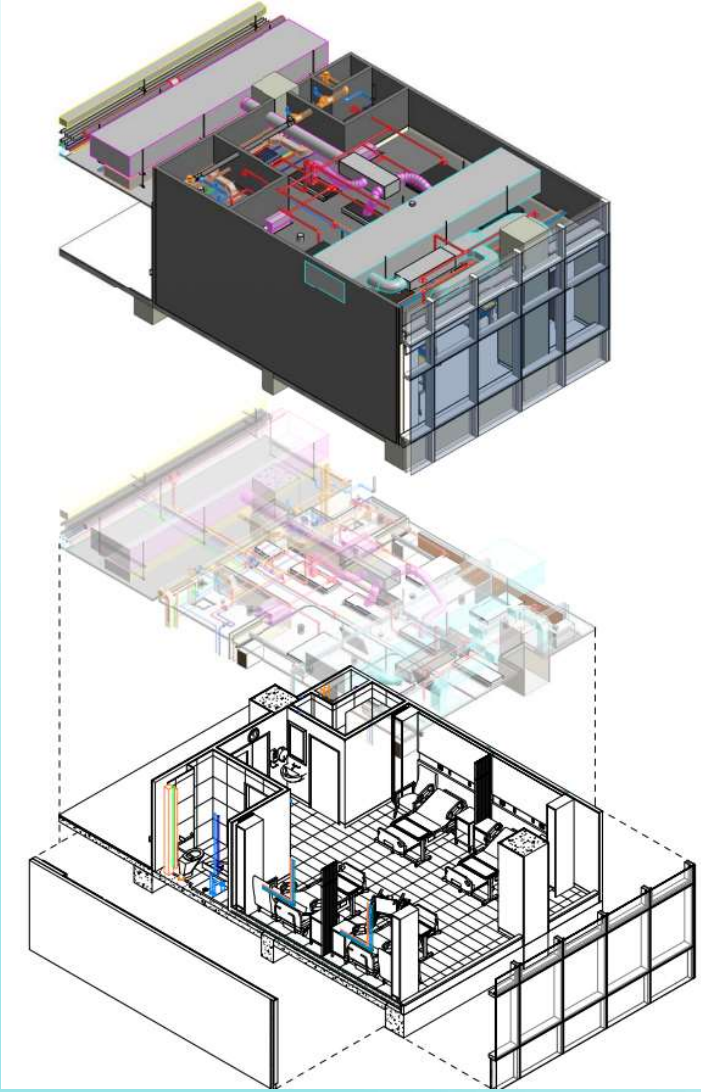
Conceptual Design in BIM

- The information contained on each tower can generate the total area with cost estimation
- Change of design cost estimation can be synchronized concurrently
- Enhance the efficiency of Schematic Design with Cost Estimation

General Floor Area Schedule

Tower Number	Level	Comments	GFA Countable
T1	Level 1	Duplex	1052 m²
T1	Level 2	Duplex	1052 m²
T1	Level 3	Duplex	1052 m²
T1	Level 4	Duplex	1052 m²
T1	Level 5	Duplex	1052 m²
T1	Level 6	Duplex	1052 m²
T1	Level 7	Duplex	1052 m²
T1	Level 8	Duplex	1052 m²
T1	Level 9	Duplex	1052 m²
T1	Level 10	Duplex	1052 m²
T1	Level 11	Duplex	1052 m²
T1	Level 12	Duplex	1052 m²
T1	Level 13	Duplex	1052 m²
T1	Level 14	Duplex	1052 m²
T1	Level 15	Duplex	1052 m²
T1	Level 16	Duplex	1052 m²
T1	Level 17	Duplex	1052 m²
T1	Level 18	Duplex	1052 m²
T1	Level 19	Duplex	1052 m²
T1	Level 20	Duplex	1052 m²
T1	Level 21	Duplex	1052 m²
T1	Level 22	Duplex	1052 m²
T1	Level 23	Duplex	1052 m²
T1	Level 24	Duplex	1052 m²
T1	Level 25	Duplex	1052 m²
T1	Level 26	Duplex	1052 m²
T1	Level 27	Duplex	1052 m²
T1	Level 28	Duplex	1052 m²
T1	Level 29	Duplex	1052 m²
T1	Level 30	Duplex	1052 m²
T1	Level 31	Duplex	1052 m²
T1	Level 32	Duplex	1052 m²
T1	Level 33	Duplex	1052 m²
T1	Level 34	Duplex	1052 m²
T1	Level 35	Duplex	1052 m²
T1	Level 36	Duplex	1052 m²
T1	Level 37	Duplex	1052 m²
T1	Level 38	Duplex	1052 m²
T1	Level 39	Duplex	1052 m²
T1	Level 40	Duplex	1052 m²
T1	Level 41	Duplex	1052 m²
T1	Level 42	Duplex	1052 m²
T1	Level 43	Duplex	1052 m²
			45216 m²

9. Design modulization and optimization in BIM



Wall Schedule

TYPE	AREA	Volume	Cost
ACID_Curtain wall 100x300Mu	302.785 m²		
Aluminum-50mm	3.854 m²		
Anti-Bacteria Ceramic Tile 300mm x 600mm x5mm	34.022 m²		
Anti-Mould Acrylic Emulsion Paint - 2mm	163.150 m²		
Ceiling - 55mm	2.551 m²		
Chengdu-Interior-75 mm	4.259 m²		
Generic - 100 mm	335.453 m²		
Interior - 79mm Partition (1-hr)	3.340 m²		
Moisture Sealer	1.963 m²	0.00 m³	
Vinyl sheet Skirting - 1mm	0.532 m²	0.00 m³	
Vinyl sheet Skirting - 25 mm	11.899 m²		
Washable & anti-mould acrylic emulsion paint - 1mm	60.879 m²		
Grand total: 117	924.684 m²		

Chair Schedule

Type	Type Mark	Count	Cost
BAS	F2503	3	

Table Schedule

Type	Type Mark	Count	Cost
Thermoform Top - Rectangular	F2502	4	

Bed Schedule

Type	Type Mark	Count	Cost
BED0269	S3101	4	

TV Schedule

Type	Type Mark	Count	Cost
TV_CEILING	F2501	4	

Curtain Schedule

Type	Type Mark	Count	Cost
	Curtain	4	

Air Terminal Schedule

Type	Type Mark	Count	Cost
400 x 250		1	
400 x 400		2	
600 x 100		2	
700 x 250		4	
1200 x 100		8	
Exhaust Air Grille		2	
Return Air Grille		5	
Supply Air Grille		2	
Transfer Grille		4	

Cabinet Schedule

Type	Type Mark	Count	Cost
Standard	F2506	4	1100.00

Shower Cubicle Schedule

Type	Type Mark	Count	Cost
PF-SH4	SHOWER	1	

Water Closet Schedule

Type	Type Mark	Count	Cost
WCA-01	F2504	1	

Water Basin Schedule

Type	Type Mark	Count	Cost
BAS	F2503	3	

Sprinkler Schedule

Type	Type Mark	Count	Cost
Exposed Sprinkler Head		13	

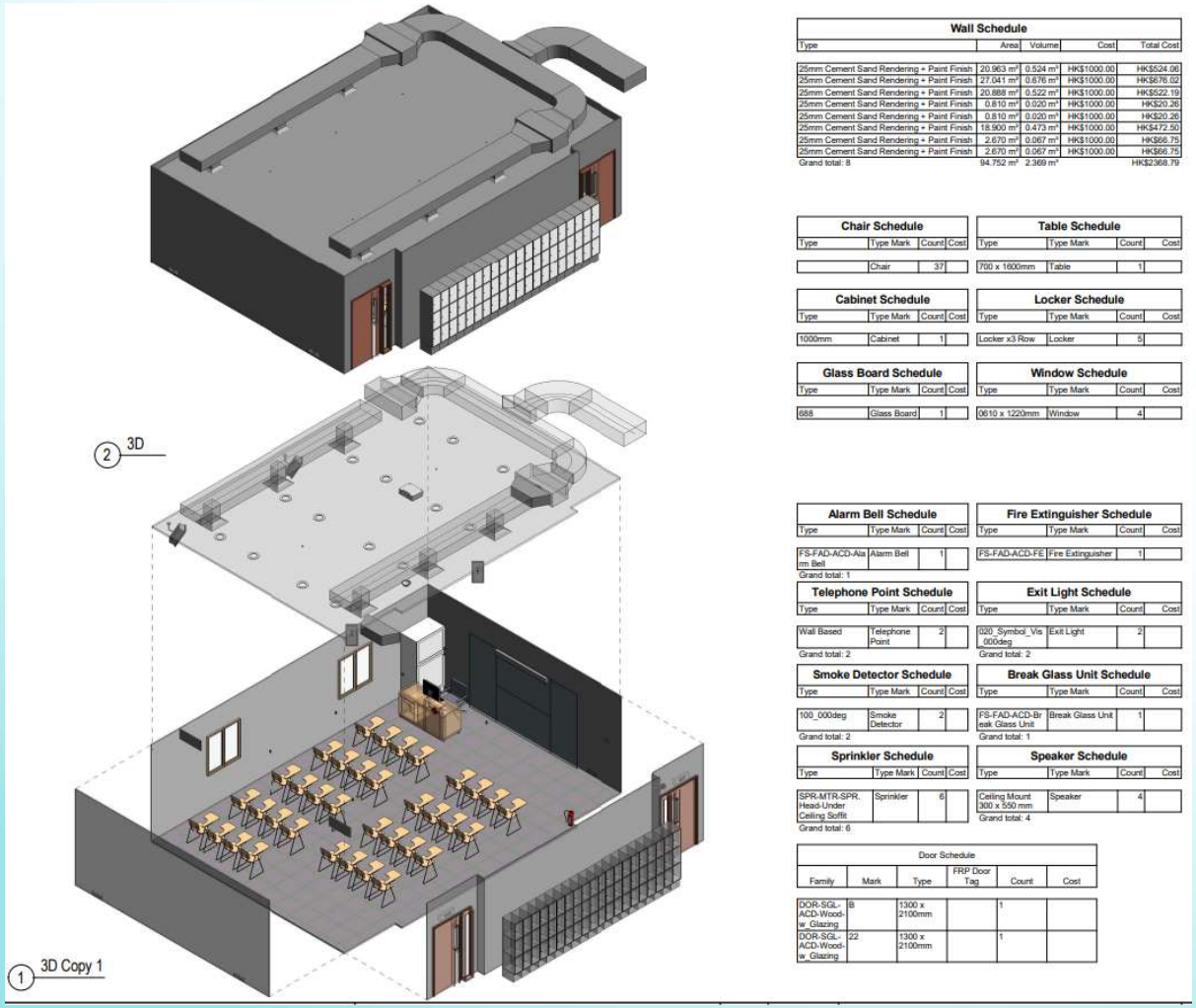
Door Schedule

Family	Mark	Type	Door Rating	Count	Cost
Flush_UneqDbl	118	Type A3_1400mm x 2100mm	-	1	
Flush_Single1	119	Type A1_900mm X 2100mm	-	1	
Flush_Single1	120	Type A1_900mm X 2100mm	-	1	

Modular by BIM

- Clash of different elements can be resolved in the early stage of the project
- Reduced significant variation order in construction
- Time saving in detail design stage

10. Design modulization and optimization in BIM



Wall Schedule

Type	Area	Volume	Cost	Total Cost
25mm Cement Sand Rendering + Paint Finish	20.963 m²	0.524 m³	HK$1000.00	HK$524.06
25mm Cement Sand Rendering + Paint Finish	27.041 m²	0.676 m³	HK$1000.00	HK$676.02
25mm Cement Sand Rendering + Paint Finish	20.888 m²	0.522 m³	HK$1000.00	HK$522.19
25mm Cement Sand Rendering + Paint Finish	0.810 m²	0.020 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	0.810 m²	0.020 m³	HK$1000.00	HK$20.26
25mm Cement Sand Rendering + Paint Finish	18.900 m²	0.473 m³	HK$1000.00	HK$472.50
25mm Cement Sand Rendering + Paint Finish	2.670 m²	0.067 m³	HK$1000.00	HK$66.75
25mm Cement Sand Rendering + Paint Finish	2.670 m²	0.067 m³	HK$1000.00	HK$66.75
Grand total: 8	94.752 m²	2.369 m³		HK$2368.79

Chair Schedule

Type	Type Mark	Count	Cost
	Chair	37	

Table Schedule

Type	Type Mark	Count	Cost
700 x 1600mm	Table	1	

Cabinet Schedule

Type	Type Mark	Count	Cost
1000mm	Cabinet	1	

Locker Schedule

Type	Type Mark	Count	Cost
Locker x3 Row	Locker	5	

Glass Board Schedule

Type	Type Mark	Count	Cost
688	Glass Board	1	

Window Schedule

Type	Type Mark	Count	Cost
0610 x 1220mm	Window	4	

Alarm Bell Schedule

Type	Type Mark	Count	Cost
FS-FAD-ACD-Alarm Bell	Alarm Bell	1	
Grand total: 1			

Fire Extinguisher Schedule

Type	Type Mark	Count	Cost
FS-FAD-ACD-FE	Fire Extinguisher	1	

Telephone Point Schedule

Type	Type Mark	Count	Cost
Wall Based	Telephone Point	2	
Grand total: 2			

Exit Light Schedule

Type	Type Mark	Count	Cost
020_Symbol_Vis_000deg	Exit Light	2	
Grand total: 2			

Smoke Detector Schedule

Type	Type Mark	Count	Cost
100_000deg	Smoke Detector	2	
Grand total: 2			

Break Glass Unit Schedule

Type	Type Mark	Count	Cost
FS-FAD-ACD-Break Glass Unit	Break Glass Unit	1	
Grand total: 1			

Sprinkler Schedule

Type	Type Mark	Count	Cost
SPR-MTR-SPR-Head-Under Ceiling Soffit	Sprinkler	6	
Grand total: 6			

Speaker Schedule

Type	Type Mark	Count	Cost
Ceiling Mount 300 x 500 mm	Speaker	4	
Grand total: 4			

Door Schedule

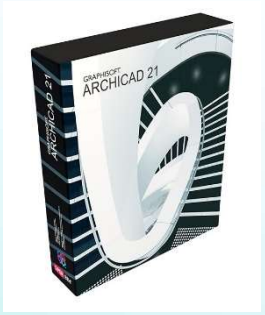
Family	Mark	Type	FRP Door Tag	Count	Cost
DOR-SGL-ACD-Wood-w_Glazing	8	1300 x 2100mm		1	
DOR-SGL-ACD-Wood-w_Glazing	22	1300 x 2100mm		1	

Modular by BIM

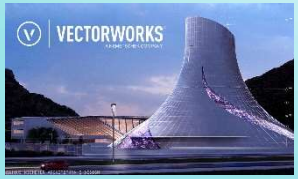
- Types and Components can be quantified by early stage of the project
- Reduced significant variation order in construction
- Time saving in detail design stage

11. Demonstration on model authoring and cost tools

– Civil 3D
– Gaphisoft ArchiCAD
– Tekla Structures
– Bentley Architecture / Aecosim Building Designer
– Nemetschek Vectorks
– Gehry Technologies - Digital Project Designer
- Cost X



Tekla®

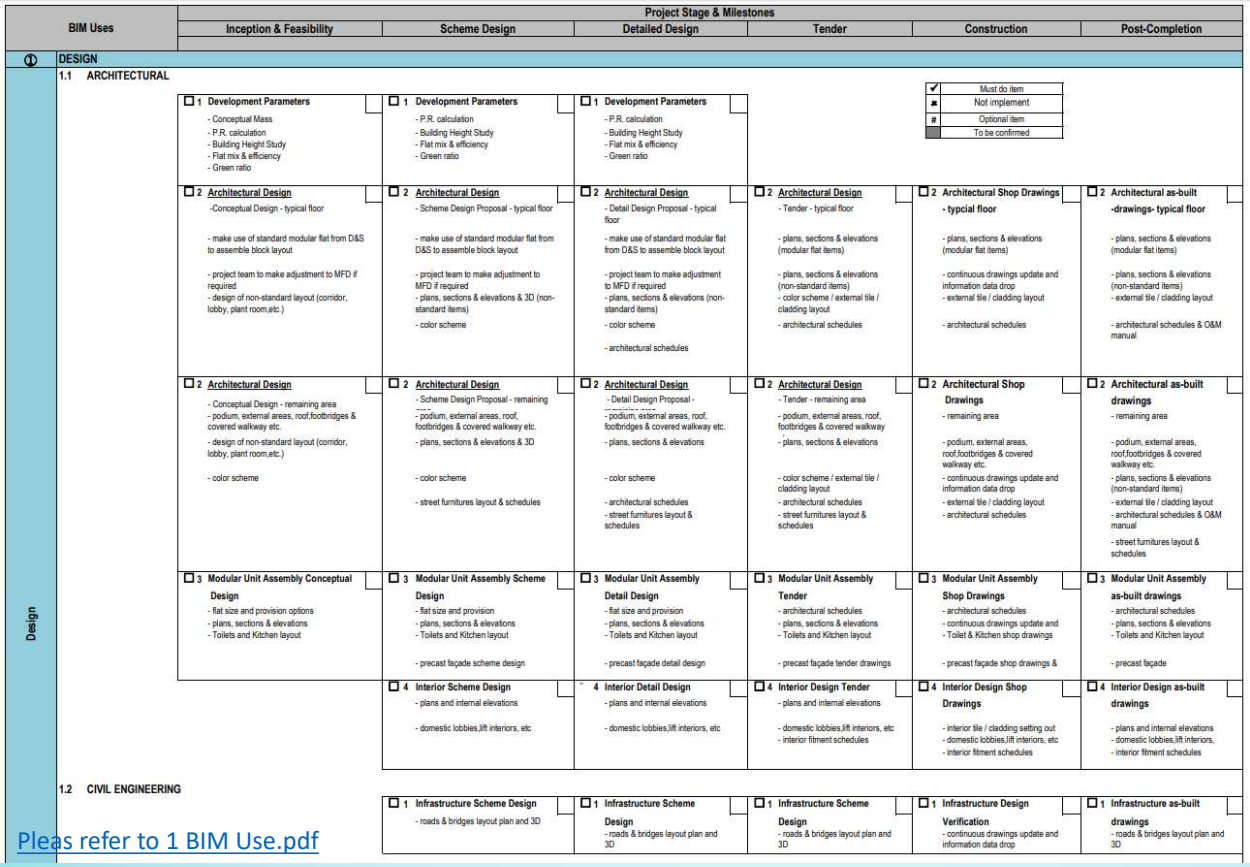


cost X

12. BIM Goal

- Establish a BIM mission statement
- Consider why BIM is important to the organization and what reason there are to use BIM ?
- Industry demand, Owner requirements, competitive advantage and innovation?
- Generate a list of standard project goals that would benefit the organization
- The goal shall be modifiable based on individual project and team characteristics
- The stand goals will be the “Menu” of goal choices and reduced the time taken to generate the goal

13. Commencement of design model authoring (Architecture, Structure, MEP, Landscape)



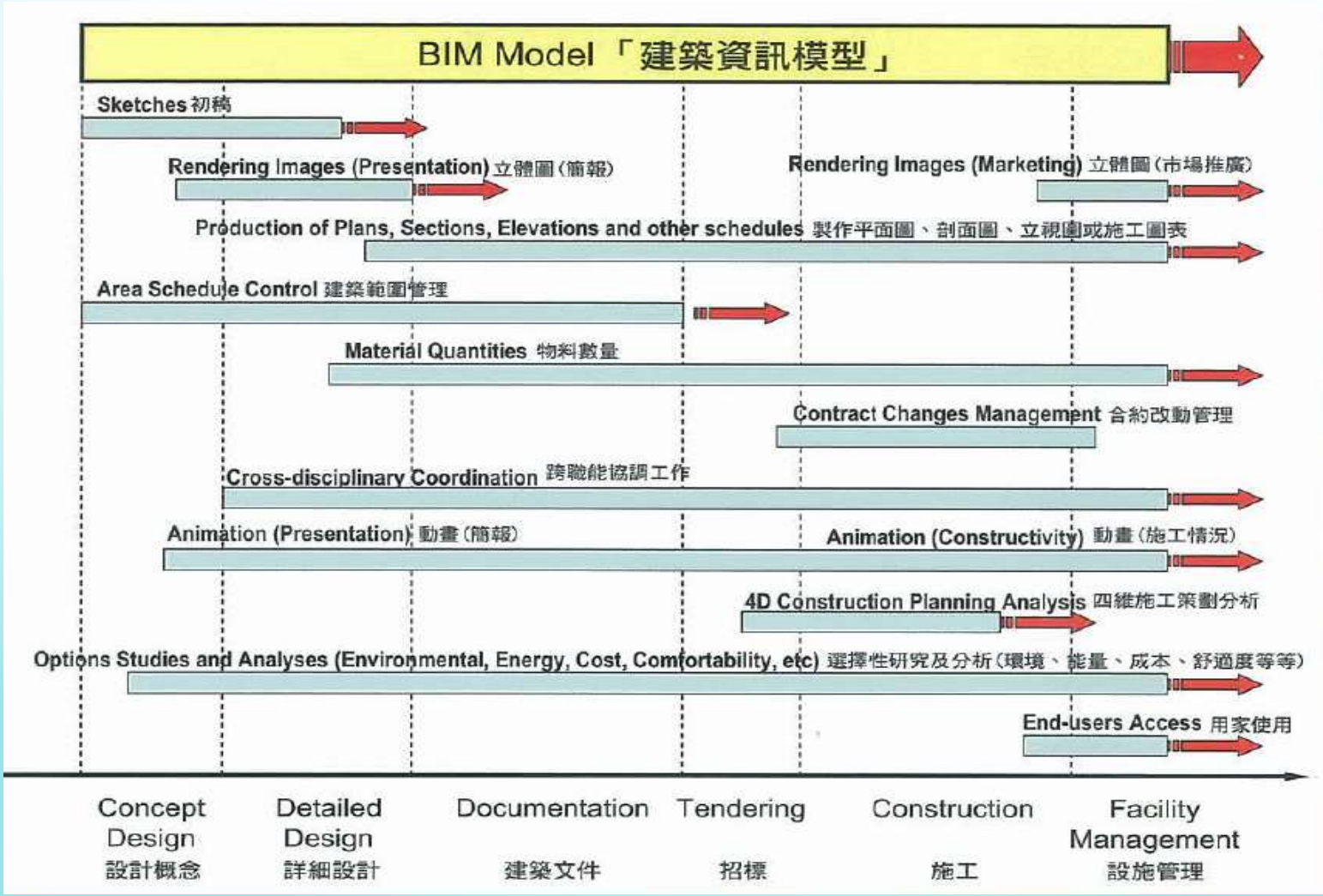
BIM Uses	Project Stage & Milestones					
	Inception & Feasibility	Scheme Design	Detailed Design	Tender	Construction	Post-Completion
① DESIGN						
1.1 ARCHITECTURAL						
Design	☐ 1 Development Parameters - Conceptual Mass - P.R. calculation - Building Height Study - Flat mix & efficiency - Green ratio	☐ 1 Development Parameters - P.R. calculation - Building Height Study - Flat mix & efficiency - Green ratio	☐ 1 Development Parameters - P.R. calculation - Building Height Study - Flat mix & efficiency - Green ratio			
	☐ 2 Architectural Design -Conceptual Design - typical floor - make use of standard modular flat from D&S to assemble block layout - project team to make adjustment to MFD if required - design of non-standard layout (corridor, lobby, plant room,etc.)	☐ 2 Architectural Design - Scheme Design Proposal - typical floor - make use of standard modular flat from D&S to assemble block layout - project team to make adjustment to MFD if required - plans, sections & elevations & 3D (non-standard items) - color scheme	☐ 2 Architectural Design - Detail Design Proposal - typical floor - make use of standard modular flat from D&S to assemble block layout - project team to make adjustment to MFD if required - plans, sections & elevations (non-standard items) - color scheme - architectural schedules	☐ 2 Architectural Design - Tender - typical floor - plans, sections & elevations (modular flat items) - plans, sections & elevations (non-standard items) - color scheme / external tile / cladding layout - architectural schedules	☐ 2 Architectural Shop Drawings - typical floor - plans, sections & elevations (modular flat items) - continuous drawings update and information data drop - external tile / cladding layout - architectural schedules	☐ 2 Architectural as-built -drawings- typical floor - plans, sections & elevations (modular flat items) - plans, sections & elevations (non-standard items) - external tile / cladding layout - architectural schedules & O&M manual
	☐ 2 Architectural Design - Conceptual Design - remaining area - podium, external areas, roof,footbridges & covered walkway etc. - design of non-standard layout (corridor, lobby, plant room,etc.) - color scheme	☐ 2 Architectural Design - Scheme Design Proposal - remaining area - podium, external areas, roof, footbridges & covered walkway etc. - plans, sections & elevations & 3D - color scheme - street furnitures layout & schedules	☐ 2 Architectural Design - Detail Design Proposal - remaining area - podium, external areas, roof, footbridges & covered walkway etc. - plans, sections & elevations - color scheme - architectural schedules - street furnitures layout & schedules	☐ 2 Architectural Design - Tender - remaining area - podium, external areas, roof, footbridges & covered walkway - plans, sections & elevations - color scheme / external tile / cladding layout - architectural schedules - street furnitures layout & schedules	☐ 2 Architectural Shop Drawings - remaining area - podium, external areas, roof,footbridges & covered walkway etc. - continuous drawings update and information data drop - external tile / cladding layout - architectural schedules	☐ 2 Architectural as-built drawings - remaining area - podium, external areas, roof,footbridges & covered walkway etc. - plans, sections & elevations (non-standard items) - external tile / cladding layout - architectural schedules & O&M manual - street furnitures layout & schedules
	☐ 3 Modular Unit Assembly Conceptual Design - flat size and provision options - plans, sections & elevations - Toilets and Kitchen layout	☐ 3 Modular Unit Assembly Scheme Design - flat size and provision - plans, sections & elevations - Toilets and Kitchen layout - precast façade scheme design	☐ 3 Modular Unit Assembly Detail Design - flat size and provision - plans, sections & elevations - Toilets and Kitchen layout - precast façade detail design	☐ 3 Modular Unit Assembly Tender - architectural schedules - plans, sections & elevations - Toilets and Kitchen layout - precast façade tender drawings	☐ 3 Modular Unit Assembly Shop Drawings - architectural schedules - continuous drawings update and - Toilet & Kitchen shop drawings - precast façade shop drawings &	☐ 3 Modular Unit Assembly as-built drawings - architectural schedules - plans, sections & elevations - Toilets and Kitchen layout - precast façade
		☐ 4 Interior Scheme Design - plans and internal elevations - domestic lobbies,lift interiors, etc	☐ 4 Interior Detail Design - plans and internal elevations - domestic lobbies,lift interiors, etc	☐ 4 Interior Design Tender - plans and internal elevations - domestic lobbies,lift interiors, etc - interior fitment schedules	☐ 4 Interior Design Shop Drawings - interior tile / cladding setting out - domestic lobbies,lift interiors, etc - interior fitment schedules	☐ 4 Interior Design as-built drawings - plans and internal elevations - domestic lobbies,lift interiors, - interior fitment schedules
1.2 CIVIL ENGINEERING						
	☐ 1 Infrastructure Scheme Design - roads & bridges layout plan and 3D	☐ 1 Infrastructure Scheme Design - roads & bridges layout plan and 3D	☐ 1 Infrastructure Scheme Design - roads & bridges layout plan and 3D	☐ 1 Infrastructure Design Verification - continuous drawings update and information data drop	☐ 1 Infrastructure as-built drawings - roads & bridges layout plan and 3D	

✓ Must do item
✱ Not implement
Optional item
▒ To be confirmed

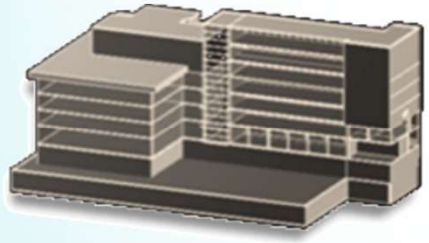
Pleas refer to 1 BIM Use.pdf

- To decide which stage to imply BIM for the project
- To select the extend of BIM involvement on each stage of the project
- To allow budget for BIM input during the project

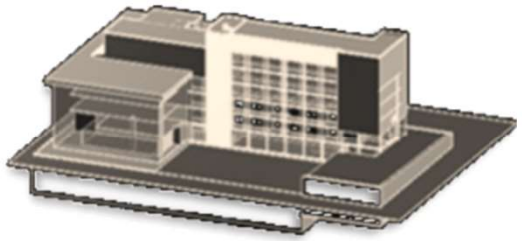
14. Introduction of the advantages of making early decisions in the design process



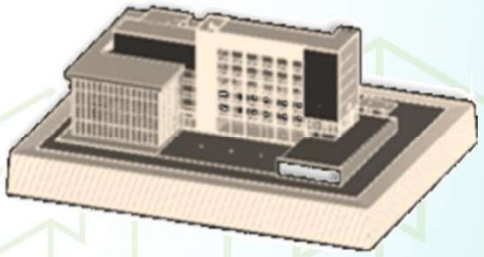
15. BIM Enables Sustainable Design



Conceptual Design



Design Development



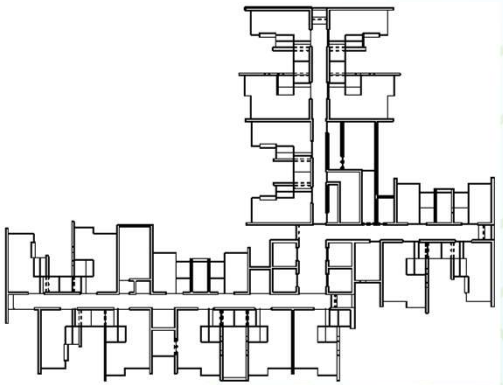
Design Validation

Use early-stage massing models	Conduct whole building energy, water & carbon analysis	Make detailed design
• Optimal location • Building form • Orientation of building design	• Benchmark energy use • Recommend potential savings • Study alternatives	• Adjust rooms and zones • Size and shape individual openings • Design custom shading devices • Choose optimal materials

16. Structural Engineering – Design

BIM Structural Model

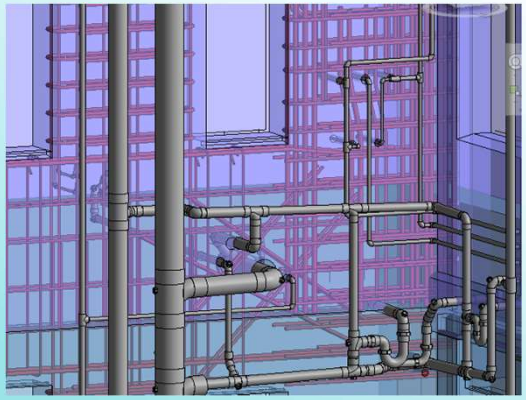
Drawing Production



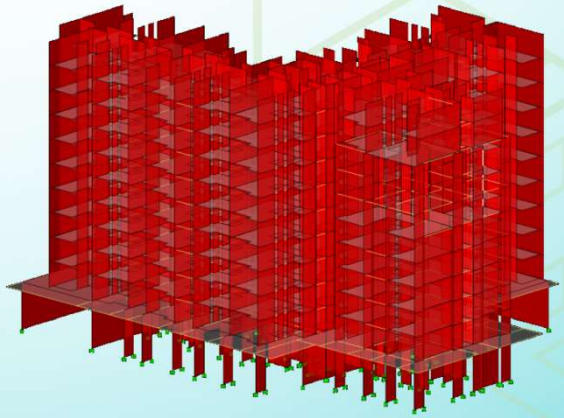
Framing Plan

Collaboration

Software Interface



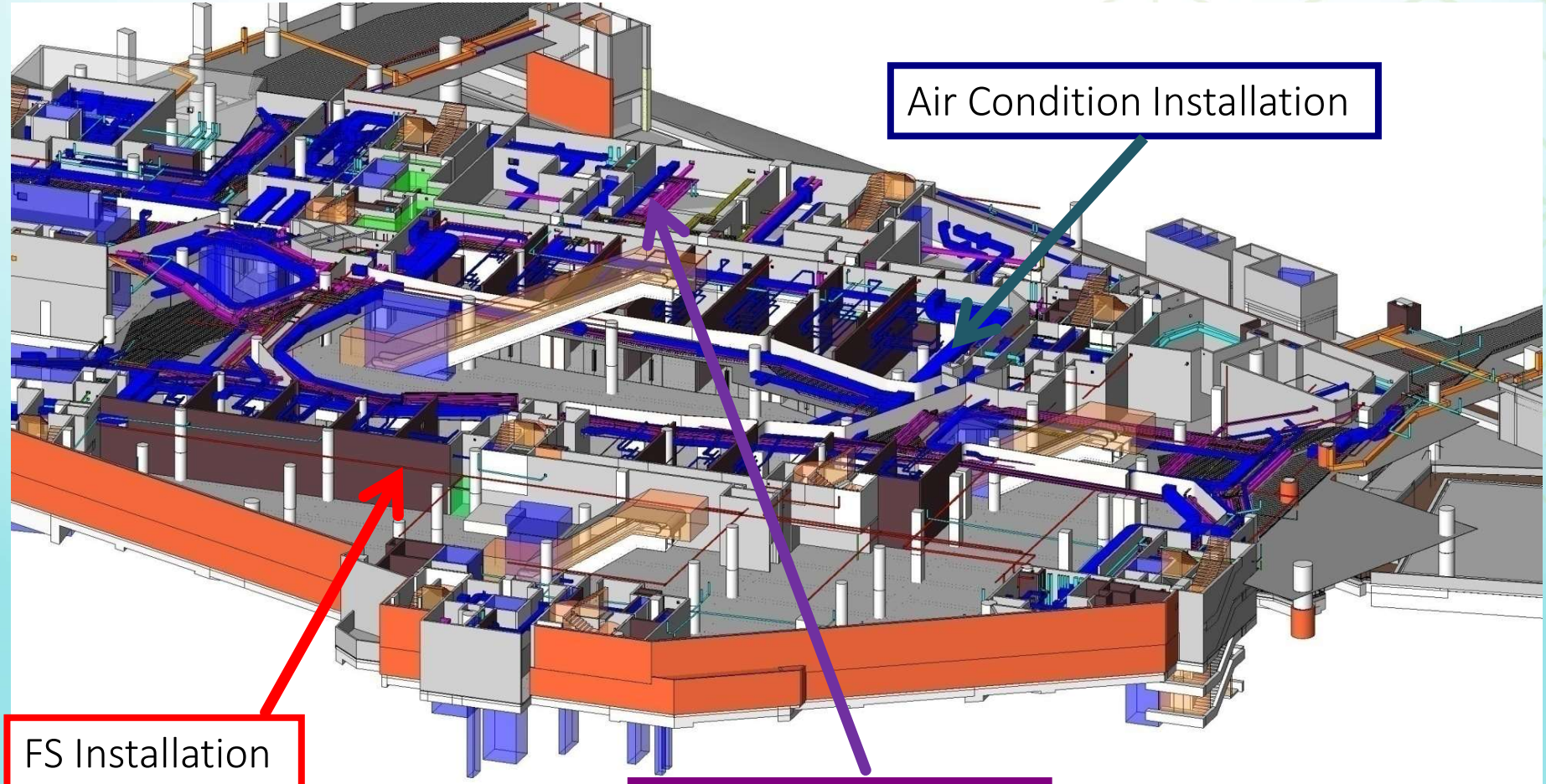
Clash Detection



Analytical / Design Model – ETABS / ORION

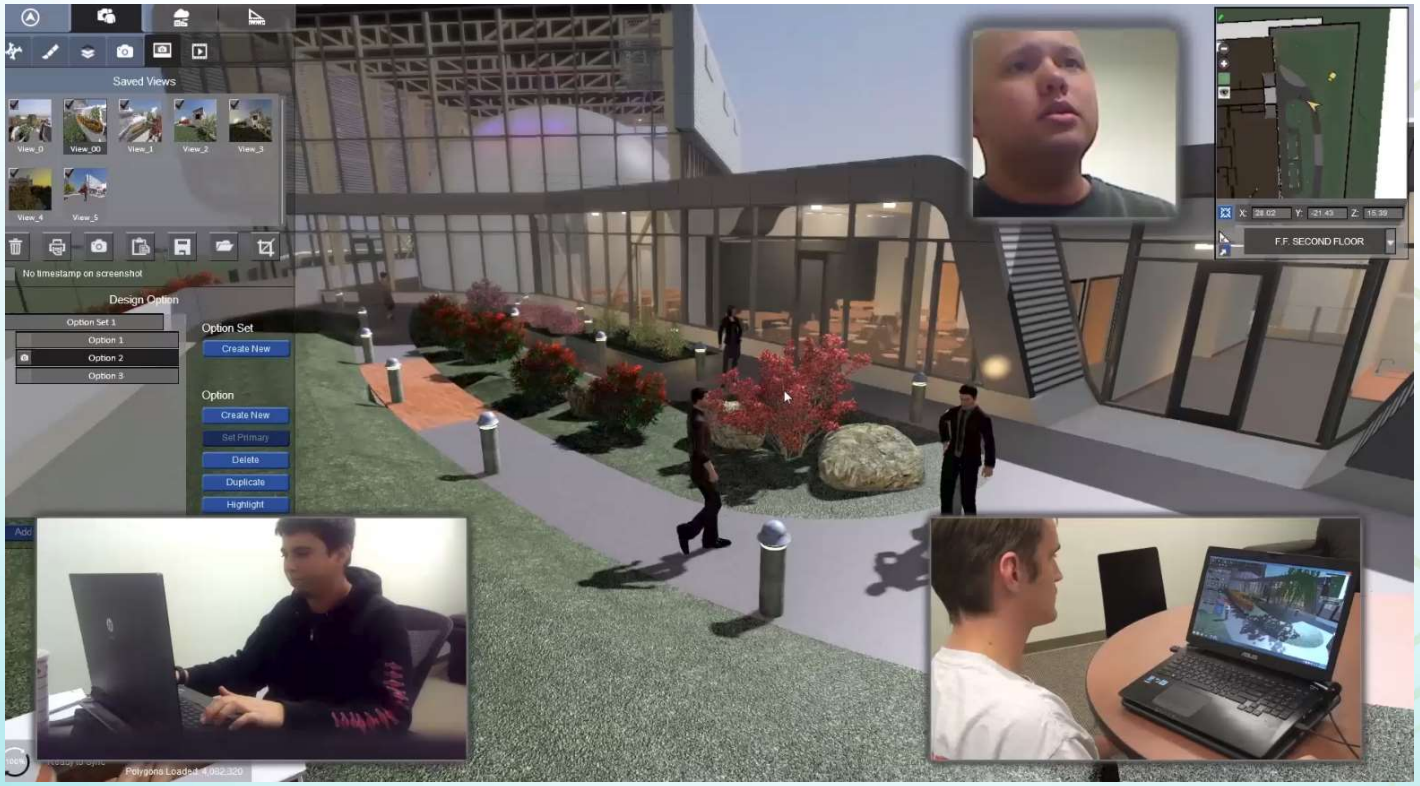
Source: Hong Kong Housing Authority

17. Building Services Installation



Source: Hong Kong Housing Authority

18. Design Review and 3D Coordination in the Virtual World

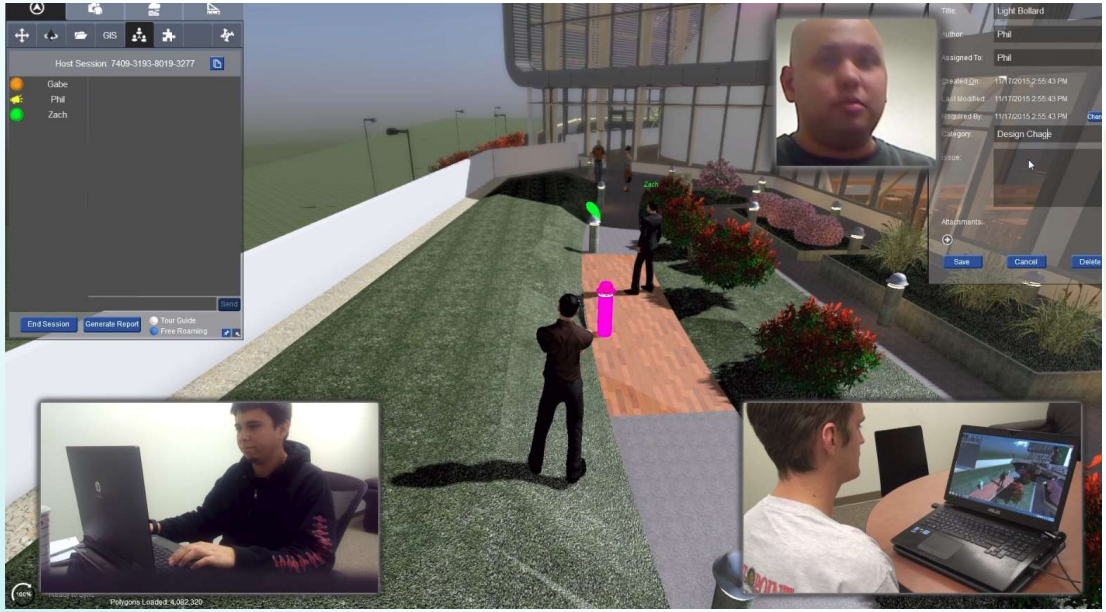


SSOT to improve Coordination

- Plugin software to simulate the virtual environment
- Different discipline can involve and revise the design at the same time

https://www.youtube.com/watch?v=DUwBQjjeVsQ

19. Design Review and 3D Coordination in the Virtual World



SSOT to improve Coordination

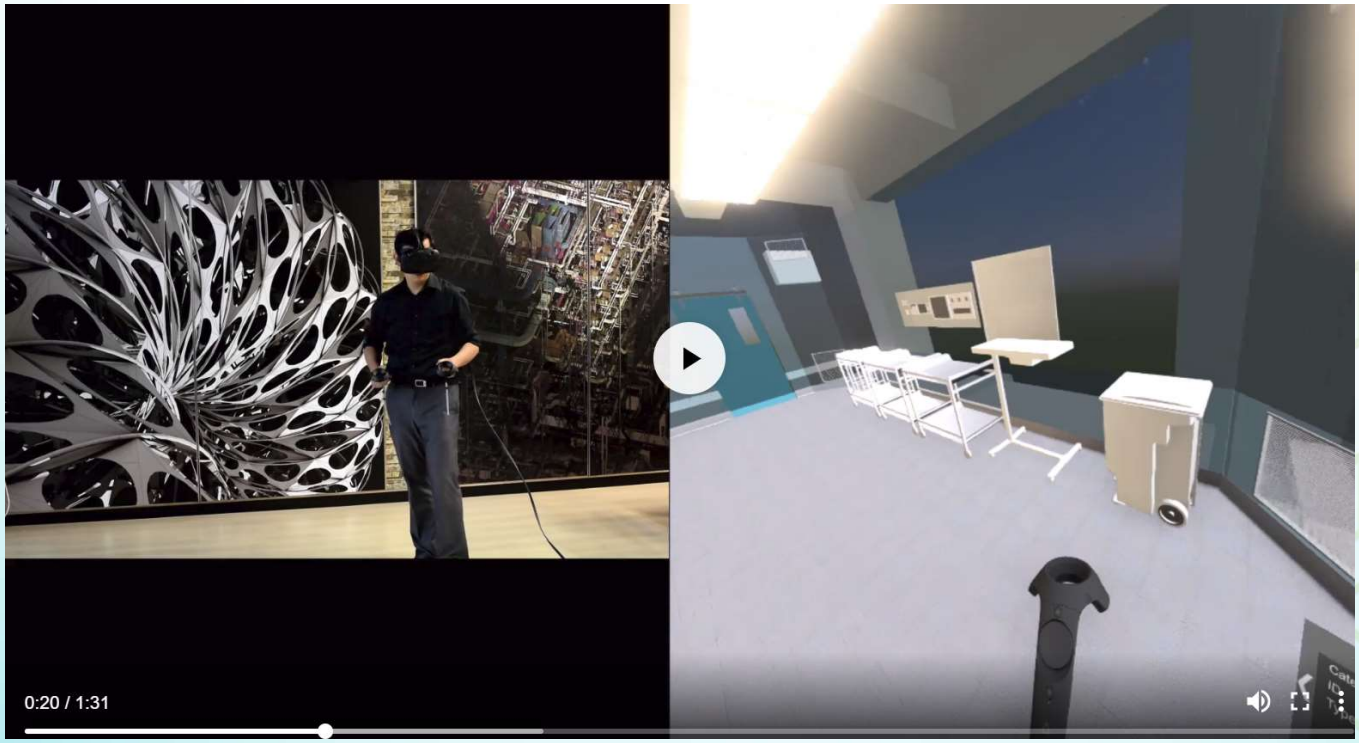
- No limit in time and place for coordination
- More effective to resolve any potential conflict before the construction

More powerful computer and Network is needed

- Large file size required more powerful computer
- High speed connectivity network is required

https://www.youtube.com/watch?v=DUwBQjjeVsQ

20. Design Review and 3D Coordination in the Virtual World

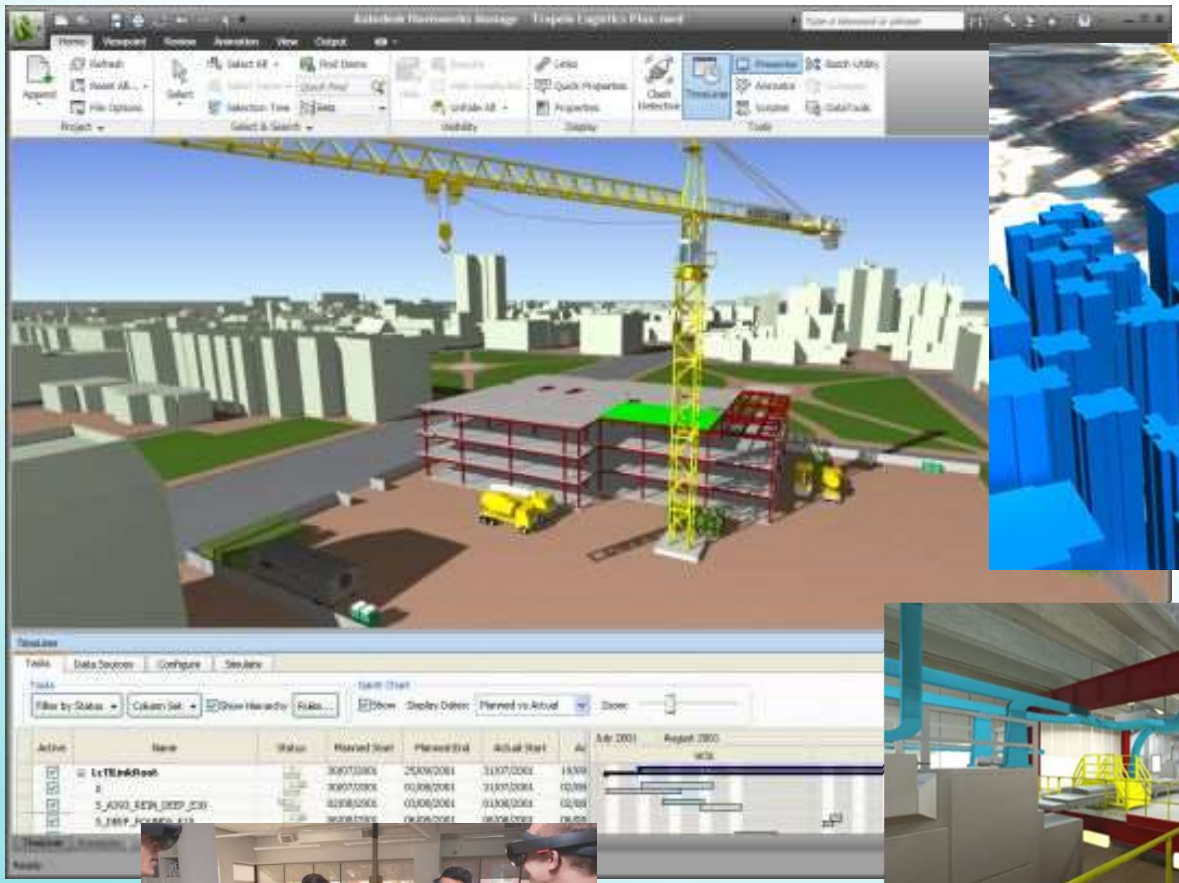


VR allow end user to review design

- More accurate and suitable design for end-user
- Specific requirement can be fulfilled by end-user involved in early design stage

https://www.youtube.com/watch?v=DUwBQjjeVsQ

21. Building Models for Virtual Design & Construction

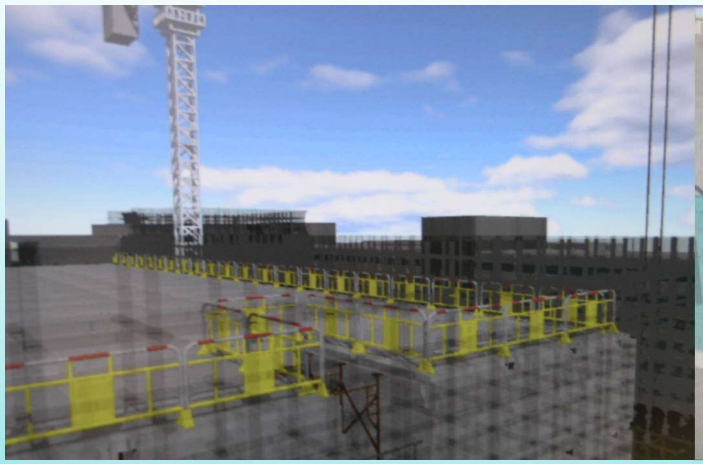


Performance validation & check buildability

22. BIM Enabling Safety In Construction Site Process

Design for safety

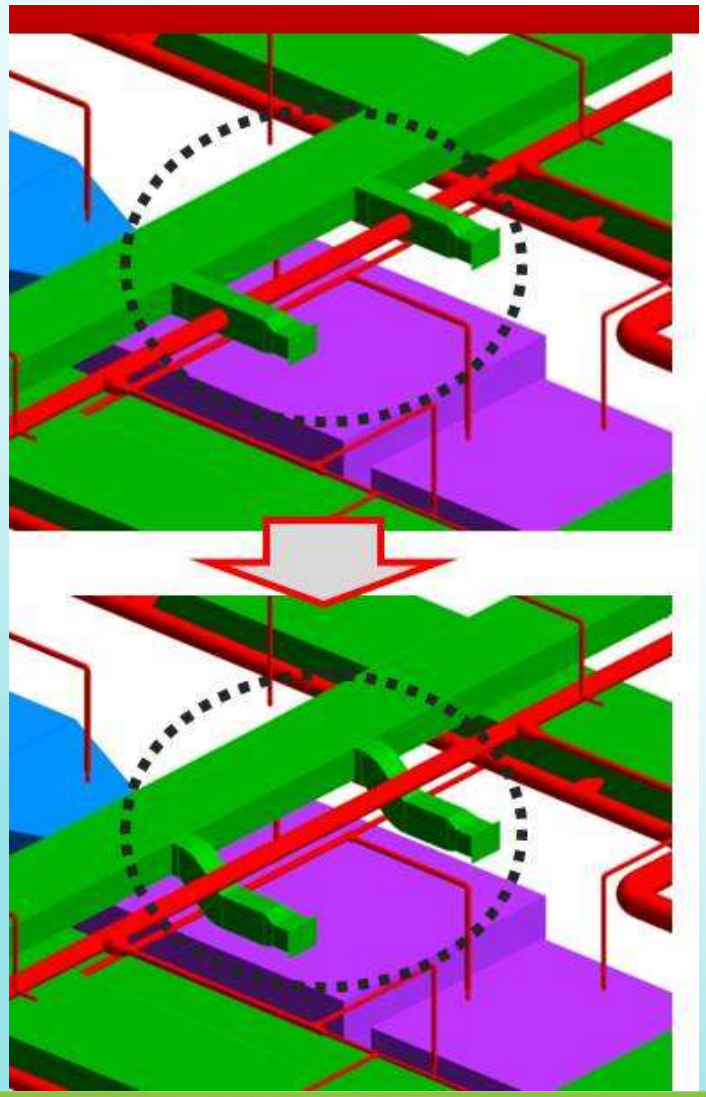
- Construction and operation planning
- Relationship between working time & space
- Validation of construction sequence
- Anticipate the interaction between workers & machineries
- Evaluation of safety from workers viewpoint
- Concern from the public



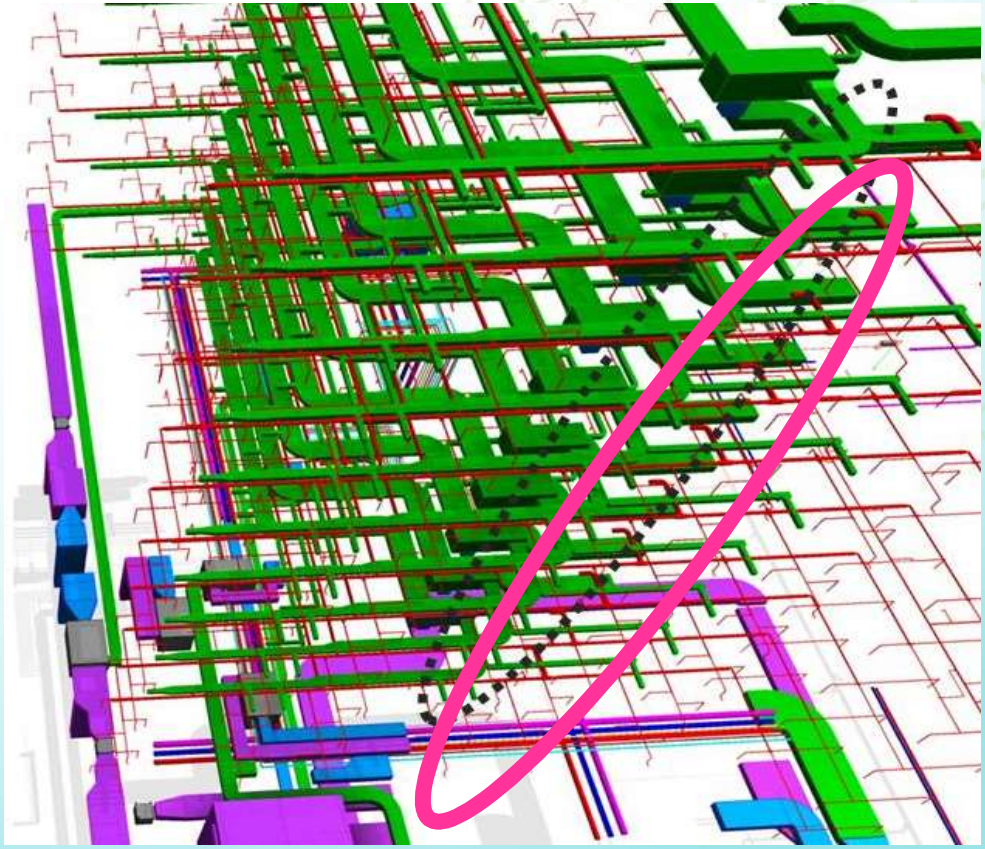
Source: Hong Kong Housing Authority

23. Clash Detection

Building Services, False ceiling, Structural Elements

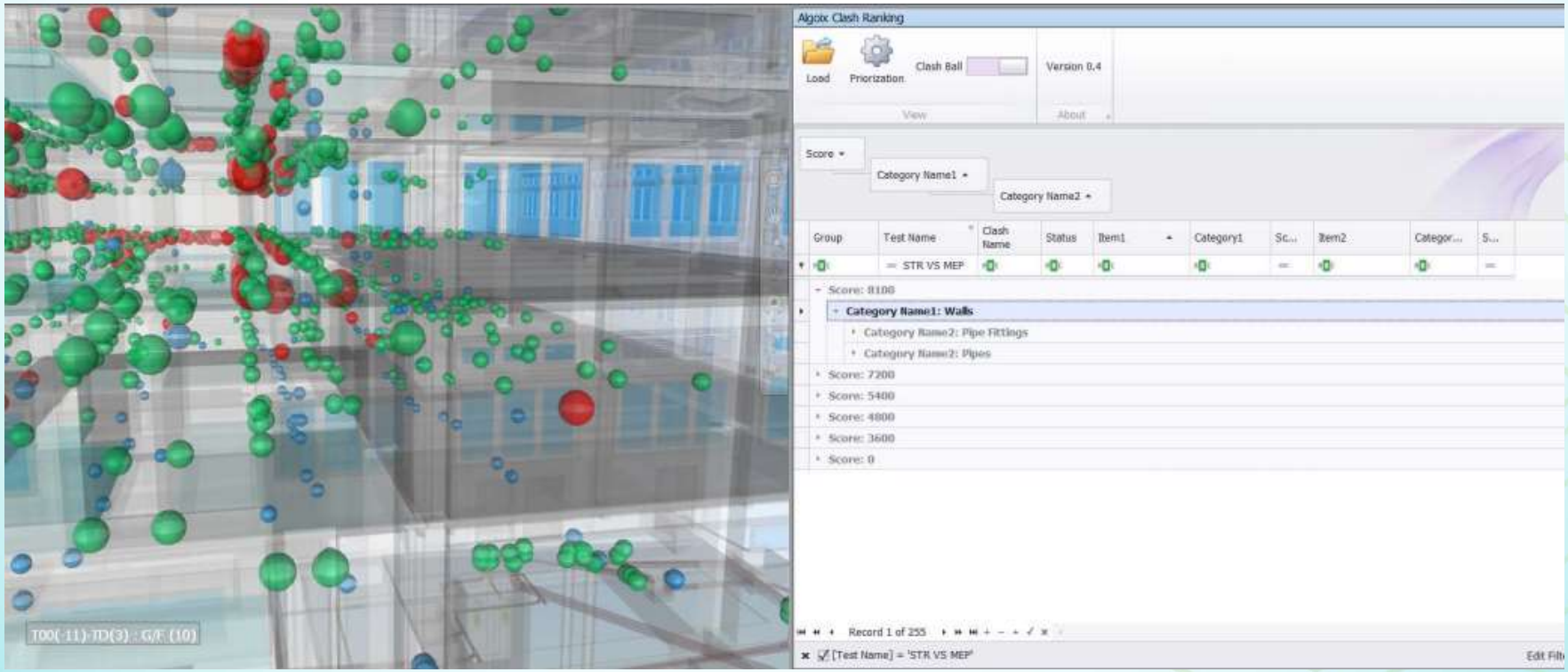


- Check clashes before build
- Minimize number of variations & avoid delay



Source: http://www.designbimstudio.com

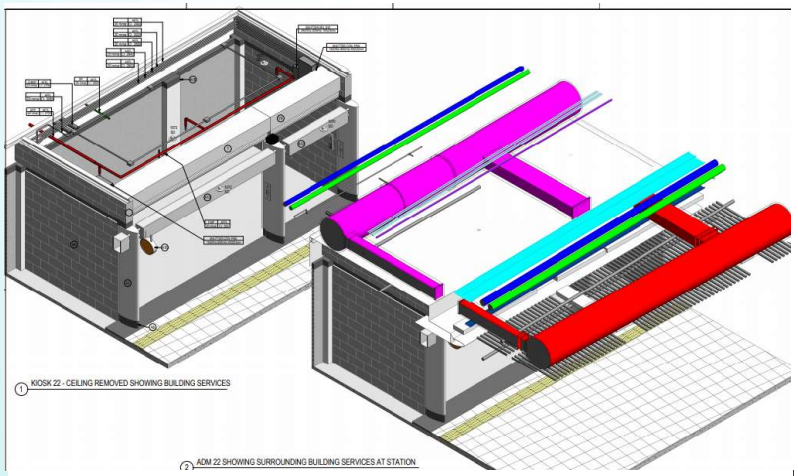
24. Clash Detection

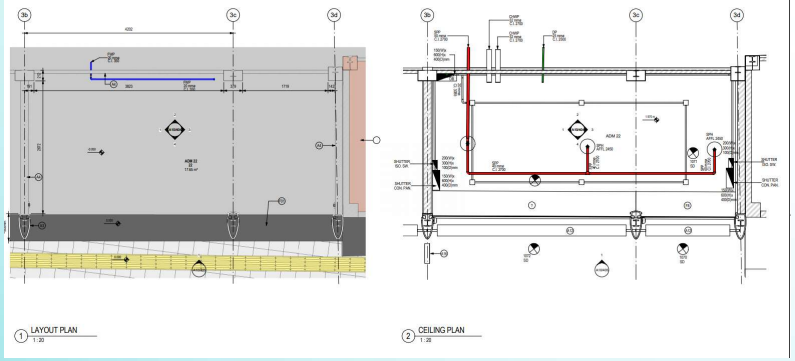


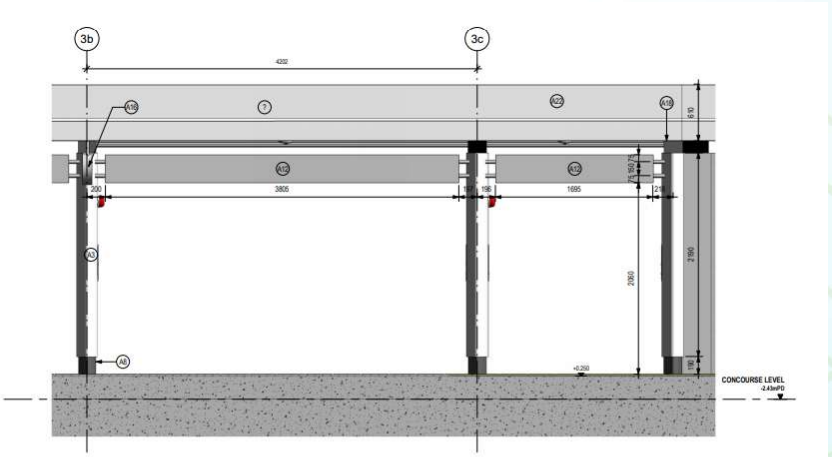
Improvement of Clash Detection

- Prioritize the major and minor clash
- Resolve the major clash by respective parties in BIM
- Prevent potential variation order in construction

25. Quality Control







FRONT ELEVATION
1 : 20

Electrical Equipment Schedule

Level	Family and Type	H	W	D	Type Mark
KIOSK 22 CONCOURSE LEVEL_ARCH	EL-ELE-MTR-Control Panel: EXF 116 200x300mm	300	200	100	SHUTTER ISO. SW.
KIOSK 22 CONCOURSE LEVEL_ARCH	EL-ELE-MTR-Control Panel: CONTRORL PANEL	600	150	400	SHUTTER CON. PAN.
KIOSK 22 CONCOURSE LEVEL_ARCH	EL-ELE-MTR-Control Panel: EXF 116 200x300mm	300	200	100	SHUTTER ISO. SW.
KIOSK 22 CONCOURSE LEVEL_ARCH	EL-ELE-MTR-Control Panel: CONTRORL PANEL	600	150	400	SHUTTER CON. PAN.
KIOSK 22 CONCOURSE LEVEL_ARCH	EL-ELE-MTR-Control Panel: DB-400x150x600	600	150	400	DB

Grand total: 5

Fire Alarm Device Schedule

Level	Family and Type	Type Mark	Mark
KIOSK 22 CONCOURSE LEVEL_ARCH	FS-FAD-MTR-Smoke Detector: FAD-MTR-Smoke Detector	SD	1070
KIOSK 22 CONCOURSE LEVEL_ARCH	FS-FAD-MTR-Smoke Detector: FAD-MTR-Smoke Detector	SD	1071
KIOSK 22 CONCOURSE LEVEL_ARCH	FS-FAD-MTR-Smoke Detector: FAD-MTR-Smoke Detector	SD	1072
KIOSK 22 CONCOURSE LEVEL_ARCH	FS-FAD-MTR-Smoke Detector: FAD-MTR-Smoke Detector	SD	1073

Grand total: 4

Sprinkler Schedule

Level	Family and Type	Type Mark	Offset (AFFL)
KIOSK 22 CONCOURSE LEVEL_ARCH	FS-SPR-MTR-Sprinkler Head: SPR-MTR-Sprinkler Head-Under Ceiling Soffit	SPH	2450

Grand total: 5

Quality Control from the Beginning of the project

- BIM Manager to setup the format of the BIM system
- BIM Manager to check the modelling progress, information input
- Contract to specify the frequency of compliance checking

26. Quality Control

Piling Schedule

Base Level	Top Level	Family	Type	Length	Type Mark	Mark	Count	Comments
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP		HP_305x305x223		3	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	42975	HP_305x305x223	CP1-P5	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	10075	HP_305x305x223	CP1-SP5	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	10075	HP_305x305x223	CP1-SP7	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	52775	HP_305x305x223	PC1-P1	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	41075	HP_305x305x223	PC1-P4	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	51875	HP_305x305x223	PC1-P6	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	51775	HP_305x305x223	PC1-P7	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	41075	HP_305x305x223	PC1-P8	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	44075	HP_305x305x223	PC1-P9	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	45275	HP_305x305x223	PC1-P10	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	53975	HP_305x305x223	PC1-P12	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	39875	HP_305x305x223	PC1-P13	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	43175	HP_305x305x223	PC1-P14	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	44575	HP_305x305x223	PC1-P15	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	45875	HP_305x305x223	PC1-P16	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	53075	HP_305x305x223	PC1-P17	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	54175	HP_305x305x223	PC1-P18	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	53375	HP_305x305x223	PC1-P19	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	40175	HP_305x305x223	PC1-P20	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	42275	HP_305x305x223	PC1-P21	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	43975	HP_305x305x223	PC1-P22	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	44175	HP_305x305x223	PC1-P23	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	51275	HP_305x305x223	PC1-P25	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	50875	HP_305x305x223	PC1-P26	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	44275	HP_305x305x223	PC1-P27	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	47675	HP_305x305x223	PC1-P28	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	48975	HP_305x305x223	PC1-P29	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	39675	HP_305x305x223	PC1-P30	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	49875	HP_305x305x223	PC1-P31	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	51475	HP_305x305x223	PC1-P32	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	41975	HP_305x305x223	PC1-P33	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	43375	HP_305x305x223	PC1-P34	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	43775	HP_305x305x223	PC1-P35	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	44675	HP_305x305x223	PC1-PC24	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	10075	HP_305x305x223	PC1-SP8	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	47075	HP_305x305x223	PC2-P11	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	48575	HP_305x305x223	TB5-P2	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	10075	HP_305x305x223	TB5-SP1	1	
BASEMENT	BASEMENT	UBP-Universal Bearing Pile-Column	305x305x223UBP	10075	HP_305x305x223	TB6-SP2	1	
Grand total: 42							42	

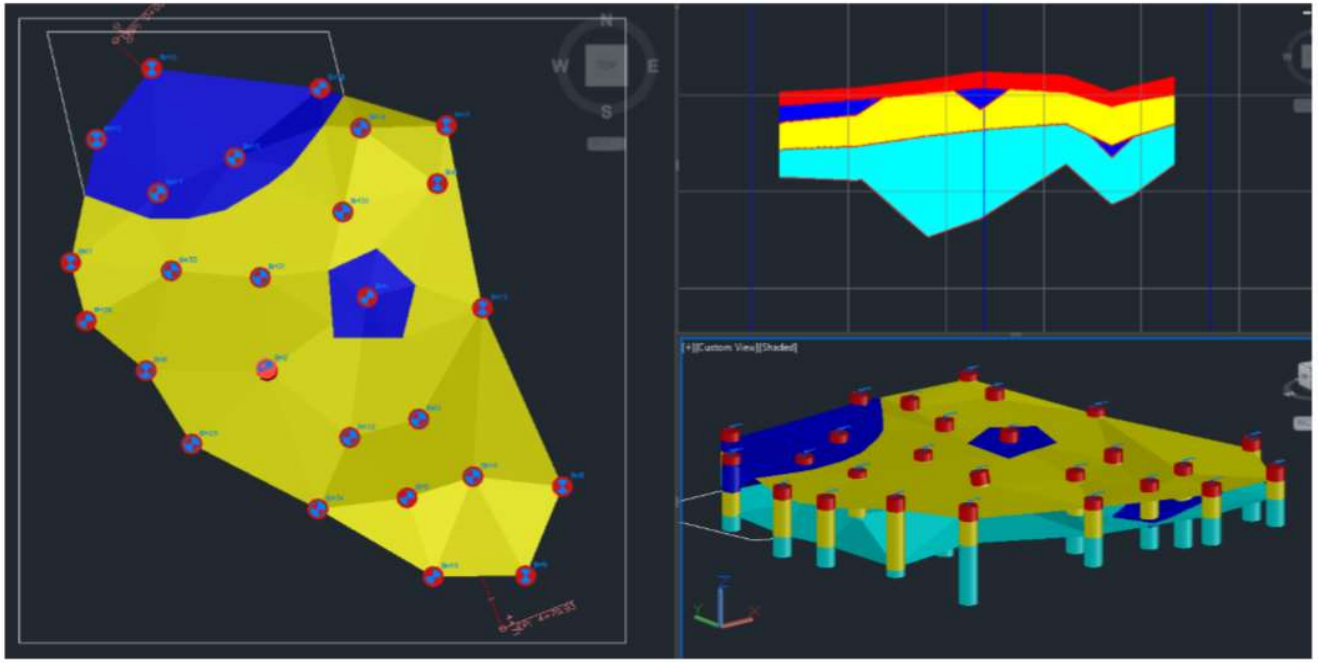
Information to be extracted from BIM

- BIM Manager to ensure the setup and input of information can be extracted from BIM by Architect, Structural Engineer, E&M consultant and Quantity Surveyor

27. Model Geology in 3D Environment

Learn how to create a geotechnical project and import data

The aim of this class is to take hole data stored in the CSV files, import them and model the resulting information.



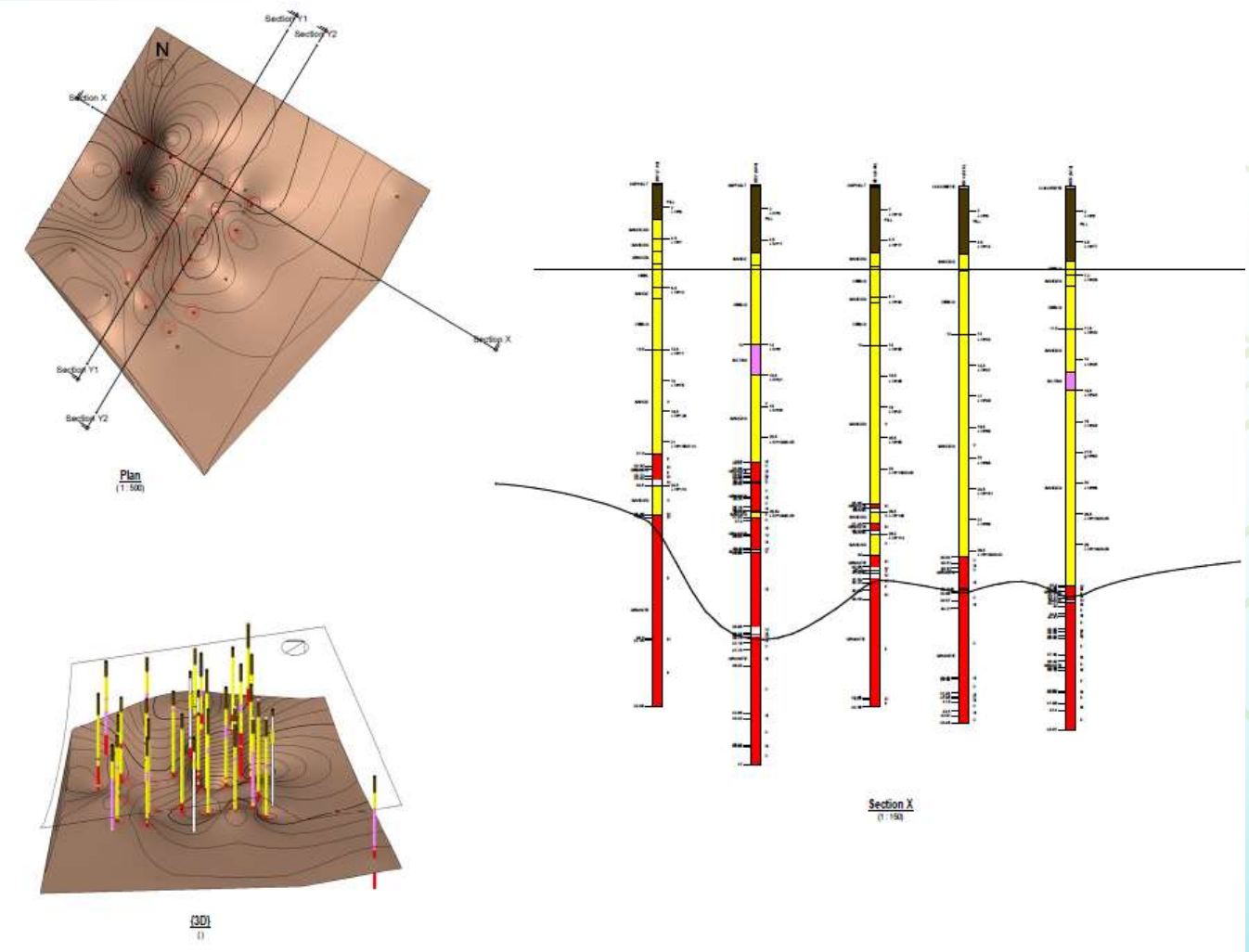
THE MODELED GEOLOGY

The Autodesk Geotechnical Module for AutoCAD Civil 3D 2016 was a total rewrite with new concepts and workflows. The 2016 version saw the introduction of Projects to store geotechnical data, the project data can then be quickly accessed in any drawing.

Integrate Geotechnical data into construction process

Source: AU2015 Gary Morin, Keynetix Ltd.

28. Geotechnical Investigation



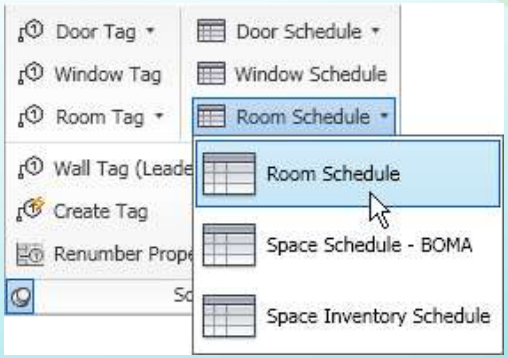
Integrate Geotechnical data into construction process

29. Calculation with BIM

The BIM concept supports a wide range of calculation and estimating activities:

- Quantity take-offs
- Door-window schedules
- Room Inventories
- Cost estimations

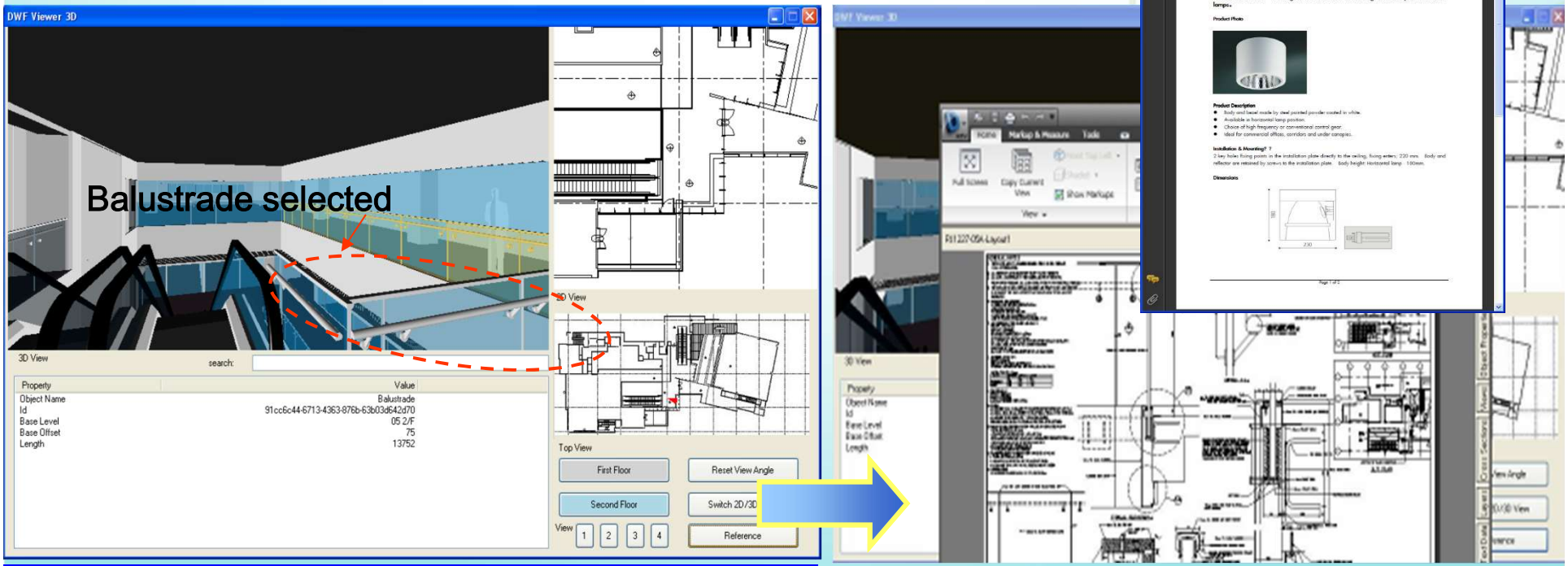
Window List			
Window Name	W Multiside Fix 13	W Triple Sash 13	W1 Casement 13
Quantity	1	1	1
From Room Number			
W x H Size	1,000x0,951	1,500x1,500	0,900x1,500
Orientation	R	L	L
Window sill height	0,900	0,900	0,900
Window head height	1,851	2,400	2,400
2D Symbol	1,000	1,500	0,900
3D Front View	1,000 / 0,951	1,500 / 1,500	0,900 / 1,500



30. Facility Management

設施管理

- As-built BIM model
- Linking Information to BIM model e.g. detailed shop drawings linked to balustrade in 3D view

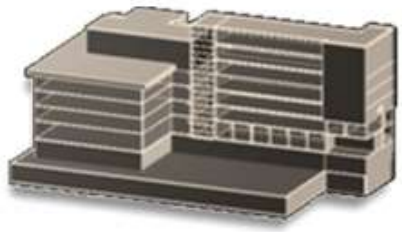


Basic Information e.g. height, type of glass

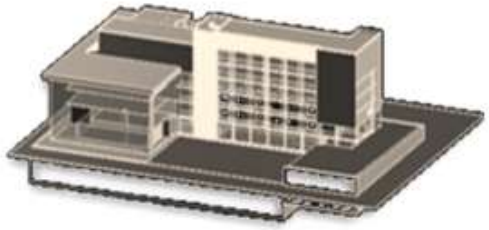
Detailed Drawings

31. Distinguish between “design model” and “analytical model”

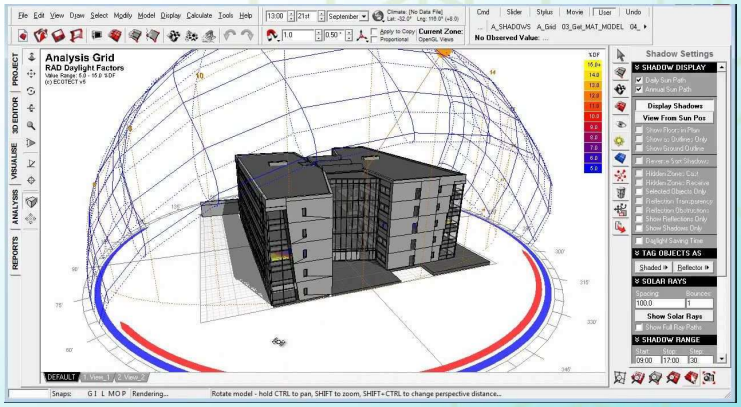
	Design Model	Analytical Model
Objectives	Continuous Design Development	Typically snap shot for analysis
Details	Fine Details as per deliverables	Supplied and isolated model to yield a particular result.
Deliverables	Professional Output such as statutory and contractual Documents	Analysis Report



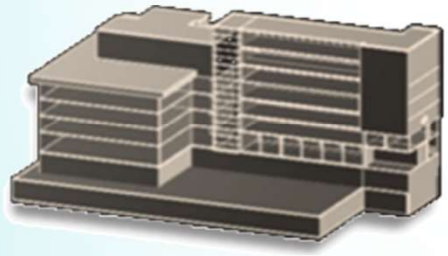
Conceptual Design



Design Development



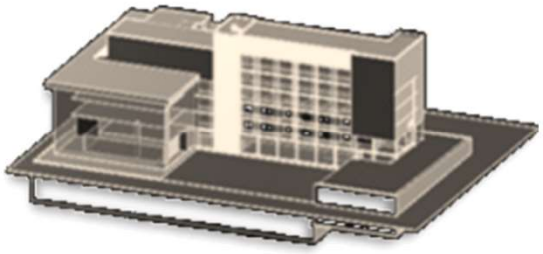
32. BIM Enables Sustainable Design



Conceptual Design

Use early-stage massing models

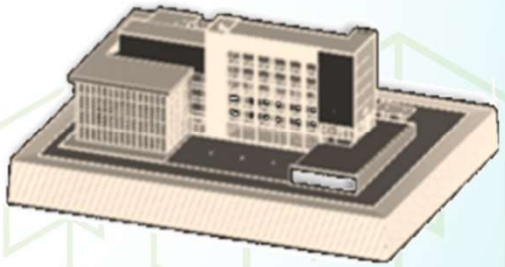
- Optimal location
- Building form
- Orientation of building design



Design Development

Conduct whole building energy, water & carbon analysis

- Benchmark energy use
- Recommend potential savings
- Study alternatives

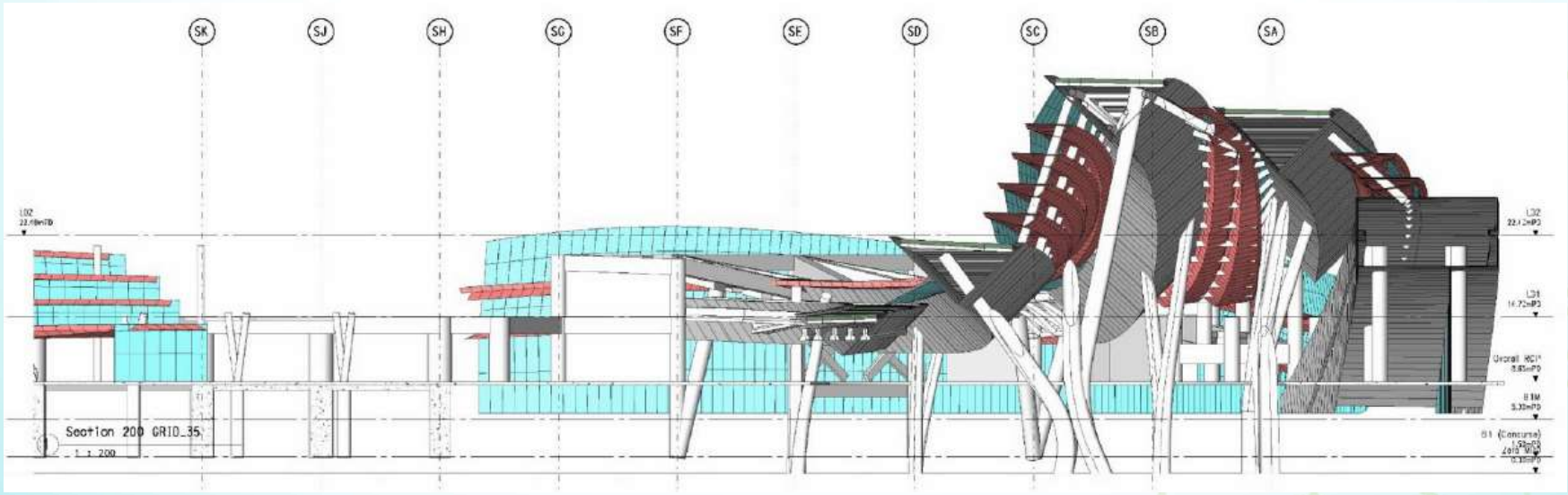


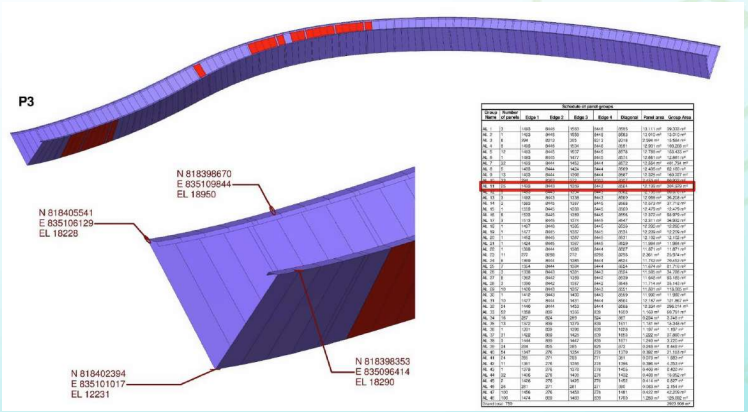
Design Validation

Make detailed design

- Adjust rooms and zones
- Size and shape individual openings
- Design custom shading devices
- Choose optimal materials

33. Details Design



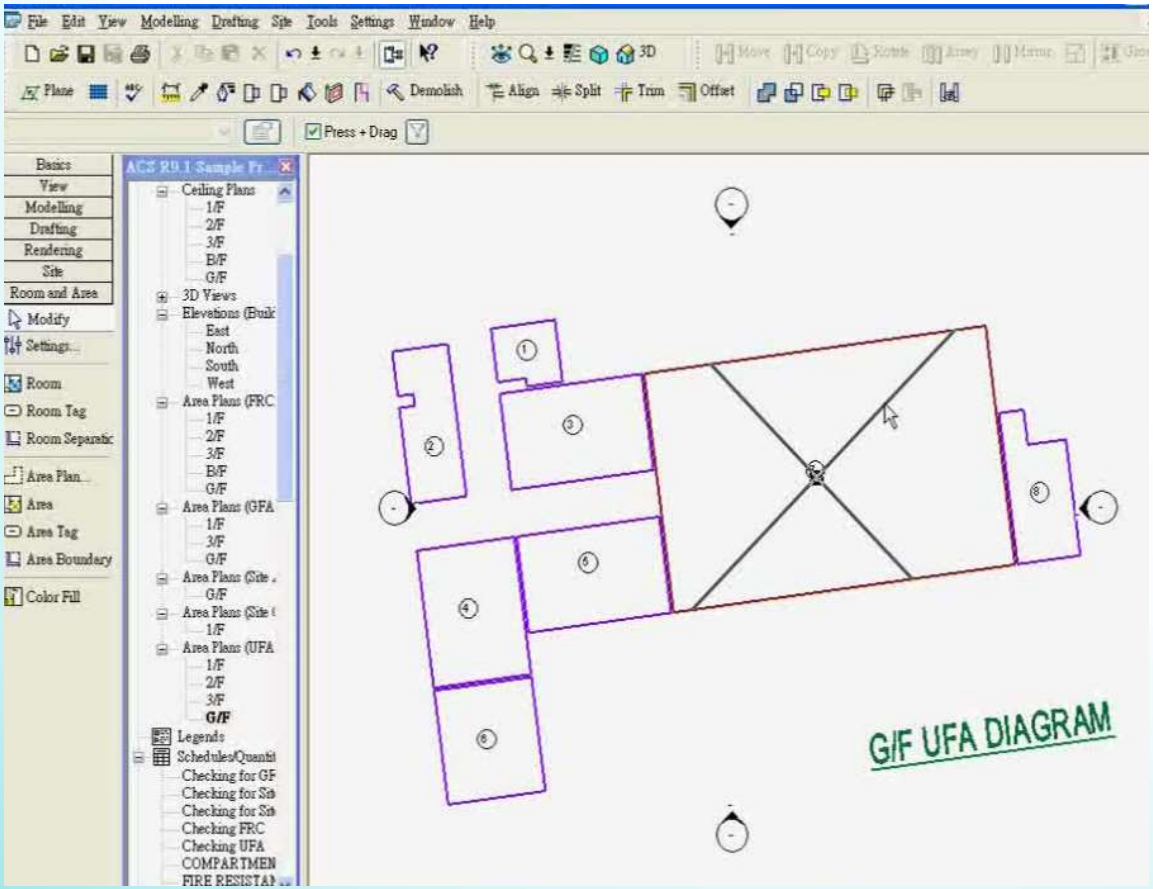


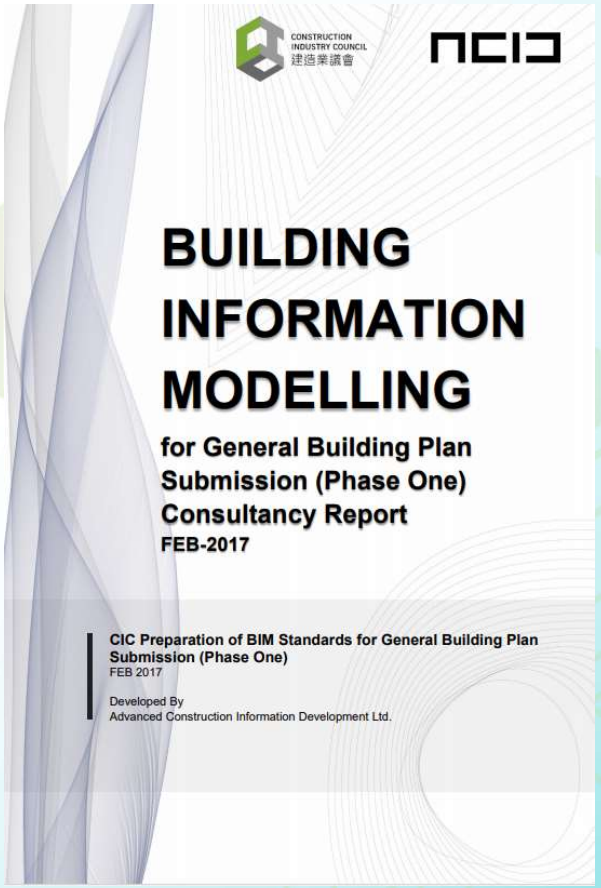
BIM to deliver detail design

Project : West Kowloon Station

34. Information needed for effective analysis of the conceptual BIM model

35. General Buildings Plan Submission





- BIM to generate GBP Submission
- SSOT can ensure the consistency of modelling and information

36. General Buildings Plan Submission

Buildings Department	Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers	ADV-34

Building Information Modelling

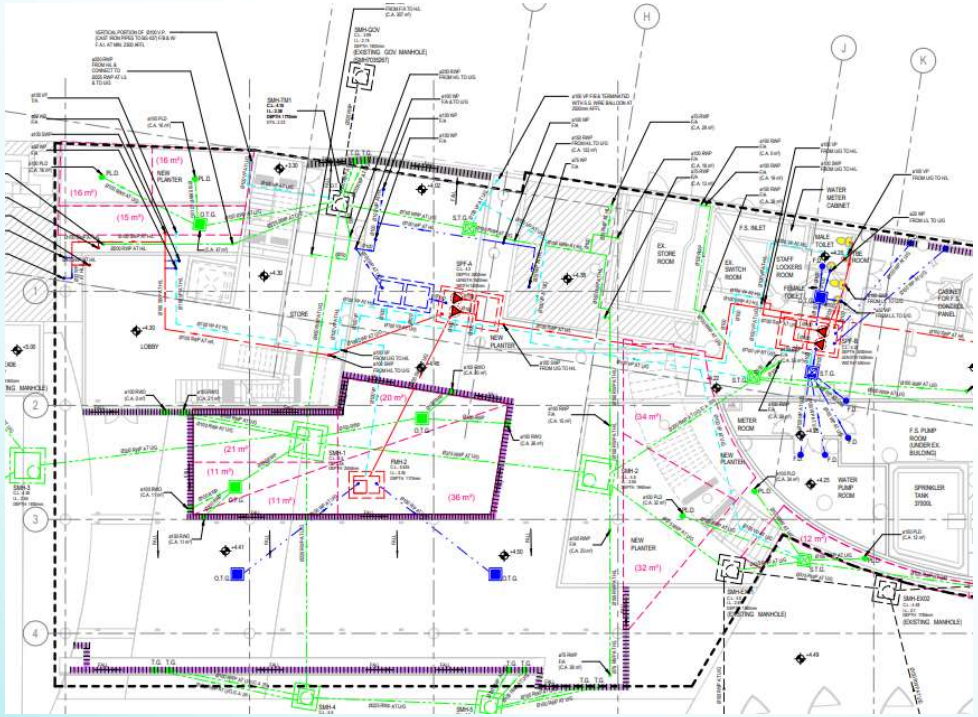
The use of Building Information Modelling (BIM) is a relatively new and innovative approach to building design and construction. The Buildings Department (BD) encourages authorized persons (AP), registered structural engineers (RSE) and registered geotechnical engineers (RGE) to consider adopting BIM in their building projects under the Buildings Ordinance. This practice note provides general guidelines on BIM submissions for building proposals as supplementary information to facilitate plan processing by the BD.

BIM Submissions

2. There is a wide range of applications of BIM on new building development and alteration and addition works which are considered useful to facilitate the BD in processing plan submissions. Some examples of BIM applications are given in **Appendix A** and the project AP/RSE/RGE are encouraged to provide the BD with a soft copy of the computer modelling information under the specified format for consideration.

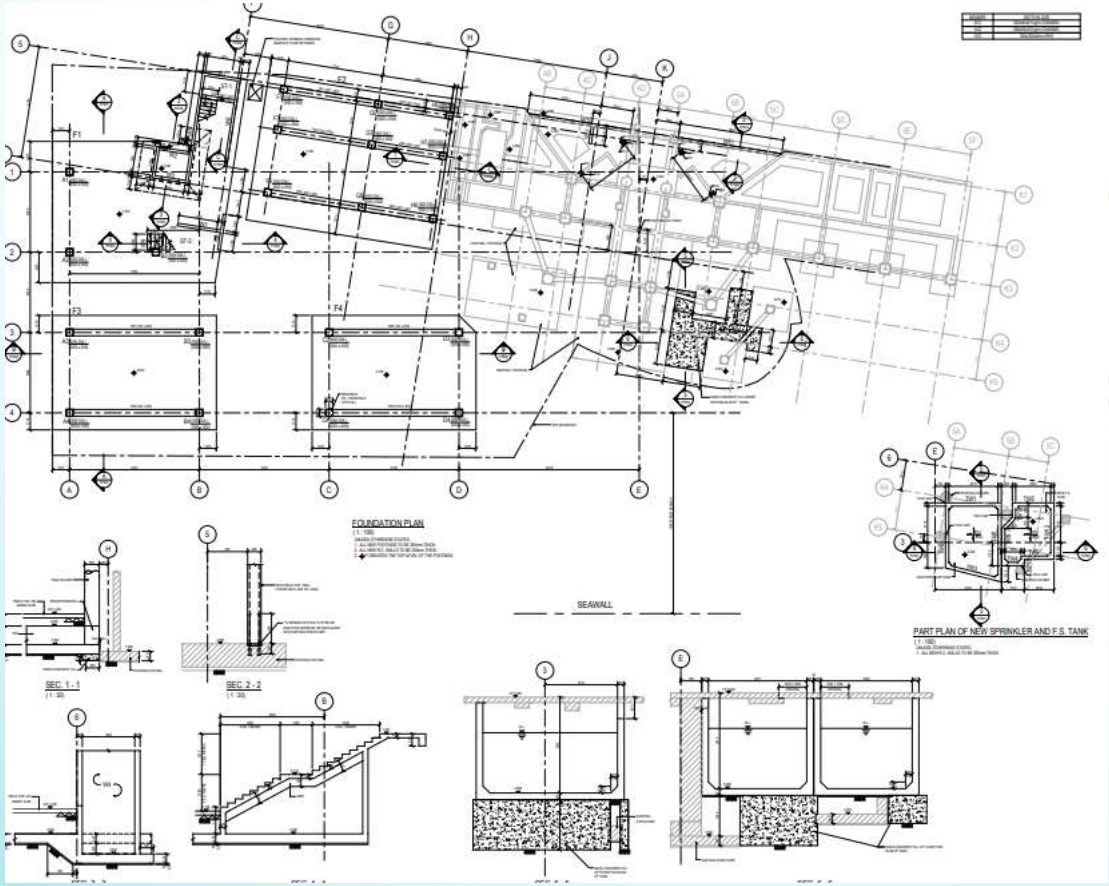
- PNAP – ADV34 encourage GBP submission with BIM support as supplementary information currently

37. General Buildings Plan Submission (E&M)



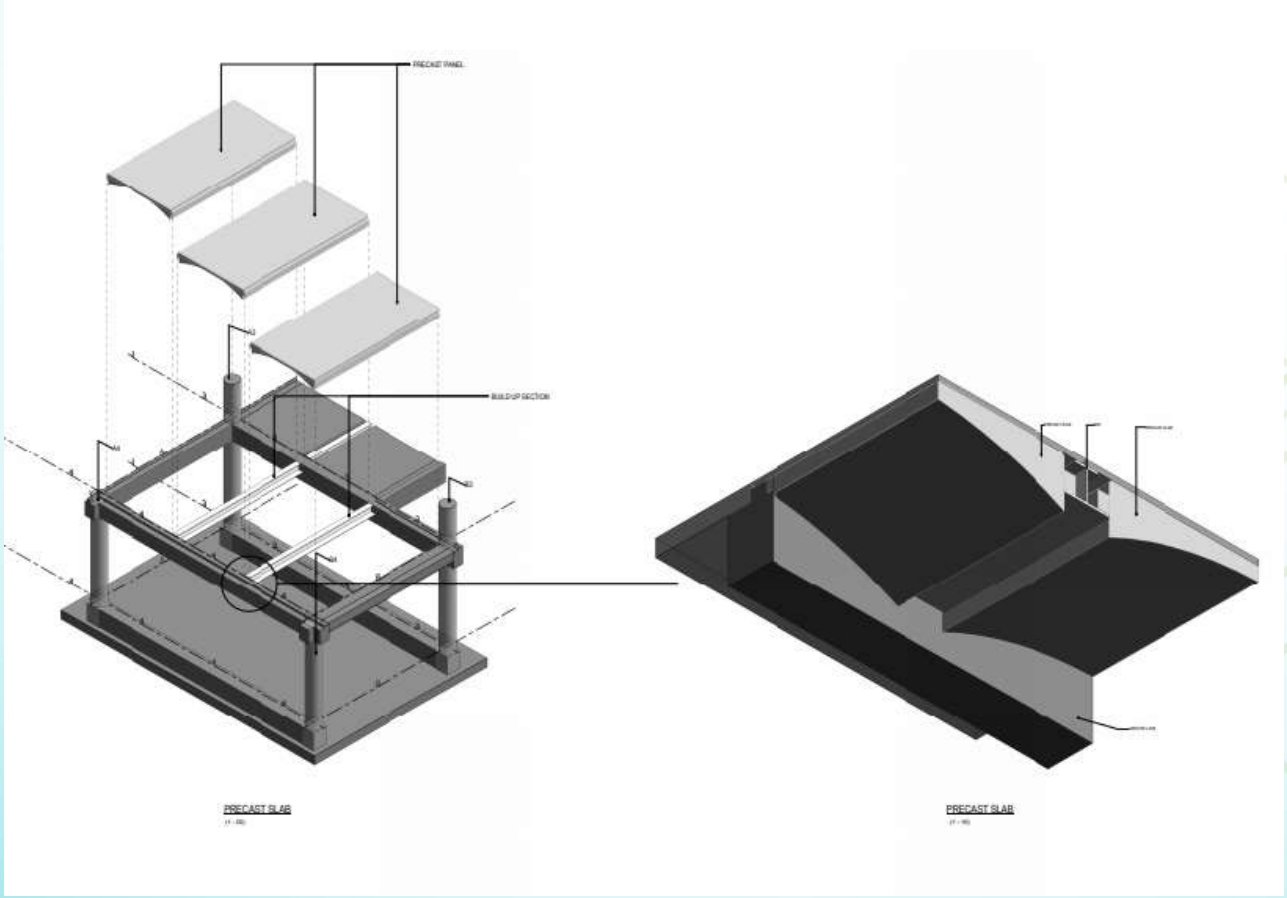
- BIM to generate E&M drawings for GBP submission
- SSOT can ensure the consistency of modelling and information
- Potential clash can be resolved during the development of the project

38. General Buildings Plan Submission (Structure)



- BIM to generate Structural drawings for GBP submission
- SSOT can ensure the consistency of modelling and information
- Potential clash can be resolved during the development of the project

39. General Buildings Plan Submission (Structure)



- Structural calculation can be generated from BIM
- SSOT to ensure the consistency of modelling and information
- Design and submission process in BIM

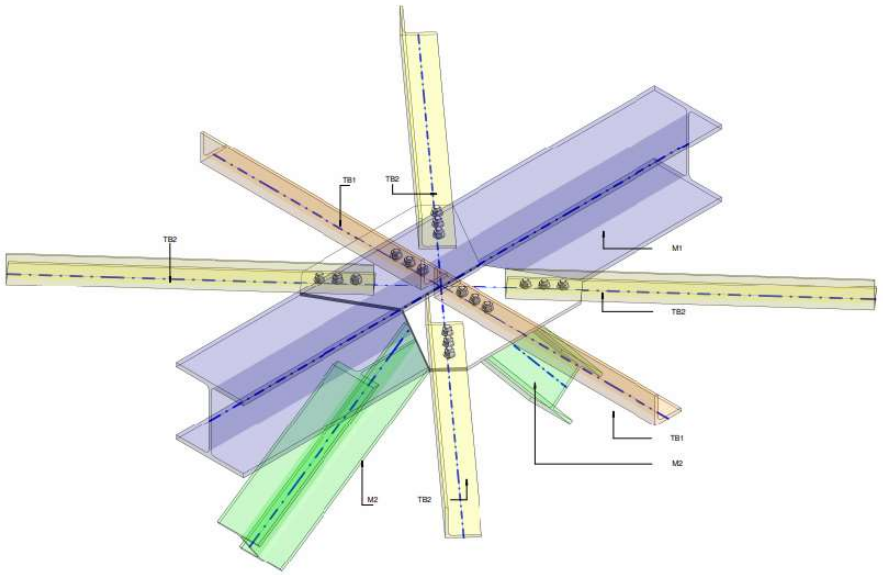
40. General Buildings Plan Submission (Structure)

DETAILS OF STEEL TYPE

MEMBER MARK	MEMBER SIZE	Count	COLOR	R	G	B
M1						
M1	254x254x73UC	1		0	0	128
M2						
M2	152x152x37UC	2		0	255	0
TB1						
TB1	100x100x12 ANGLE	2		255	128	0
TB2						
TB2	100x100x8 ANGLE	4		255	255	0
Grand total: 9						

DETAILS OF STEEL COST

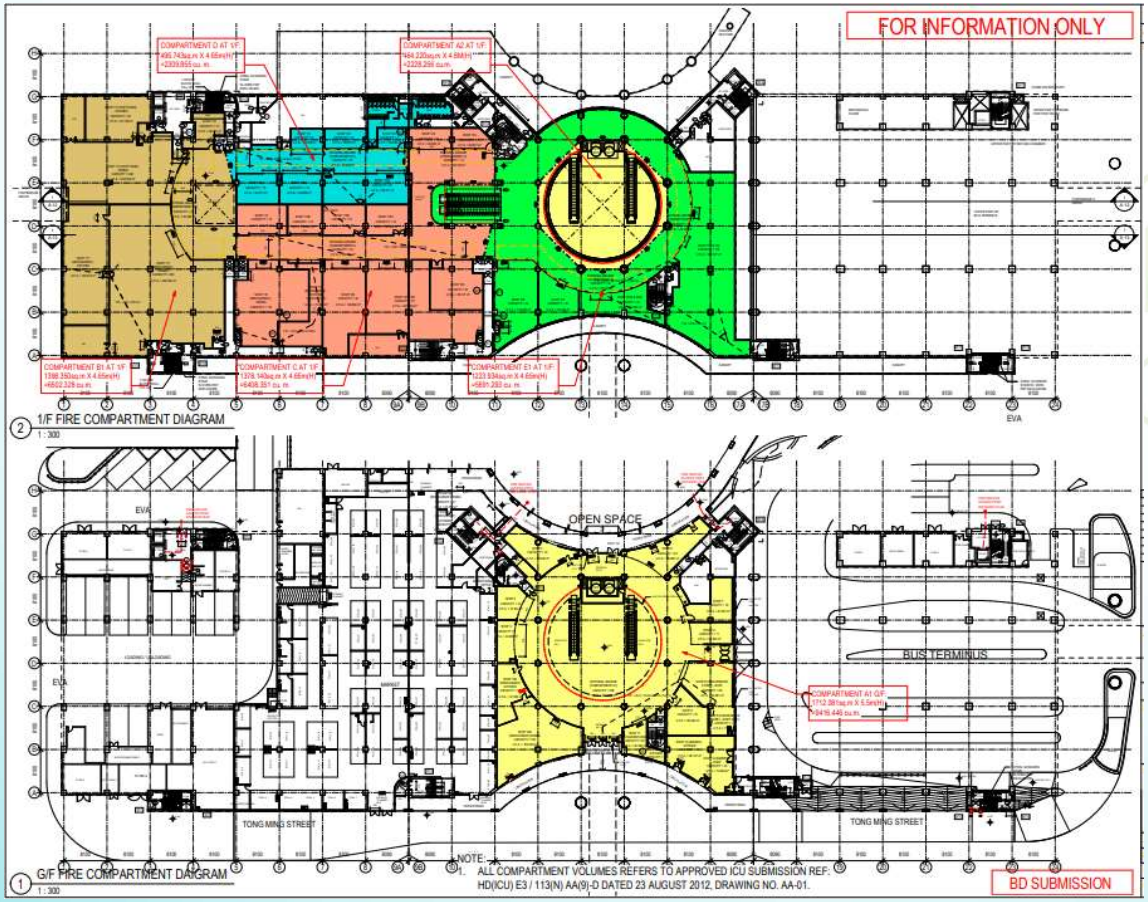
MEMBER MARK	LENGTH (MM)	MEMBER SIZE	UNIT COST (PER METRE RUN)	COUNT	STEEL COST
M1					
M1	1820	254x254x73UC	HK$254.00	1	HK$462.28
M2					
M2	880	152x152x37UC	HK$152.00	1	HK$133.76
M2	740	152x152x37UC	HK$152.00	1	HK$112.48
TB1					
TB1	865	100x100x12 ANGLE	HK$105.00	1	HK$90.83
TB1	865	100x100x12 ANGLE	HK$105.00	1	HK$90.83
TB2					
TB2	1170	100x100x8 ANGLE	HK$100.00	1	HK$116.95
TB2	1170	100x100x8 ANGLE	HK$100.00	1	HK$116.95
TB2	1170	100x100x8 ANGLE	HK$100.00	1	HK$116.95
TB2	1170	100x100x8 ANGLE	HK$100.00	1	HK$116.95
Grand total: 9	9848			9	HK$1,357.99



1 ISOMETRIC DETAIL OF STEEL

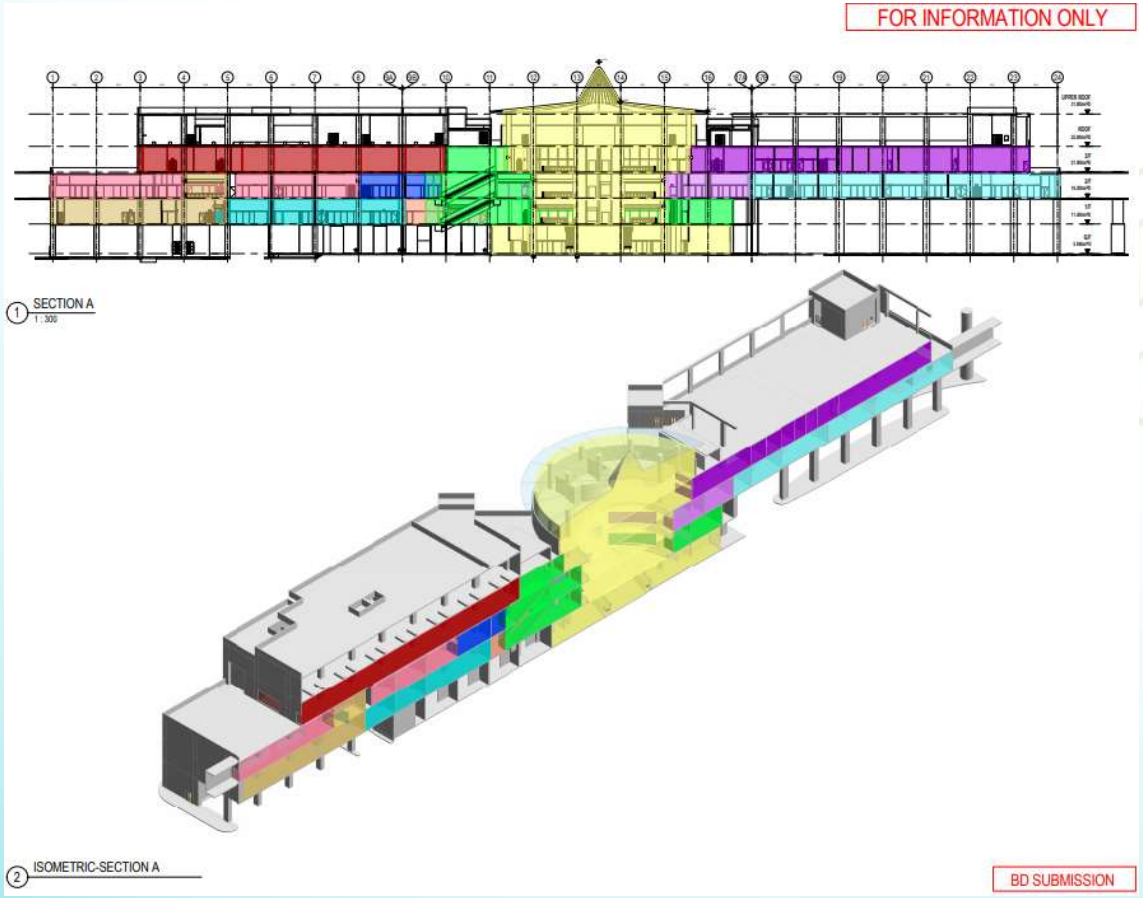
- SSOT to ensure the consistency of modelling and information
- Detail Design can be carried out from GBP consistently by SSOT

41. General Buildings Plan Submission (A&A)



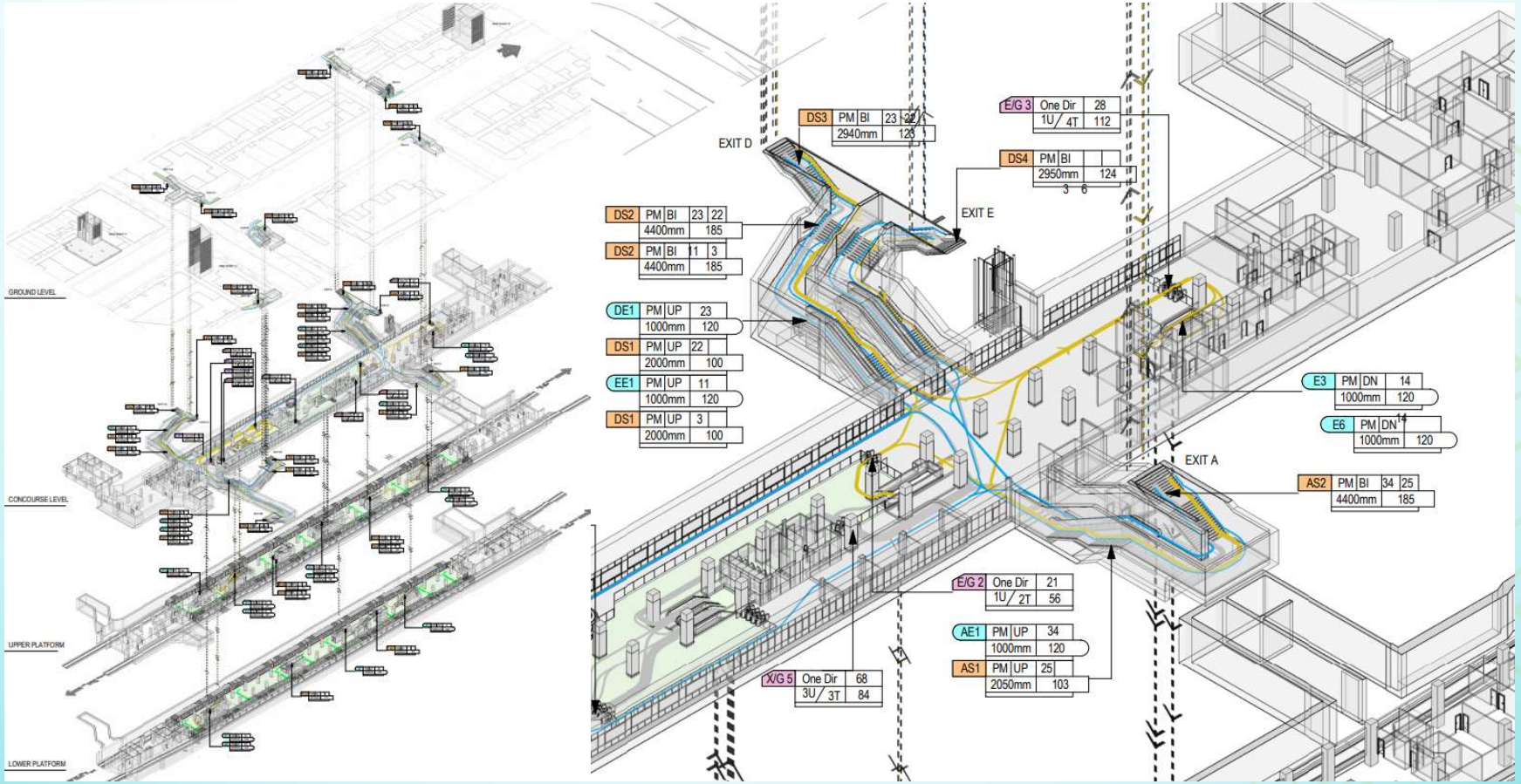
- BIM to generate drawings for A&A GBP submission
- Area analysis can be achieved by BIM
- A clear indication of scope of submission in 3D form BIM

42. General Buildings Plan Submission (A&A)



- BIM to generate drawings for A&A GBP submission
- Area analysis can be achieved by BIM
- A clear indication of scope of submission in 3D form BIM

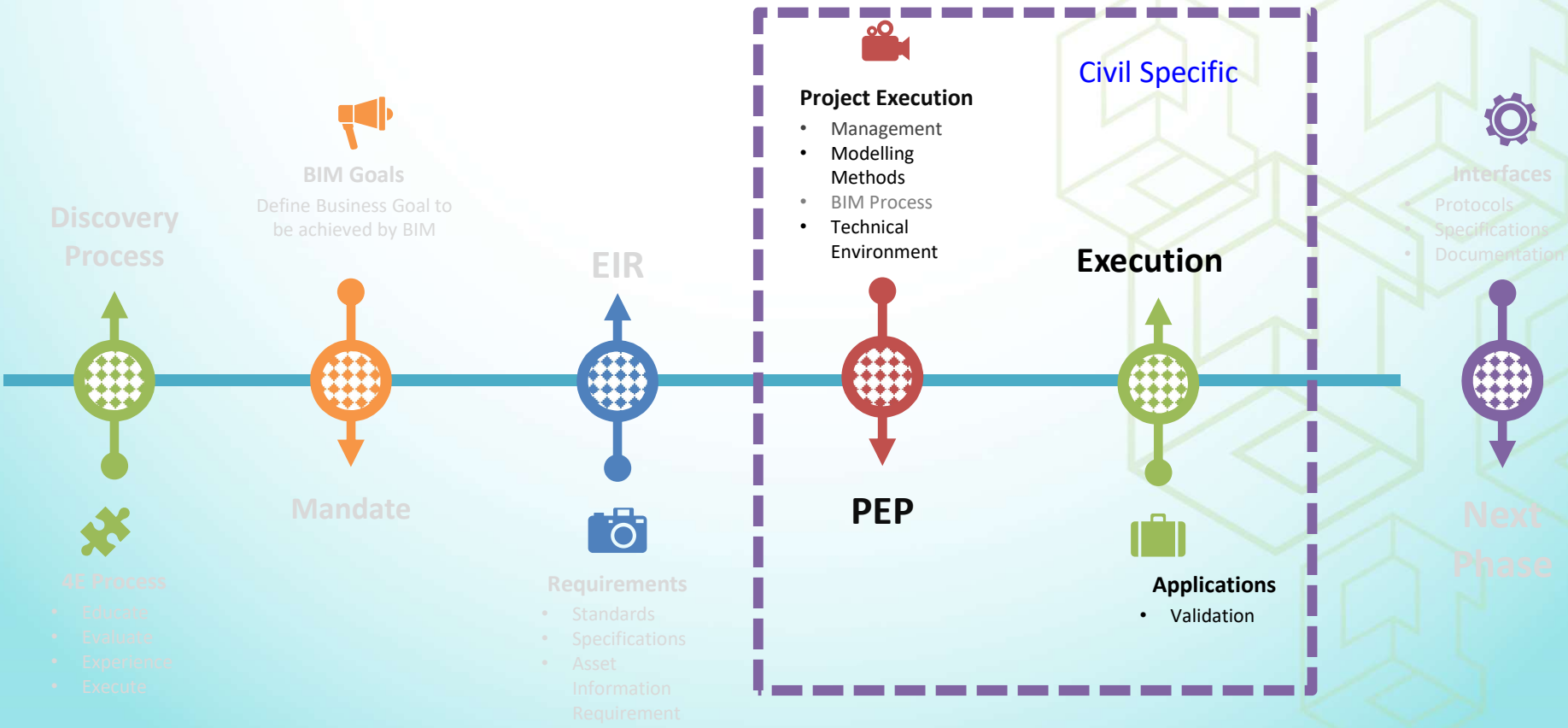
43. Further Analysis



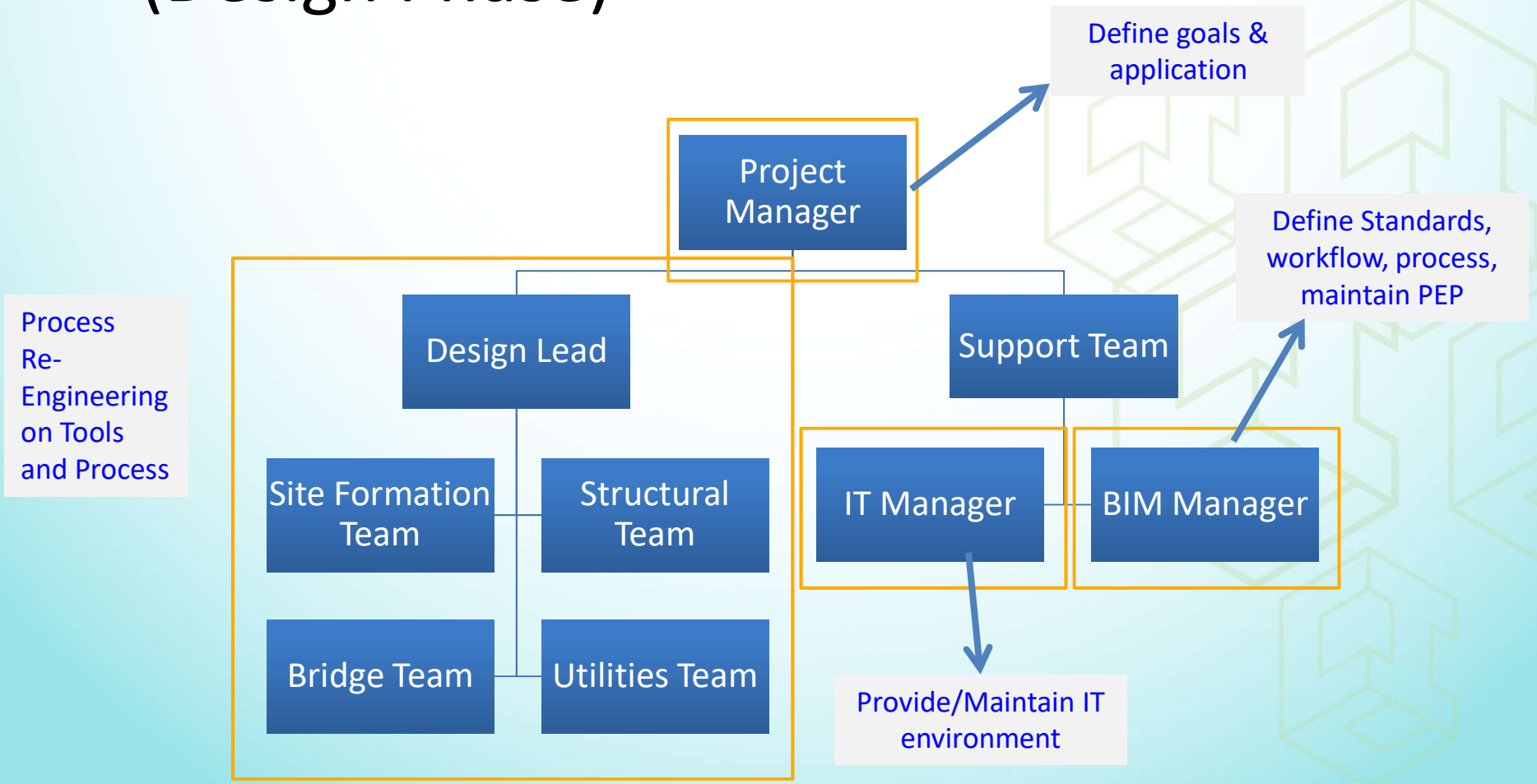
- Use BIM as an analysis tool
- Input of data with parameter can generate information from BIM
- Simulation can be run in BIM as a virtual analysis

Day 3 - BIM Model as a Project Database (Full Day)

1. Civil Project Execution

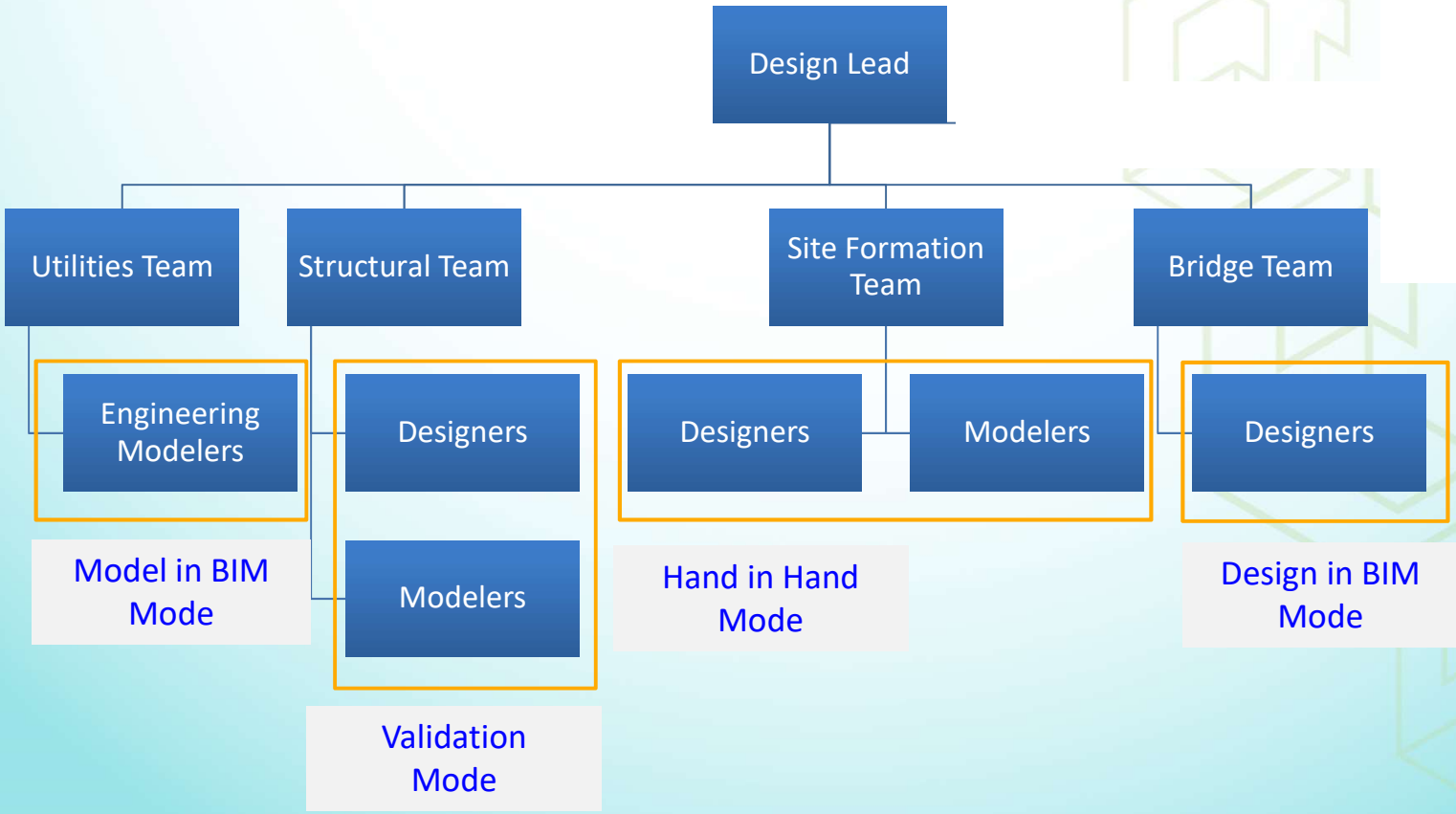


2. O-Chart, Role and Responsibility (Design Phase)



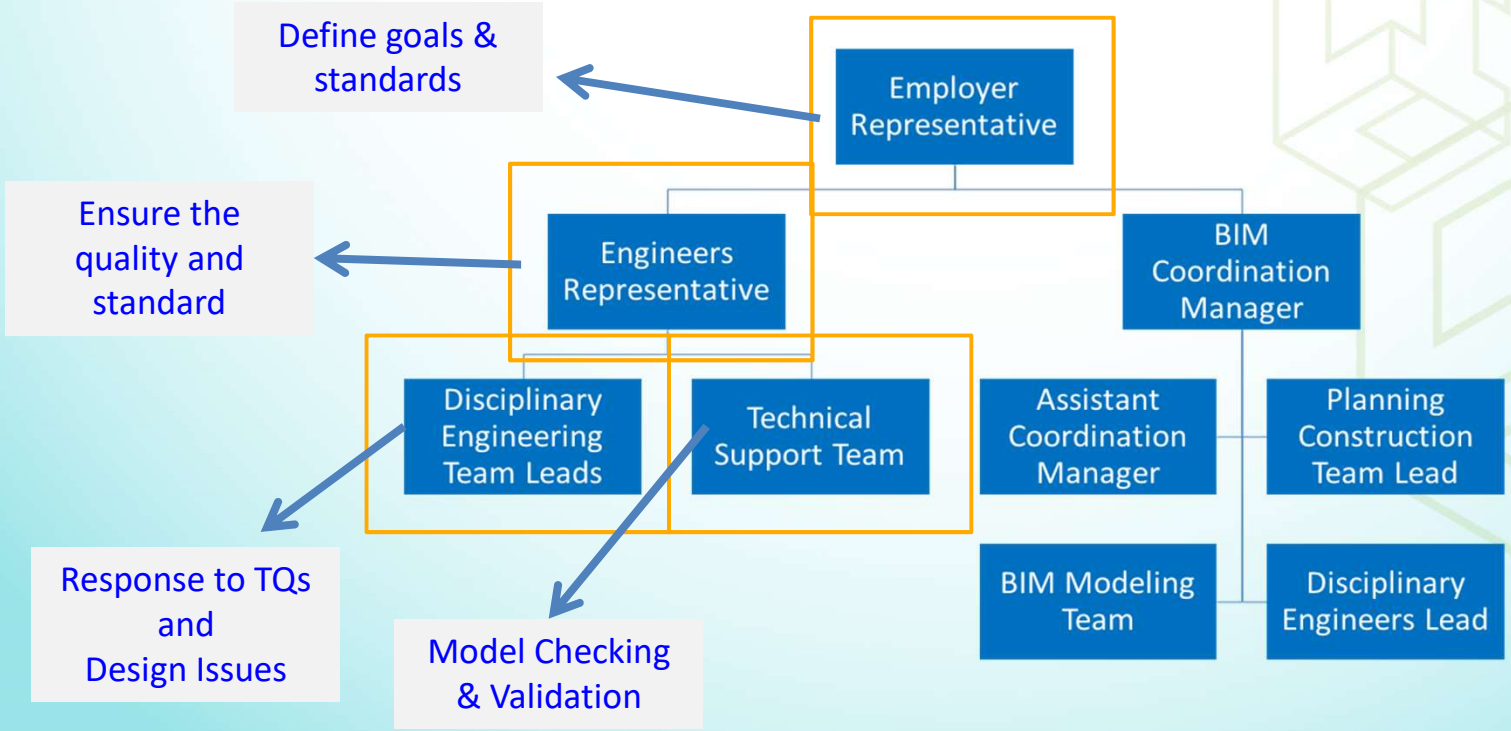
- The Role and Responsibility to be setted up at the beginning
- BIM Manager under Support Team for Project Manager

3. Mode of Process Re-engineering



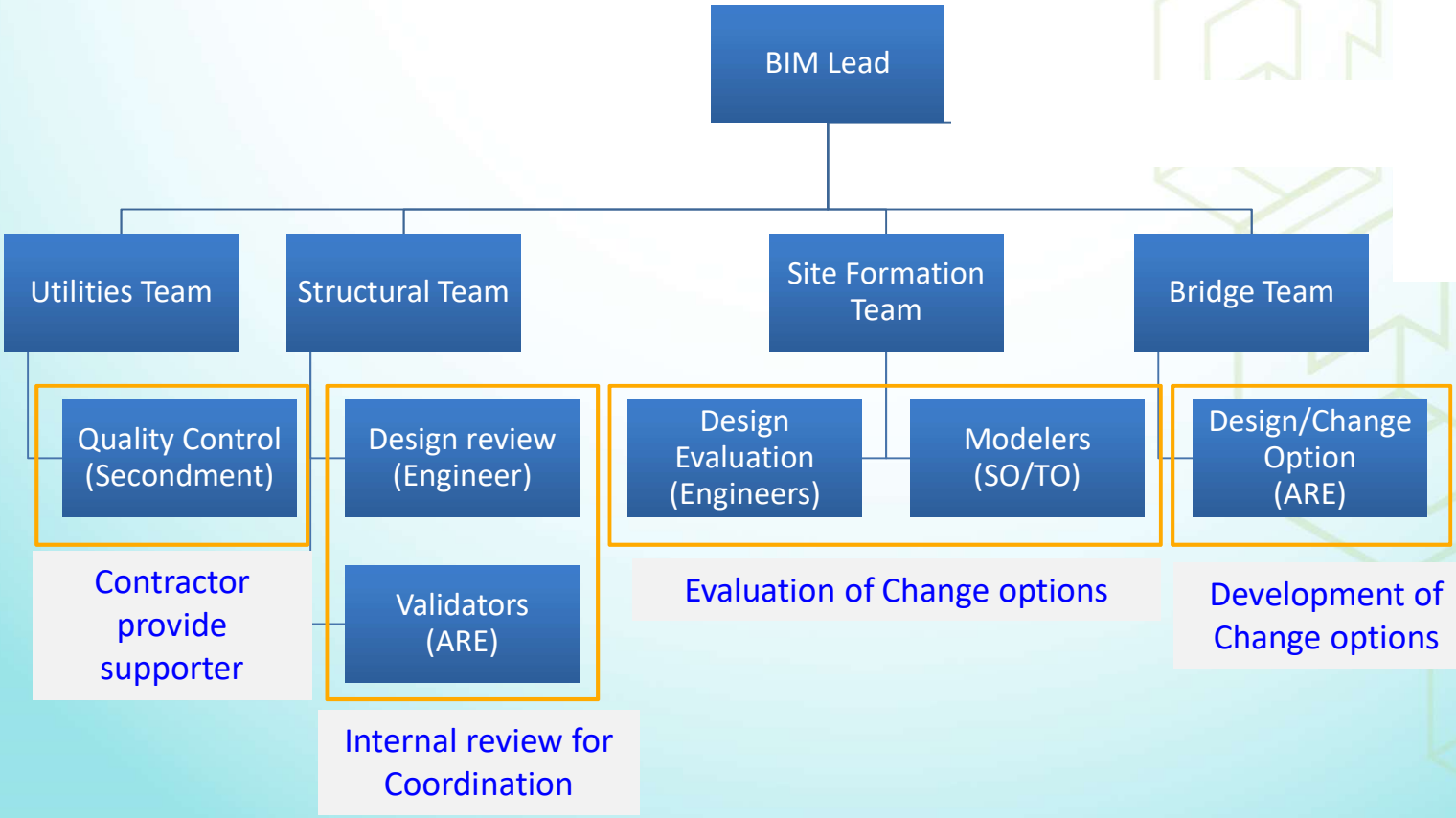
- BIM Model under each discipline

4. O-Chart, Role and Responsibility (Construction Phase)

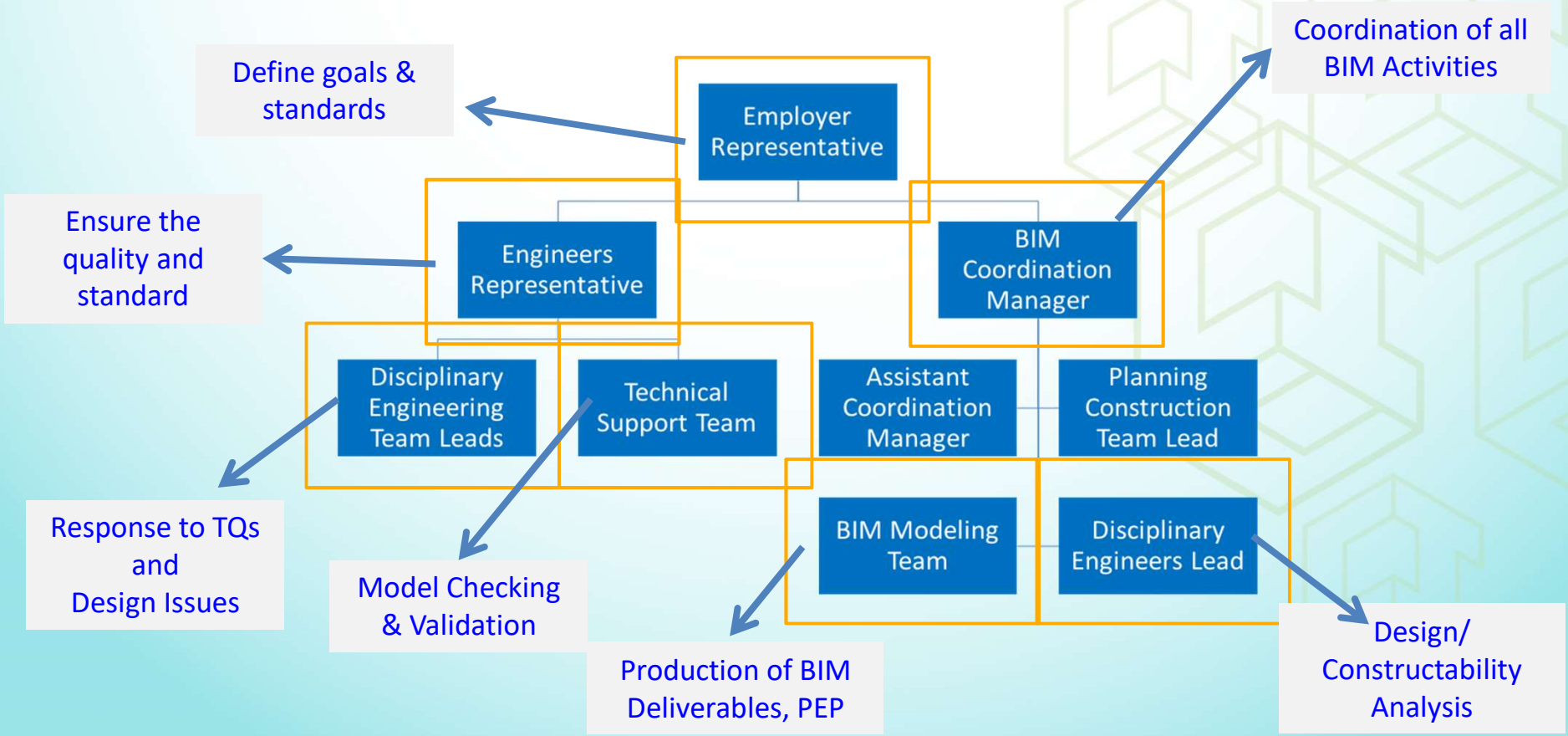


- Respective Representative to define Goals & Standard
- Engineering to response TQ and Model checking by Technical Support Team

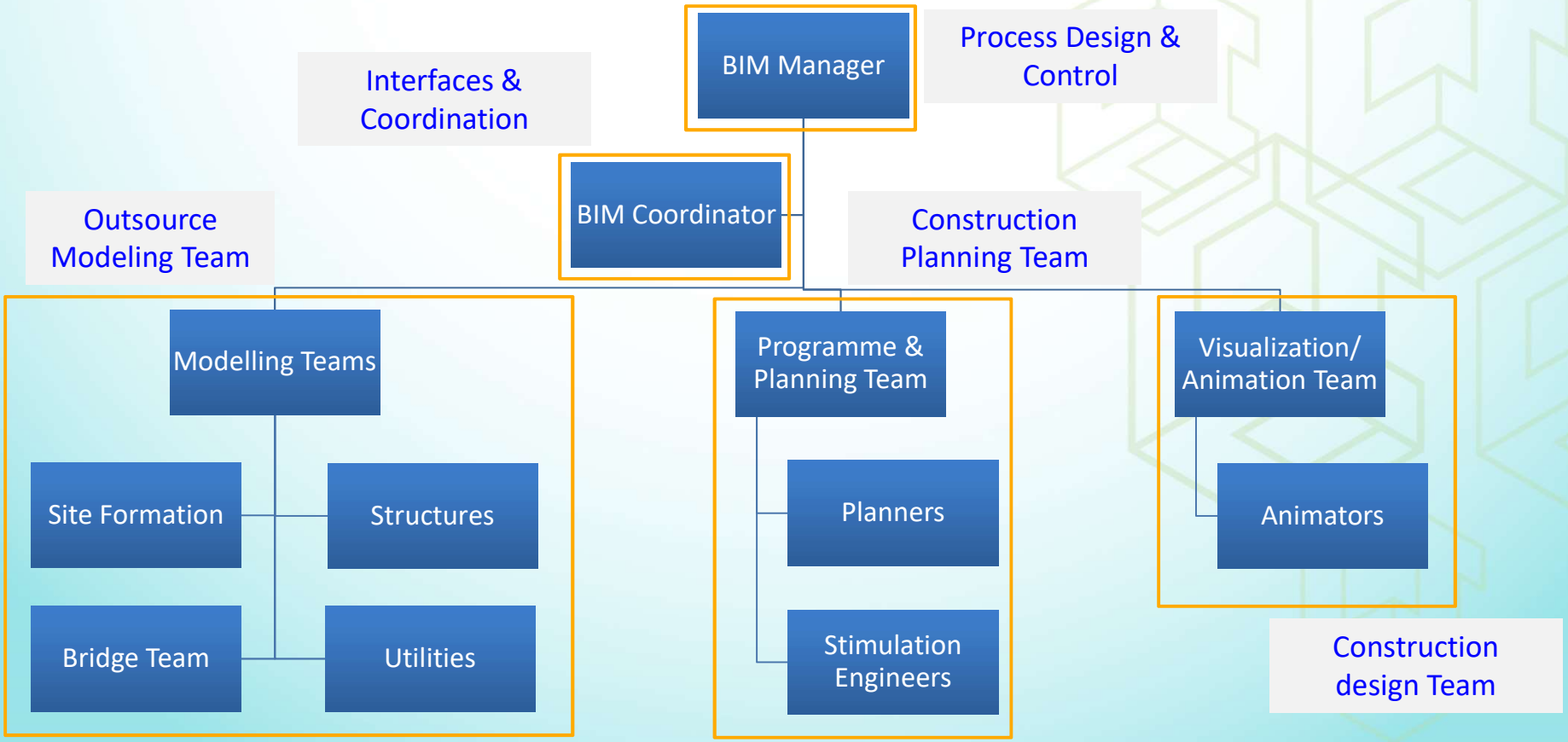
5. Modes of Re-Engineering (RSS)



6. O-Chart, Role and Responsibility (Construction Phase)



7. Contractor BIM Team



8. Model Subdivision and LoD

Project Specific Sub-division: O-Chart & File Size

ID	Disciplinary Model	Initial Model	Design Model	Coordinated Model	As-built Model	Sub Models
ES	Existing Site Model	200	200	250	250	4
ER	Road Model	250	300	350	500	7
BR	Bridge Model	250	300	350	500	34
UP	Underpass Model	250	300	350	500	11
BD	Building Model	250	300	350	500	27

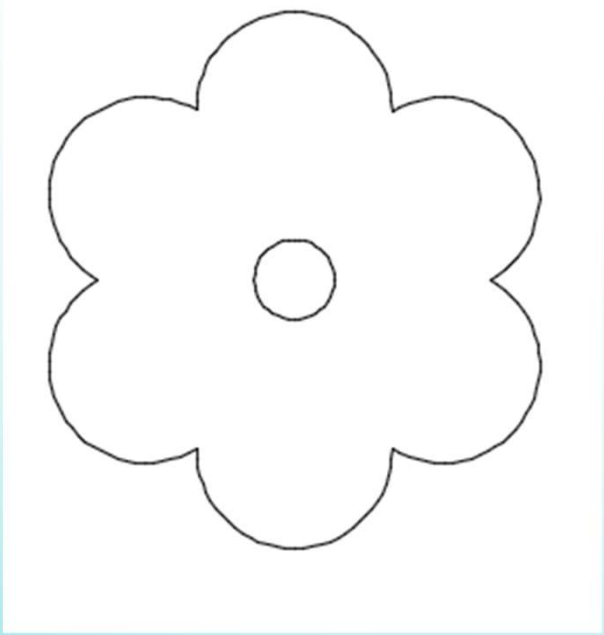
Progressively Developed during project;
May not developed to same LoD

Further sub-division for operation and versioning

- To define LOD in different Stage during the project
- BIM Manager to supervise the LOD and sub-divide models if required

9. LOD 100

LoD	Description
100	Tree as a **symbol**

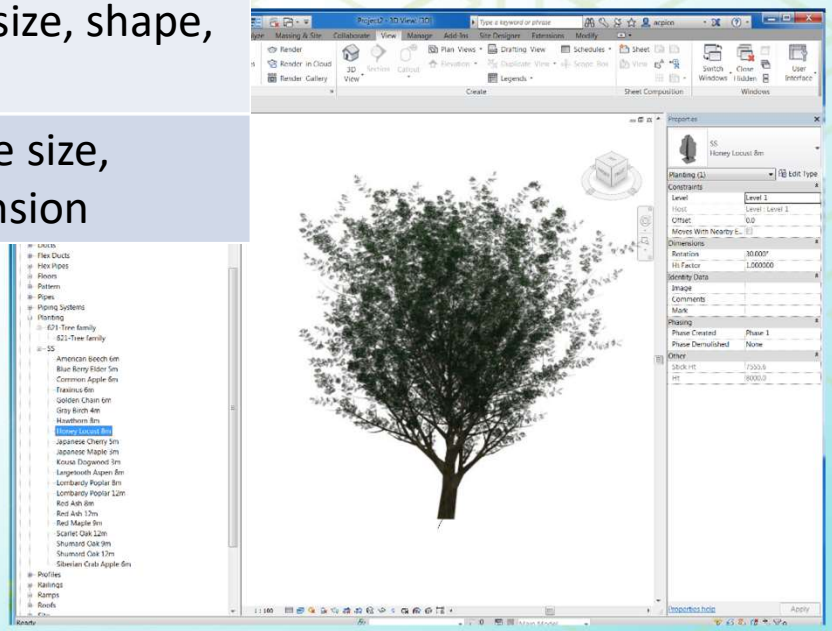


10. LOD 200

LoD	Description
100	Tree as a **symbol**
200	Tree as a **Generic**, with approximated size, shape, location, orientation

11. LOD 299?

LoD	Description
100	Tree as a **symbol**
200	Tree as a **Generic**, with approximated size, shape, location, orientation
300	Tree as a **Specific Object**, with accurate size, shape, location, orientation and dimension



- The LOD need to specify at the beginning of the project
- Example as LOD300 cannot be achieved by designer

12. Level of Development – Example Tree

LoD	Description
100	Tree as a **symbol**
200	Tree as a **Generic**, with approximated size, shape, location, orientation
300	Tree as a **Specific Object**, with accurate size, shape, location, orientation and dimension
400	Tree as a **Specific Object**, with excavation limits/Installation requirements
500	Tree as a **Specific Object**, with name, type, plant date, etc

13. CIC Standard : Pavement

Pavement (Carriageway, Footpath, Cycle Track)

LOD	Description	Data	Example Image
100	Approximate alignment, width and spot levels of the paving surfaces		
200	Element modelling to include approximate 3D alignment, shape and width of pavement		
300	Element modelling to include: • Accurate size and geometry of every layer of paving components (frication course, wearing course, base-course, road-base, sub-base, etc.) that varies continuously along the road alignment • Accurate super-elevation and longitudinal fall of the pavement components Required non-graphic information associated with model elements includes: • Polygon Feature Type * • Surface Material Type * • Paver Type * • Headroom requirement (* to match HyD GIS requirement)		

14. Model Subdivision and Modelling Methodology

Further Sub-division by Type of works

Implication of analytical information availability

ID	Name	Description	Type	Authoring Tools	Category
ER01	FS_Pav	Realigned Ferry Street Pavement	Roadwork	Civil 3D	Corridor
ER02	CPS_CB	Ching Ping Street Cantilever Barrier	Noise Barrier	Revit	Corridor
ER03	FS_Fur	Ferry Street Furniture	Furniture	Civil 3D	Corridor
ER04	FS_STM	Ferry Street Storm water	Drainage	Civil 3D	Pipe Network
ER05	FS_SEW	Ferry Street Sewerage	Sewerage	Civil 3D	Pipe Network
ER06	FS_WTM	Ferry Street Watermain	Water pipe	Civil 3D	Pipe/Pipe Fitting
ER07	FS_CAB	Ferry Street Cable Duct	Cable	Revit	Conduit/Conduit Fitting

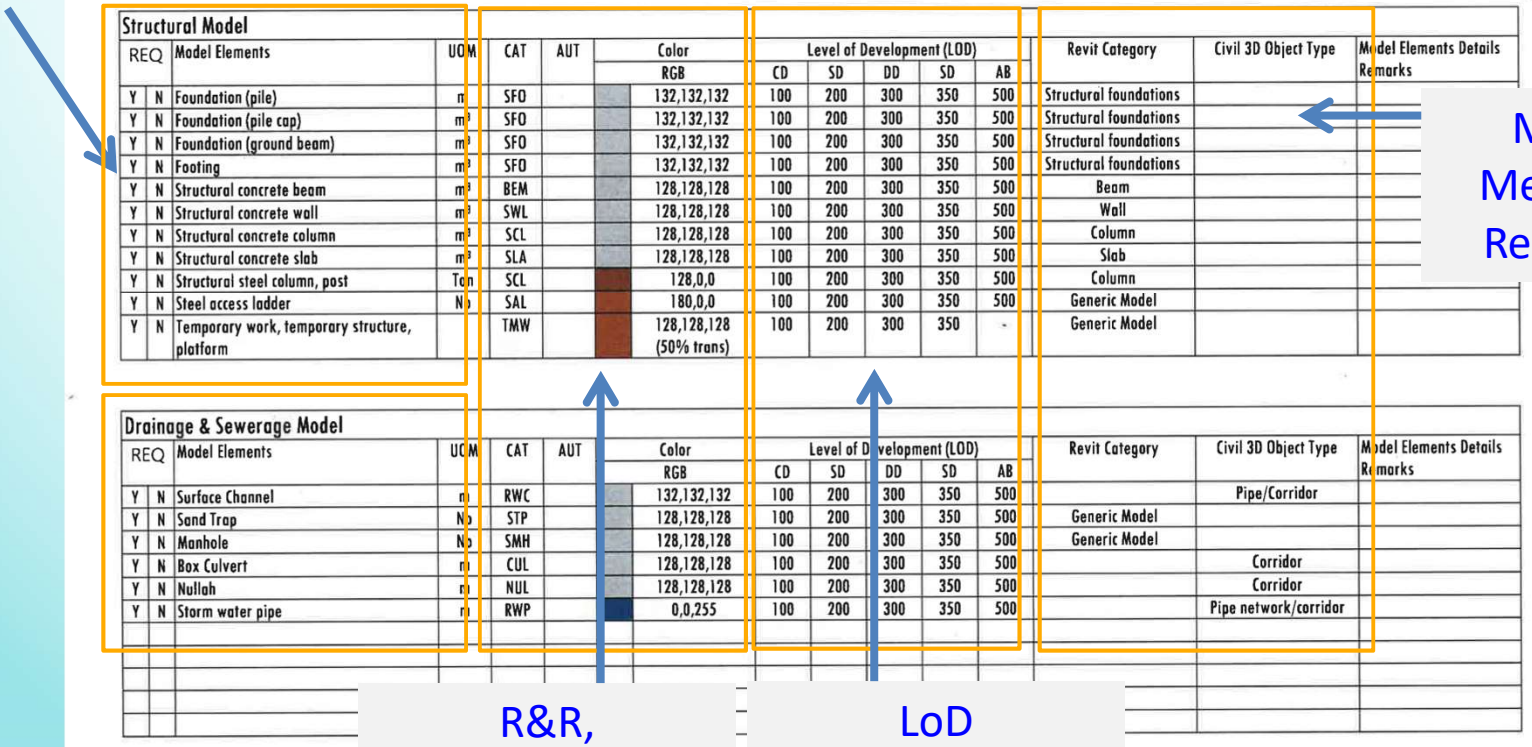
Further sub-division for different modelling tools

15. GEO Disciplinary Model Requirement

- Site Model
  - Existing Ground
  - Nearby 200m building
- Civil Model
  - All nearby by 200m road, tunnel, bridge…
  - Temp Traffic Arrangement
- Geological Model
  - Strata
  - Ground water surface
- Rigid Barrier Model
- Flexible Barrier Model
- Man-made Slope Model
- Rock Slope Model
- Retaining Wall Model
- Soil Nail Model
- Structural Model
- Architectural Model
  - Lands 3Ds Data

16. Sample Model Breakdown Table

Model Breakdown



Structural Model

REQ		Model Elements	UOM	CAT	AUT	Color RGB	Level of Development (LOD) CD	SD	DD	SD	AB	Revit Category	Civil 3D Object Type	Model Elements Details Remarks
Y	N	Foundation (pile)	m	SFO		132,132,132	100	200	300	350	500	Structural foundations		
Y	N	Foundation (pile cap)	m^3	SFO		132,132,132	100	200	300	350	500	Structural foundations		
Y	N	Foundation (ground beam)	m^3	SFO		132,132,132	100	200	300	350	500	Structural foundations		
Y	N	Footing	m^3	SFO		132,132,132	100	200	300	350	500	Structural foundations		
Y	N	Structural concrete beam	m^3	BEM		128,128,128	100	200	300	350	500	Beam		
Y	N	Structural concrete wall	m^3	SWL		128,128,128	100	200	300	350	500	Wall		
Y	N	Structural concrete column	m^3	SCL		128,128,128	100	200	300	350	500	Column		
Y	N	Structural concrete slab	m^3	SLA		128,128,128	100	200	300	350	500	Slab		
Y	N	Structural steel column, post	Ton	SCL		128,0,0	100	200	300	350	500	Column		
Y	N	Steel access ladder	No	SAL		180,0,0	100	200	300	350	500	Generic Model		
Y	N	Temporary work, temporary structure, platform		TMW		128,128,128 (50% trans)	100	200	300	350	-	Generic Model		

Drainage & Sewerage Model

REQ		Model Elements	UOM	CAT	AUT	Color RGB	Level of Development (LOD) CD	SD	DD	SD	AB	Revit Category	Civil 3D Object Type	Model Elements Details Remarks
Y	N	Surface Channel	m	RWC		132,132,132	100	200	300	350	500		Pipe/Corridor	
Y	N	Sand Trap	No	STP		128,128,128	100	200	300	350	500	Generic Model		
Y	N	Manhole	No	SMH		128,128,128	100	200	300	350	500	Generic Model		
Y	N	Box Culvert	m	CUL		128,128,128	100	200	300	350	500		Corridor	
Y	N	Nullah	m	NUL		128,128,128	100	200	300	350	500		Corridor	
Y	N	Storm water pipe	m	RWP		0,0,255	100	200	300	350	500		Pipe network/corridor	

Modelling Methodology Requirement

R&R, Convention

LoD Requirement

17. GEO Required File Naming Convention

Field No	1	2	3	4	5	6	7
	Project	-Originator	-Volume/Zone	-Level/Location	-Type	-Role	-Description
	GE19/2011	GEO	XX	XX	M3	GE	ES-200

Field 5: 2 character for Type

AF: Animation File CM: Combined Model DR: Drawing
M2: 2D Model M3: 3D Model VS: Visualization Model

Field 6: 2 character for Role (Refer to CIC BIM standard)

CN: Contractor CV: Civil Engineer EE : Electric Engineer
LS: Land Surveyor LA: Landscape Architect GE: Geotechnical Engineer
PM: Project Manager SC: Sub Contractor ST: Structural Engineer

Field 7: 2 character for description of discipline + 3 Character for usage discipline/LoD + 1 Character for Revision (optional)

Discipline

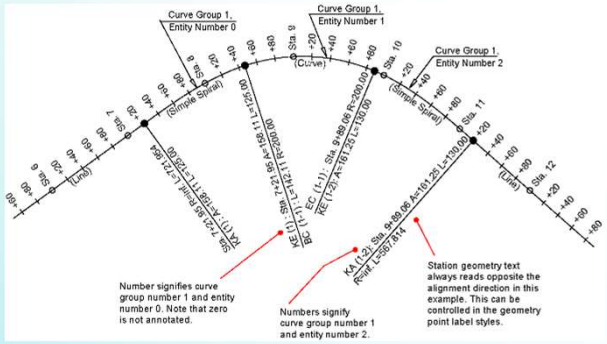
ES : Existing Site Model EG: Existing Ground Model DS: Storm Drainage Model
ST: Structural Model
MP: Multiple

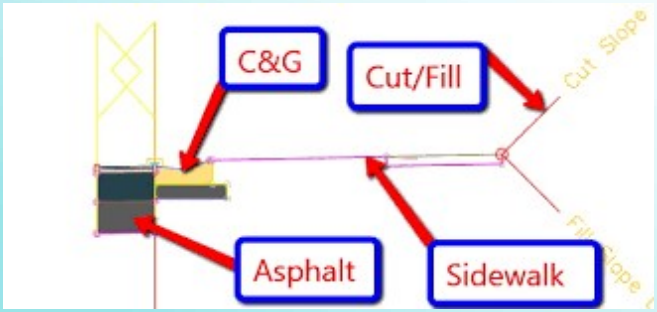
Usage

WIP : Work in Progress COR: Coordination 3DV: 3D Virtual Reality
4DP: 4D programme simulation CON : Construction use DRG: Drawing Production
ASB: As-Built Model CSD : Cost Saving/Alternative Design
CMS : Construction Method Simulation

18. Modelling Methodology : Road Model

Ref. Alignment





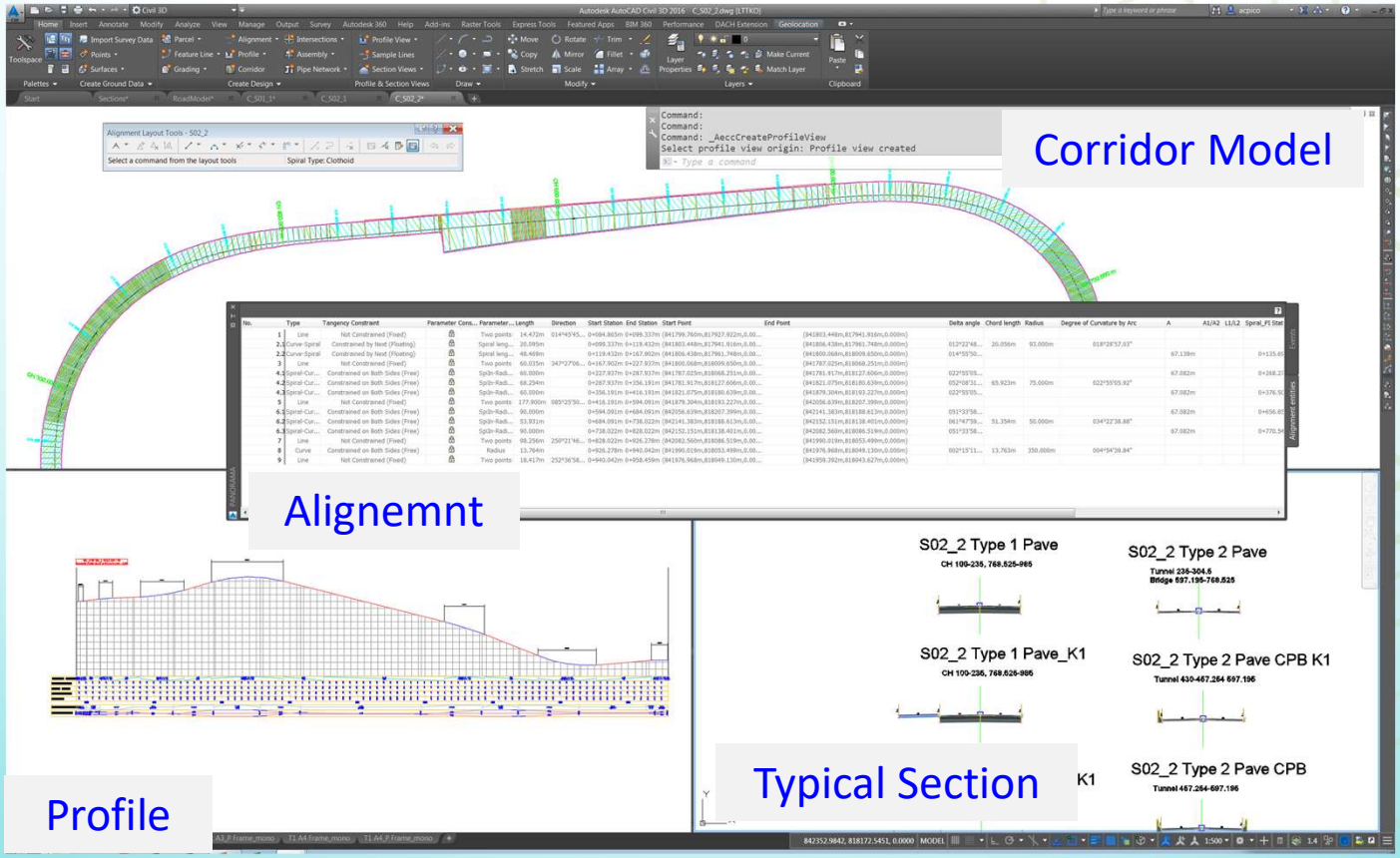
Typical Section

Corridor Model

19. Modelling Methodology : Road Model

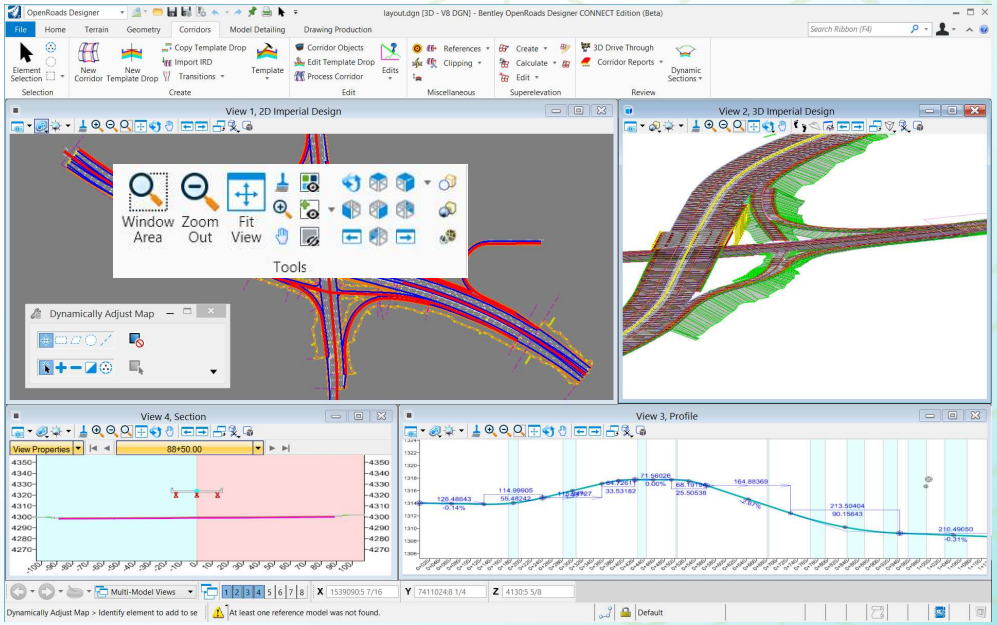
ID	Terminology	Autodesk Civil 3D	Format	Bentley Open Road	Format	Exchange Format
1	Road Model	Corridor	DWG	Corridor	DGN	N/A
2	Centre Alignment	Hz. Alignment	DWG/XML	Hz Geometry	DGN/ALG	XML
3	Vertical Alignment	Profile	DWG/XML	Vr Geometry	DGN/ALG	XML
4	Existing Terrain	Surface	DWG/XML	Surface	DGN/DTM	XML
5	Typical Section	Assembly	DWG	Template	ITL	N/A
6	Road Components	Sub-assembly	PKT	Features	ITL	N/A
7	Create Edit Road Library/Component	Sub-assembly composer	PKT	Components Editor	ITL	N/A
8	Kerb Alignment	Alignment / Feature Line	DWG	Line	DGN	XML/DXF

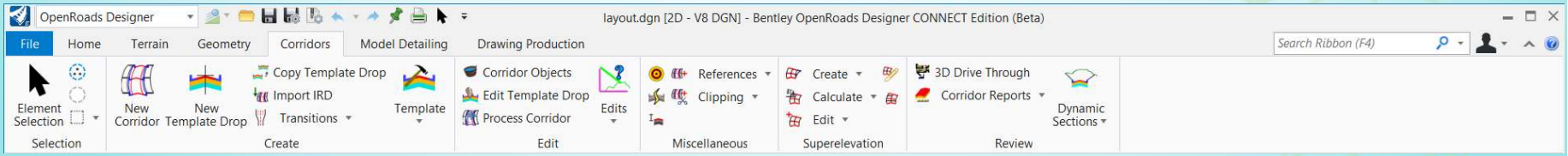
20. C3D Road Modeling



21. OpenRoads Designer

- Survey
- Terrain Modelling
- Geometry (H & V)
- Corridor Modelling
- Dynamic Cross Sections
- Design Intent
- Civil Cells
- Design-Time Visualization

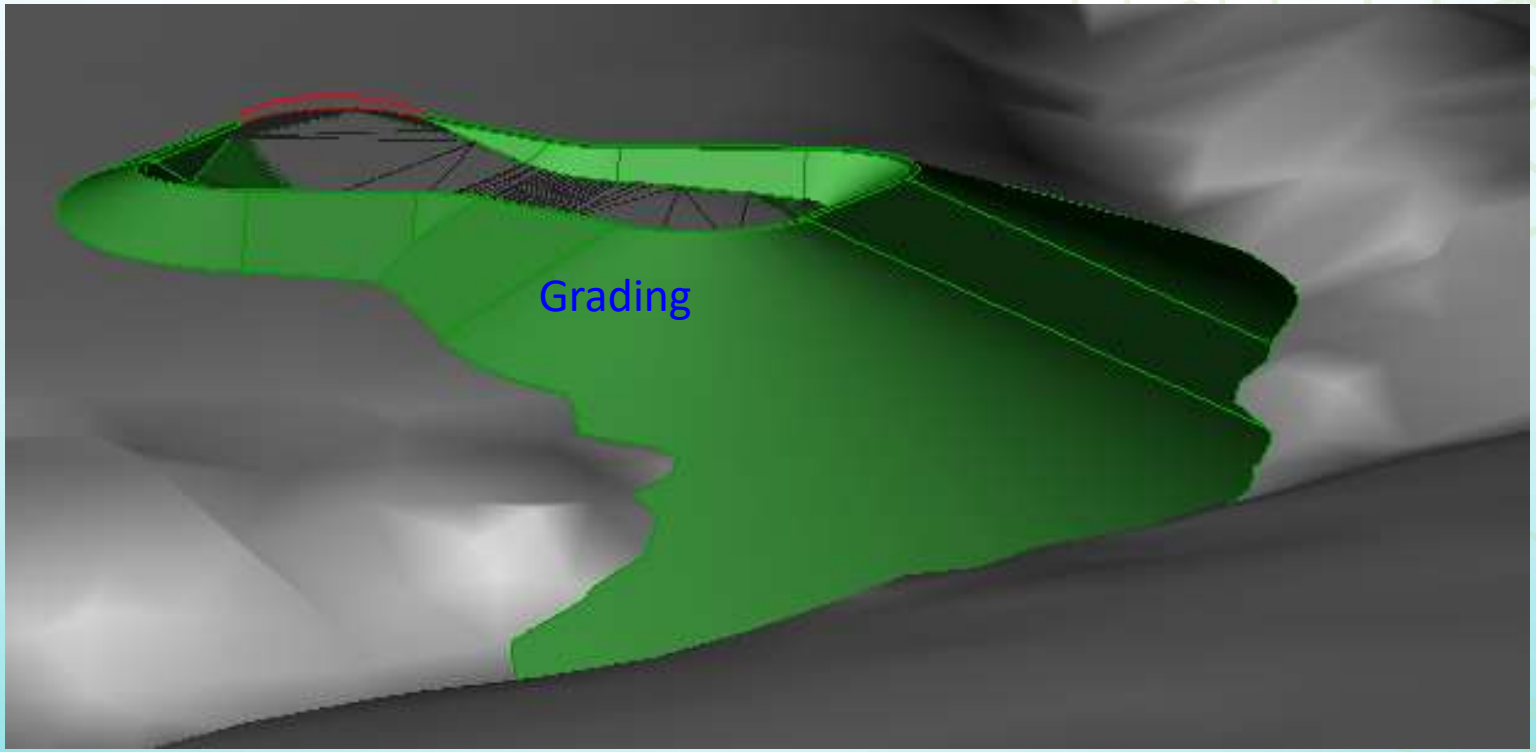




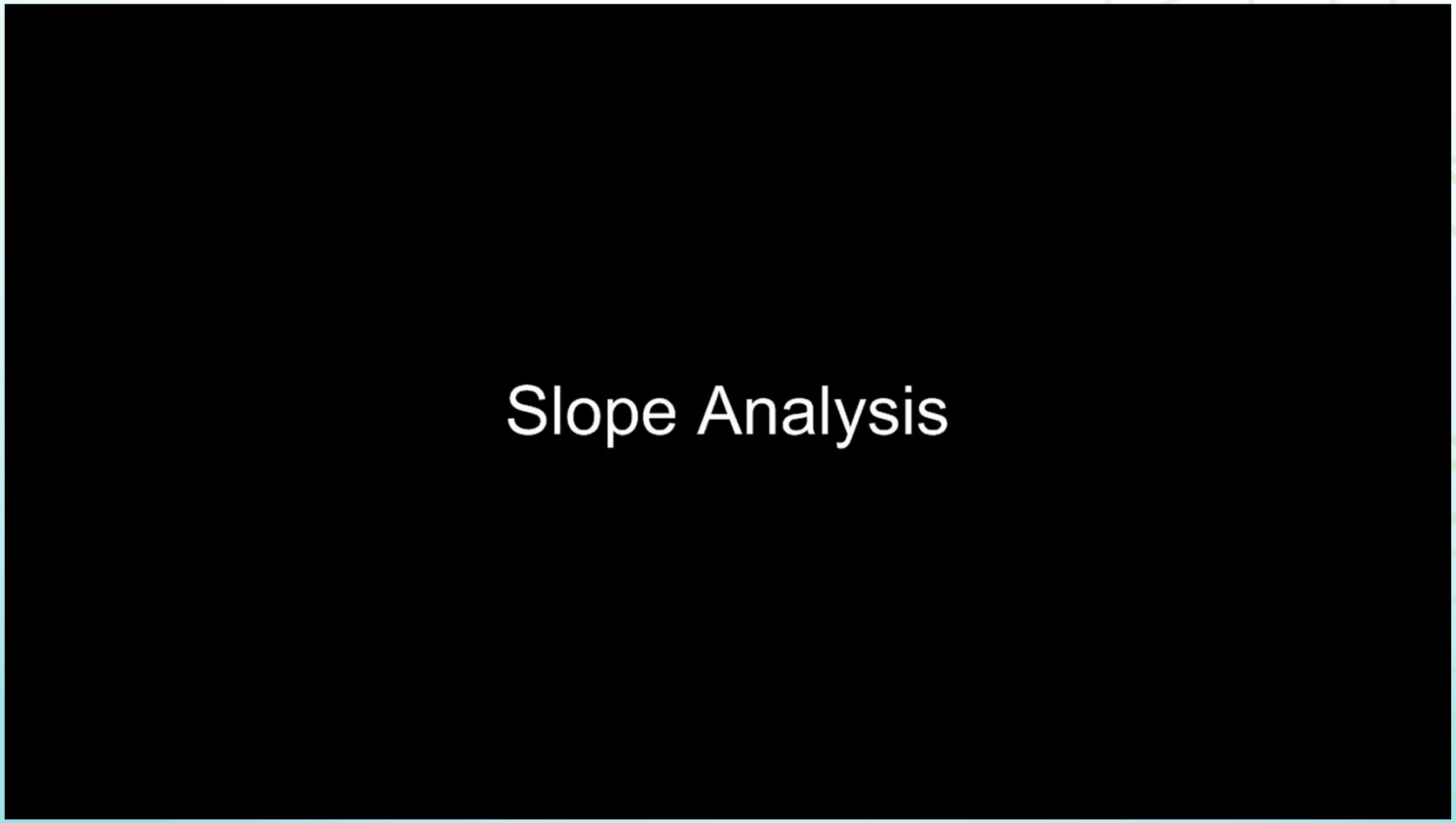
Road Modelling Demo

22. Create Parametric Road Model

Surface/DTM Model



23. Modelling Methodology : Site Formation

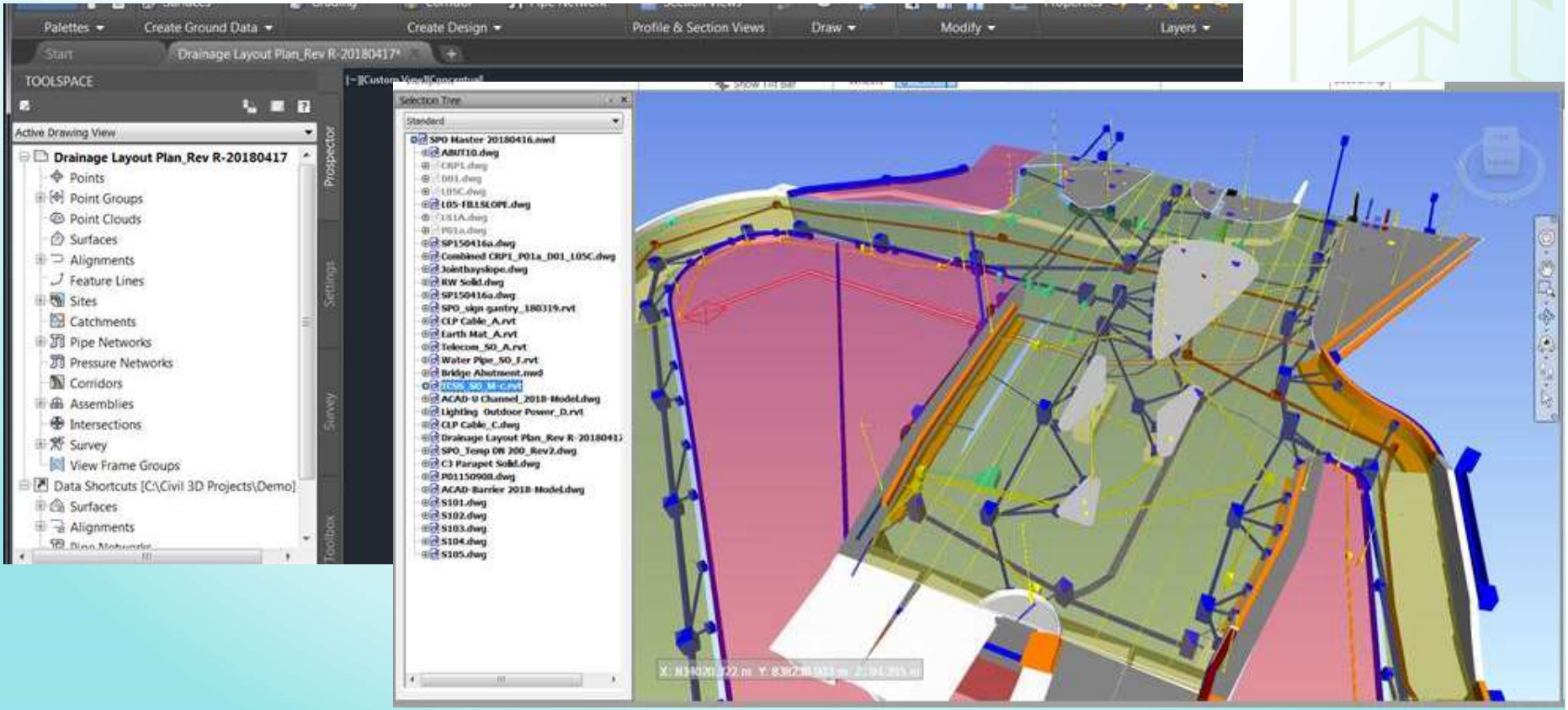


24. Modelling Methodology : Site Model

ID	Terminology	Autodesk Civil 3D	Format	Bentley Open Road	Format	Exchange Format
1	Site formation/Slope	Grading	DWG/XML	3D Slope	DGN/DTM	XML
2	Existing Terrain	Surface	DWG/XML	Terrain	DGN/DTM	XML
3	Building Foot print	Feature Line	DWG	Geometry Tool	DGN	XML
3	Strata/ Sub-surface	Surface	DWG/XML	Terrain	DGN/DTM	XML
4	Bore hole	(Geotechnical Extension)	DWG	(GINT)	DGN	AGS/XML

Site formation Modelling Demo

25. Modelling Methodology : Utilities Model

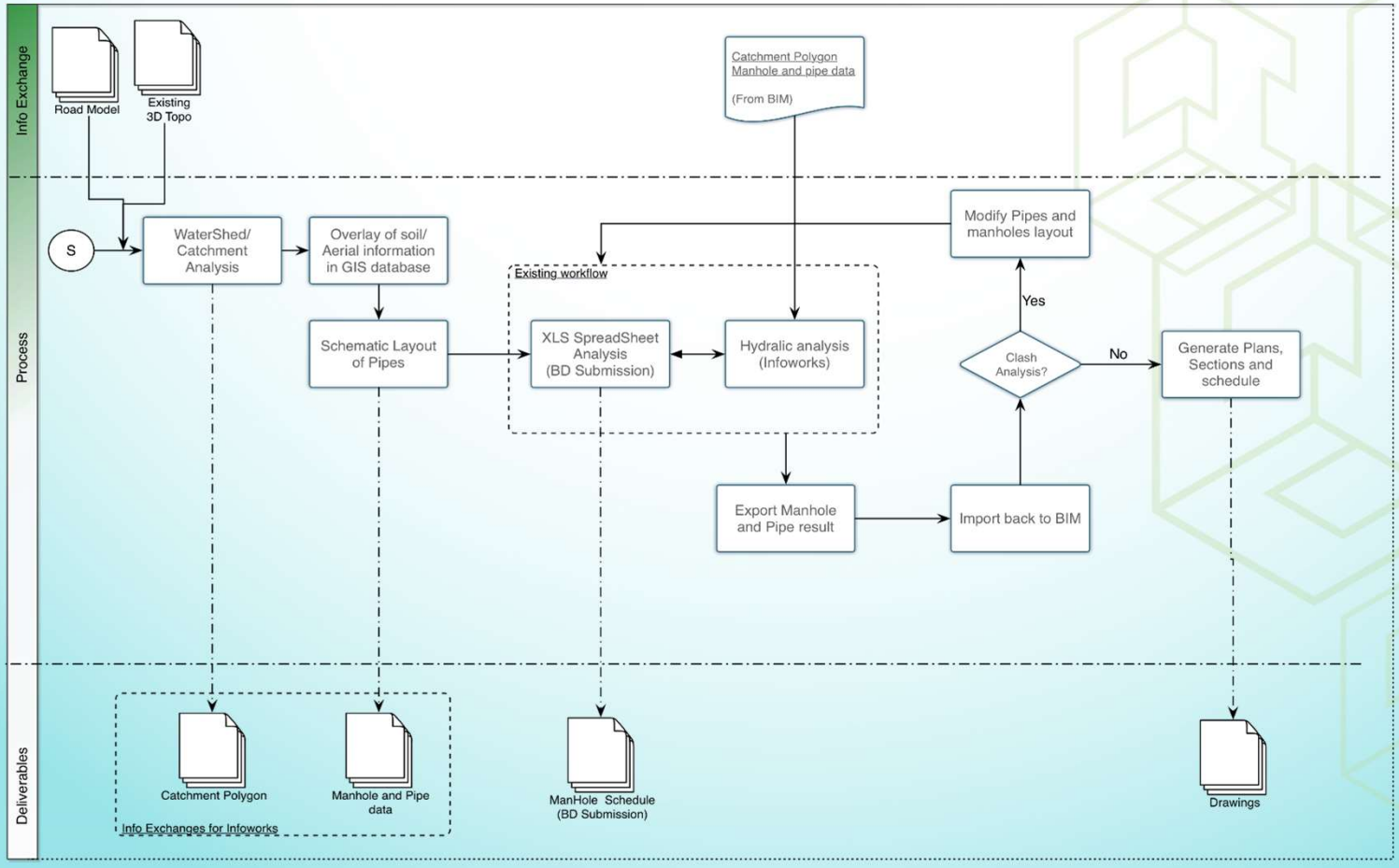


26. Modelling Methodology : Underground Utilities

ID	Terminology	Autodesk	Format	Bentley	Format	Exchange Format
1	Storm Drain/PVC/DI Pipes	C3D: Pipe Network	DWG	SSU: Pipes	DGN	XML
2	Pressure Pipe	C3D: Pressure pipe	DWG	SSU: Pipes	DGN	XML
3	Manholes	C3D: Structures	DWG	SSU: Cells	DGN	N/A
4	Valve, Bend, Fittings	C3D: Fittings	DWG	SSU: Cells	DGN	N/A

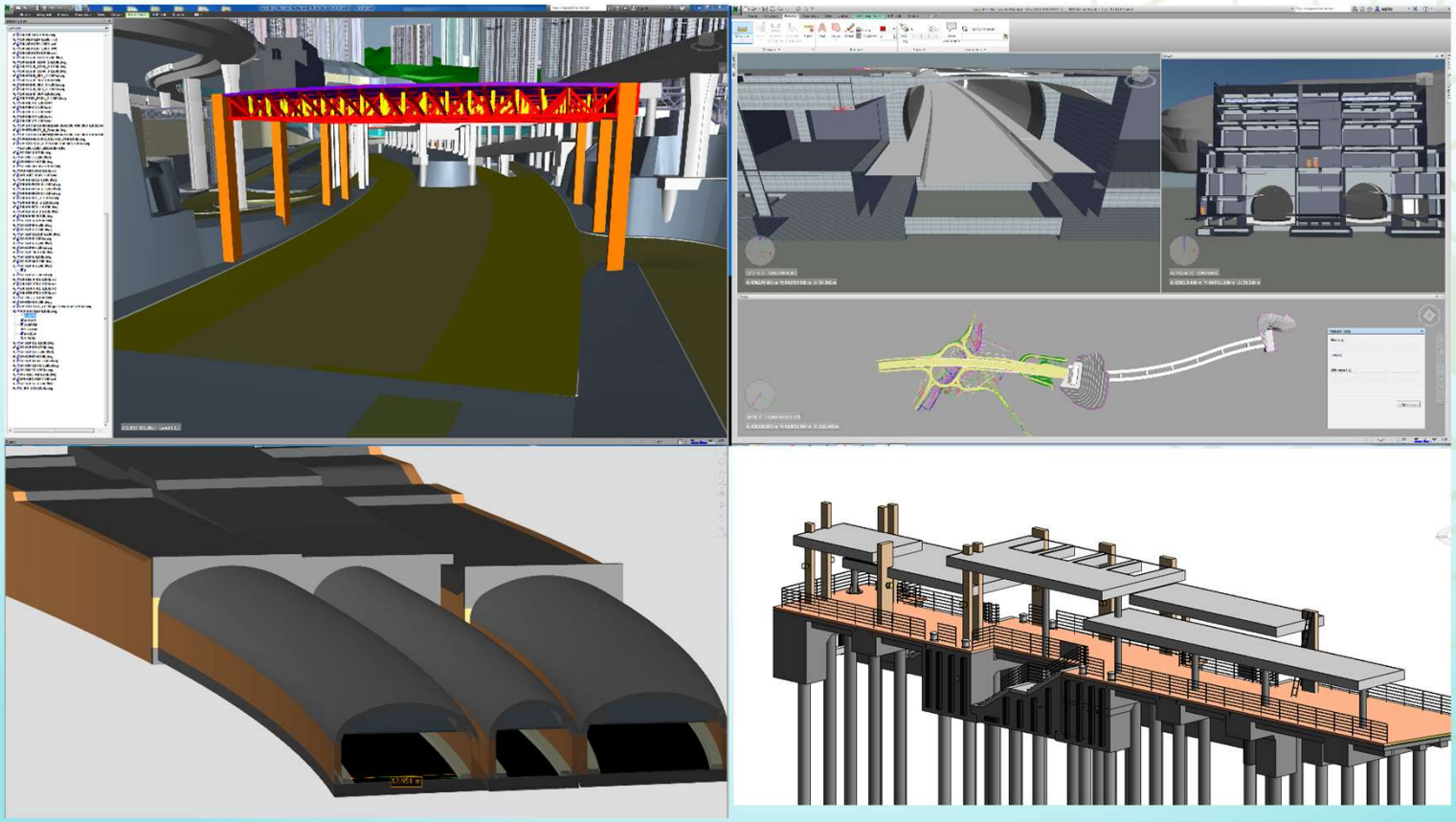
- Utilities could be modelled in C3D/SSU or Revit/AECOSim
- Key Consideration
  - Interfaces with Terrain
  - Storm drainage analysis

27. Strom Drain Analysis



Storm Drain Modelling Demo

28. Modelling Methodology : Structural Model

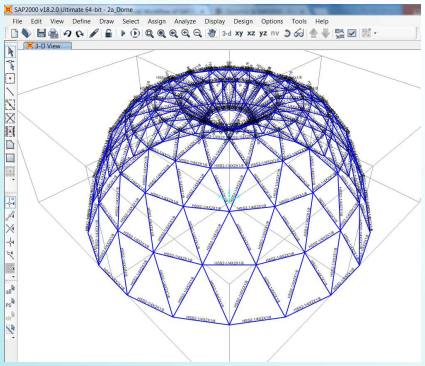


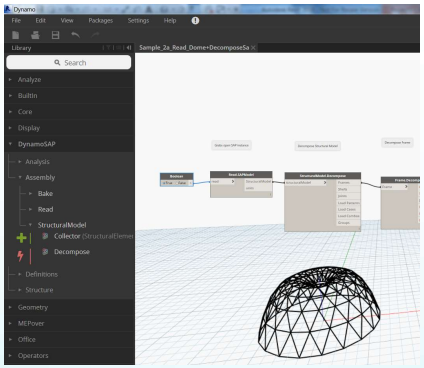
29. Modelling Methodology : Structural Models

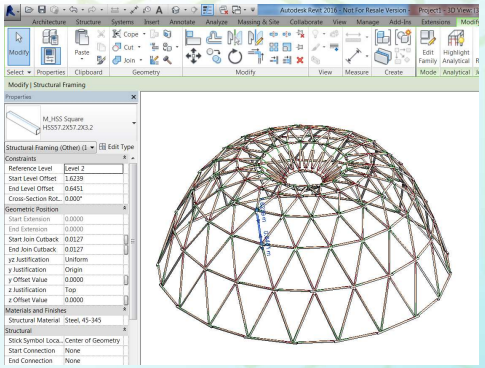
ID	Terminology	Autodesk	Format	Bentley	Format	Exchange Format
1	Beam, Column, Slab…	RVT: Structural Framing	DWG	ABD: Structural Element	DGN	XML
2	Pile, Pile Cap..	RVT: Structural Foundation	DWG	ABD: Structural Element	DGN	XML
3	Bridge Piers	RVT: Generic model	DWG	ABD: Generic model	DGN	N/A
4	Bridge Segments	C3D: Corridor	DWG	OBM : Deck	DGN	N/A
5	Tunnel Lining	C3D: Corridor	DWG	ORD: Corridor	DGN	N/A
6	Retaining Wall	C3D: Corridor	DWG	ORD: Corridor	DGN	N/A

30. Integrate Structural Analysis

SAP2000 → Dynamo → Revit

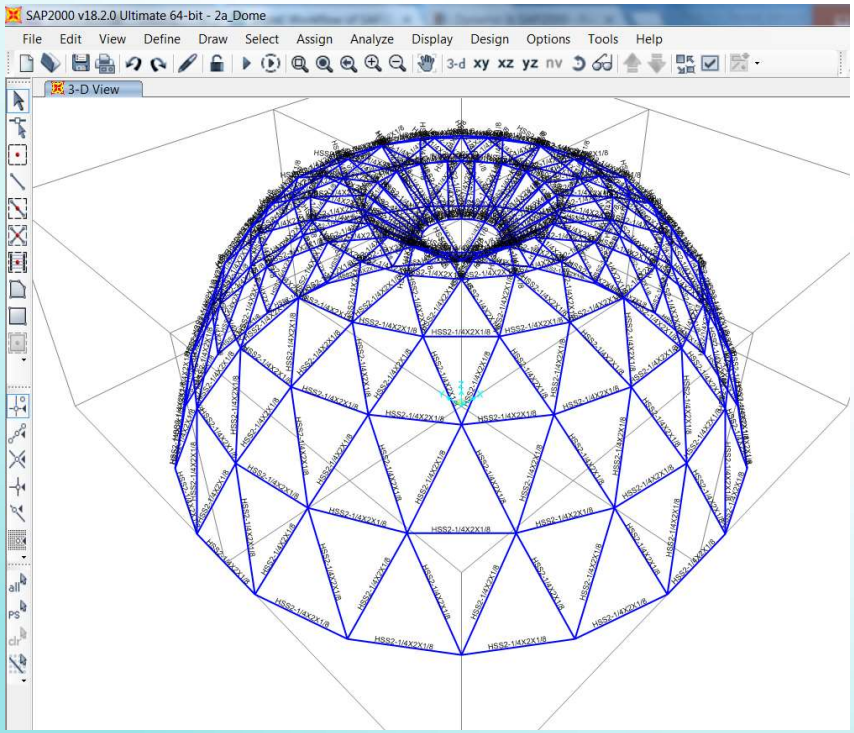




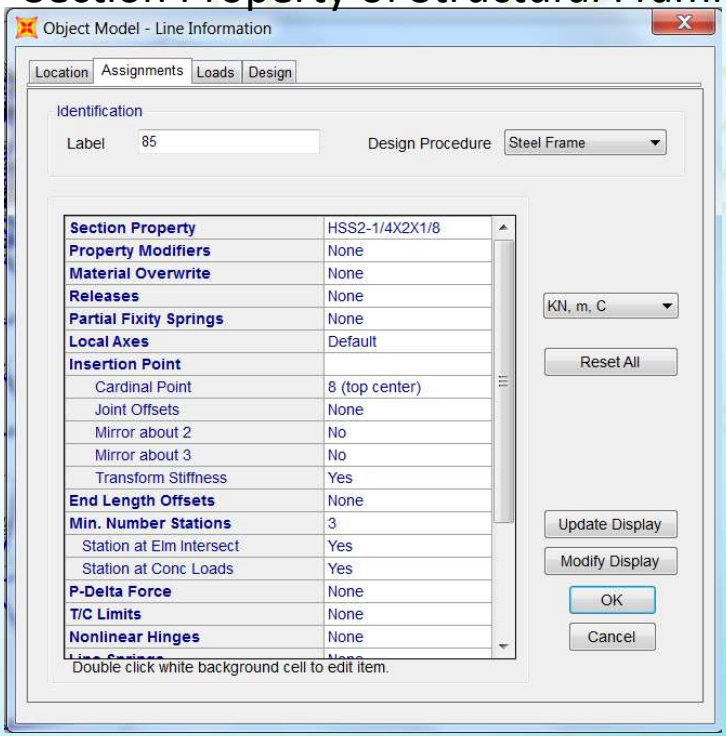


31. SAP2000

Model in SAP2000

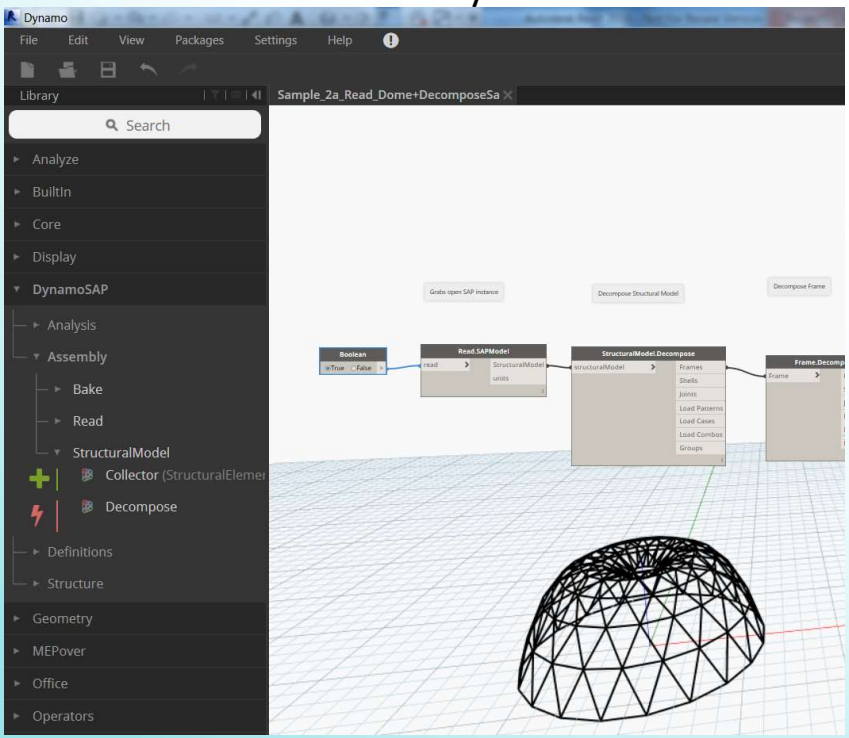


Section Property of Structural Framing

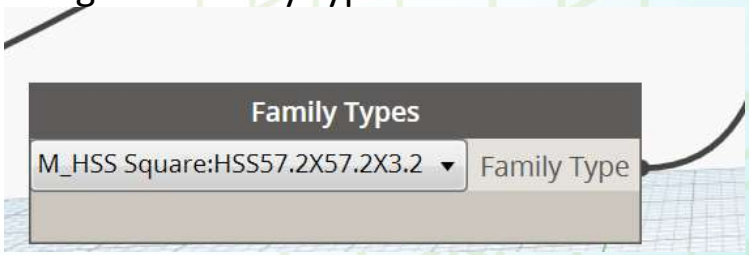


32. Dynamo

Load SAP 2000 Model in Dynamo

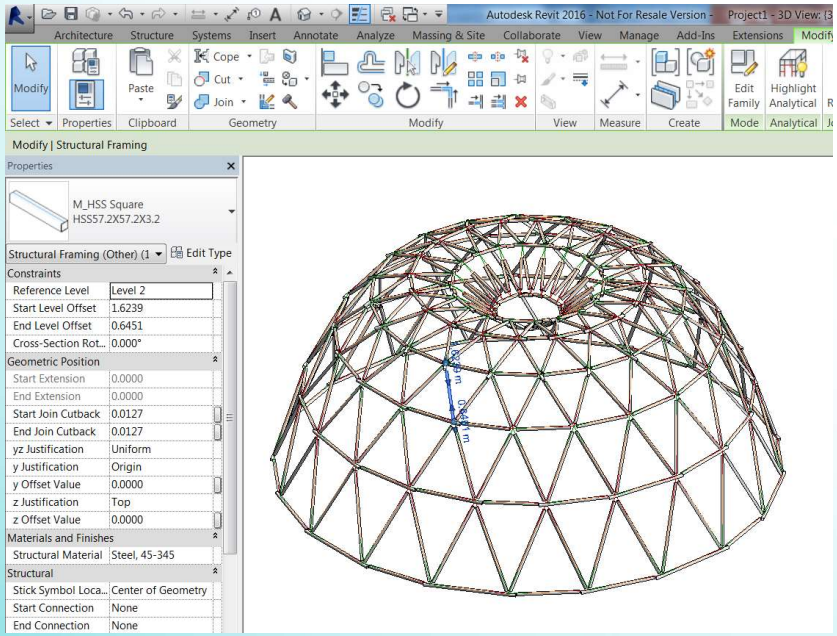


Assign the family type to member

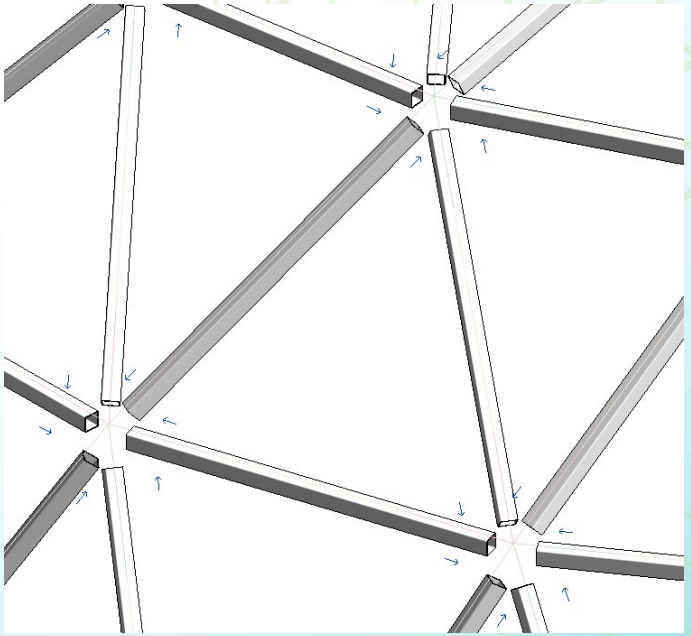


33. Revit

Regenerate Framing Model by Dynamo



Adjust Further Structural Connection Detail



34. Format and Software

	C3D	RVT	ORD	ABD	Open Format	Shared Format	Related Tools
Alignment-based Road Model	Y		Y		IFC	XML	
Topography-related Site formation Model	Y		Y			XML	
Strata Models (Plugins)	GEO		GINT			XML	HolebaseSI
Utilities Model	Y	Y	SSU	Y	IFC	XML	
Bridge Segment Model	Y		OBD		IFC		
Bridge Substructure/Superstructure		G		G	IFC		
Tunnel Model	Y				IFC		Sub Assem composer
Retaining Wall Model	Y	G	Y	G	IFC		
4DMS						MP4	NWD/ Sychro
Drawings/Site Sketches	*	*	*	*	DXF	PDF	
3DVR						EXE	3DS/LRT
Asset Information (COBie)		Y		Y		COBIE	

- IFC 4.0
  - Latest Version support ALG
  - XML-based Text file
- COBie
  - BIM/FM Standard
  - PAS 1192-4
  - XLS file 13 tables
- XML
  - Terrain and alignments
  - XML-base Text files

Y - Default Function
G– Generic Solid
GEO – Geotechnical Module
GINT – GINT Module
SSU: SubSurface Utilities
OBD: OpenBridge Designer
3DS: 3Ds Max
LDT: LumenRT

35. Project Execution – Quality Audit

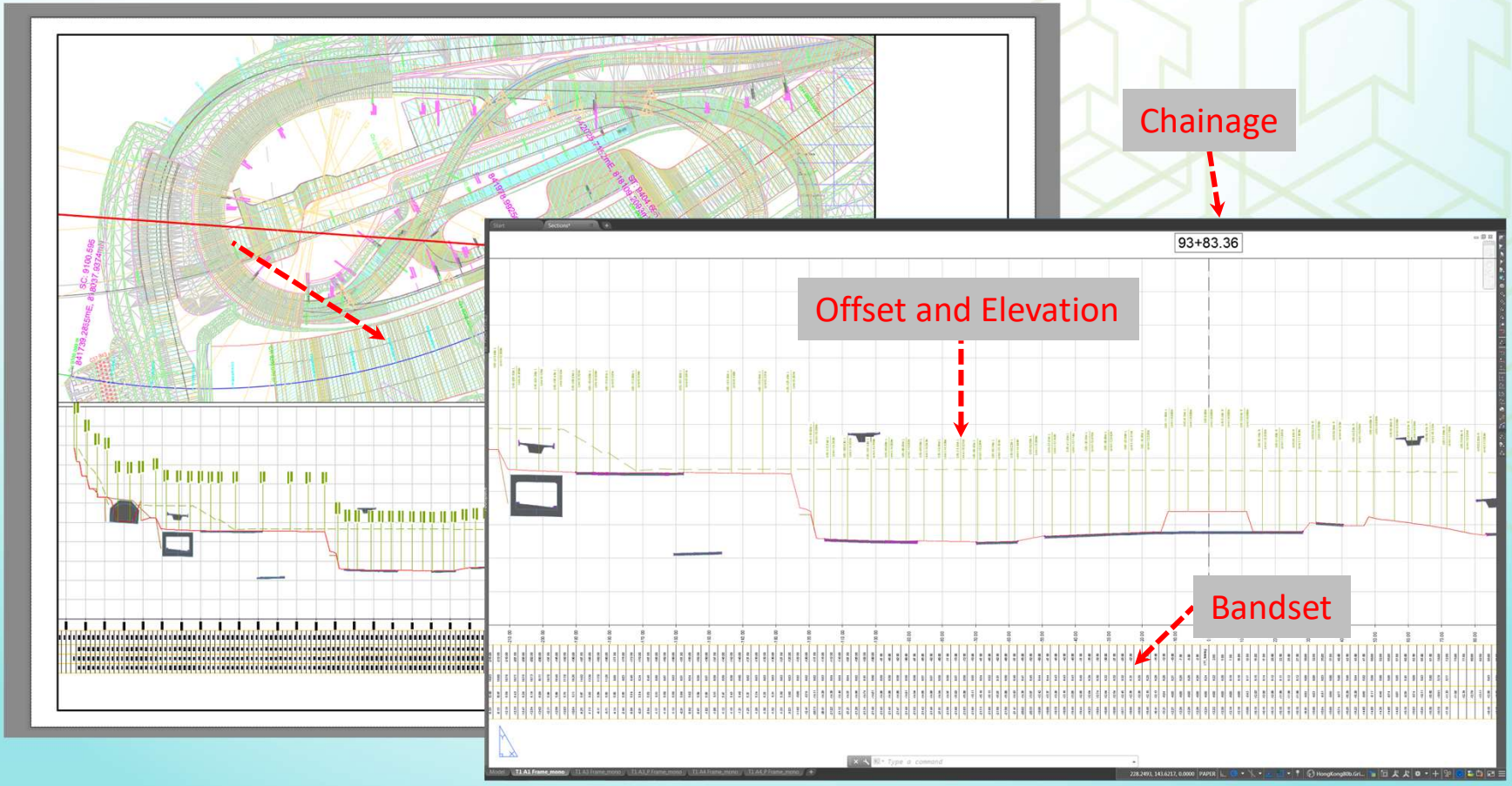
36. QA/QC Process

- Design Standard
  - TPDM
- Modelling Standard
  - Type and Category
- Geometry Accuracy
  - Location, Size, dimension
- Information Completeness

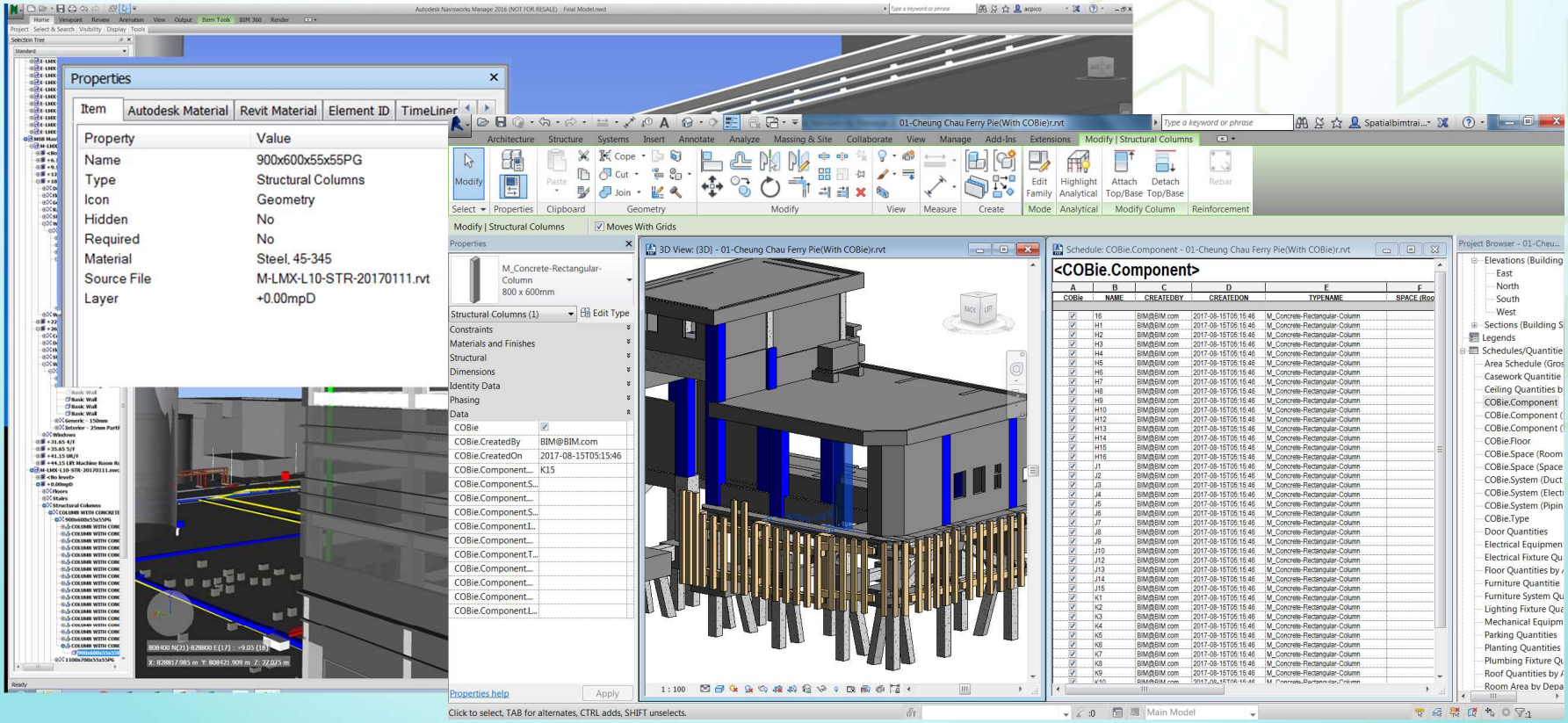
37. BIM Quality check/Quality report

	Visual Inspection	Software Aided	Others
Design Standard	N/A	Design Constraints	Revision Mgt
Modelling Standard	Yes	N/A	Random Checks
CAD Standard	Yes	N/A	Version Mgt
Interference check	Yes	Clash Detection	Revision Mgt
Geometry Accuracy	Overlaid	Sections and Annotation	Point Cloud Overlaid
Information Completeness	Yes	Schedules	Onsite Inspection

38. Geometry : BIM Generate Section and Annotation



39. Information : Schedule

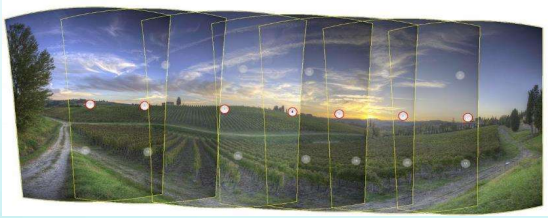


40. As-Built Verification via Laser scanning

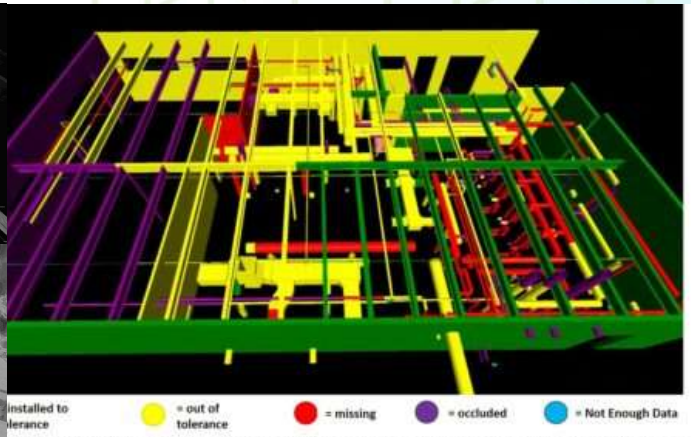
Mobile Scanner

UAV Devices

Point Cloud

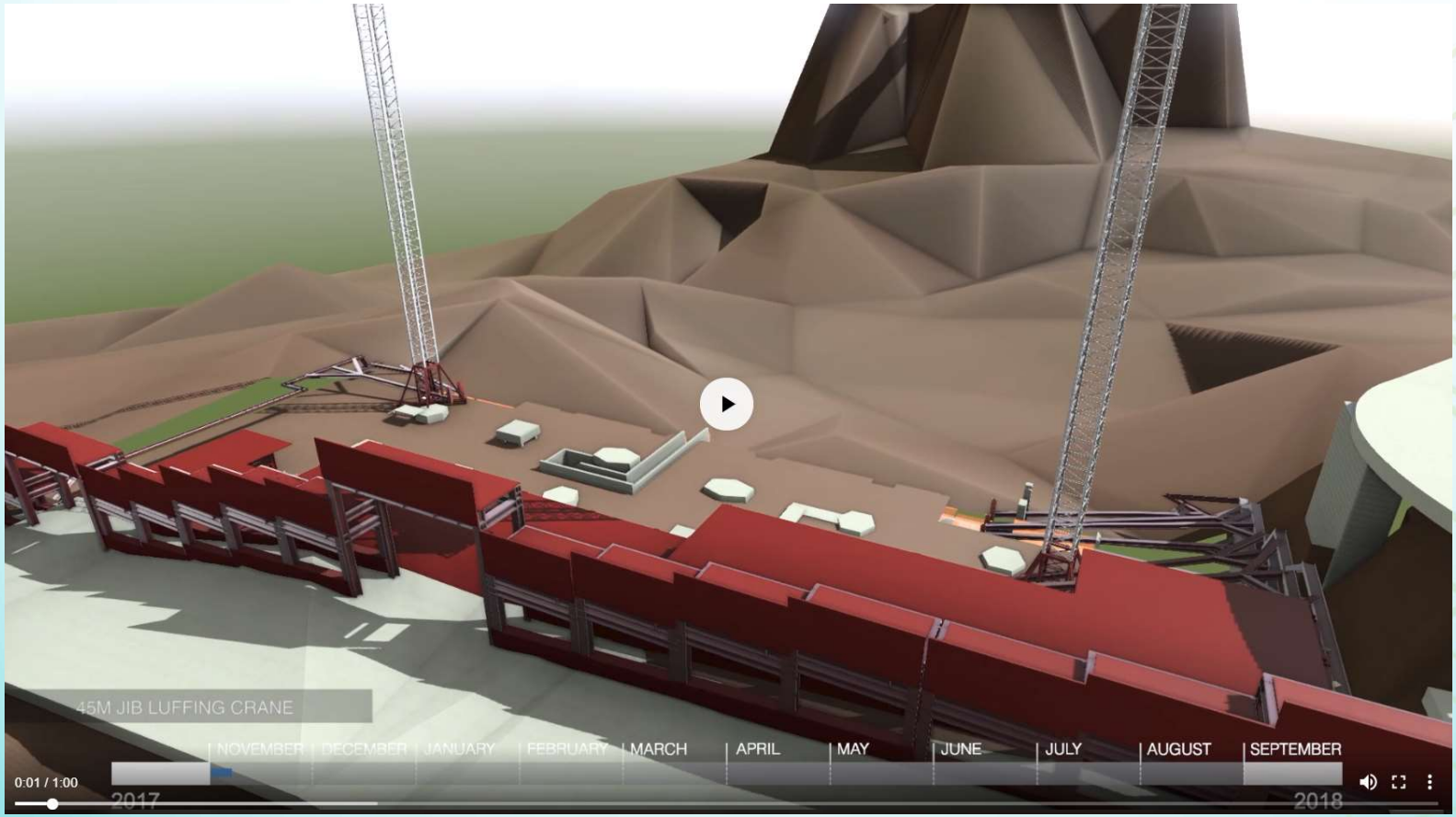


Verification



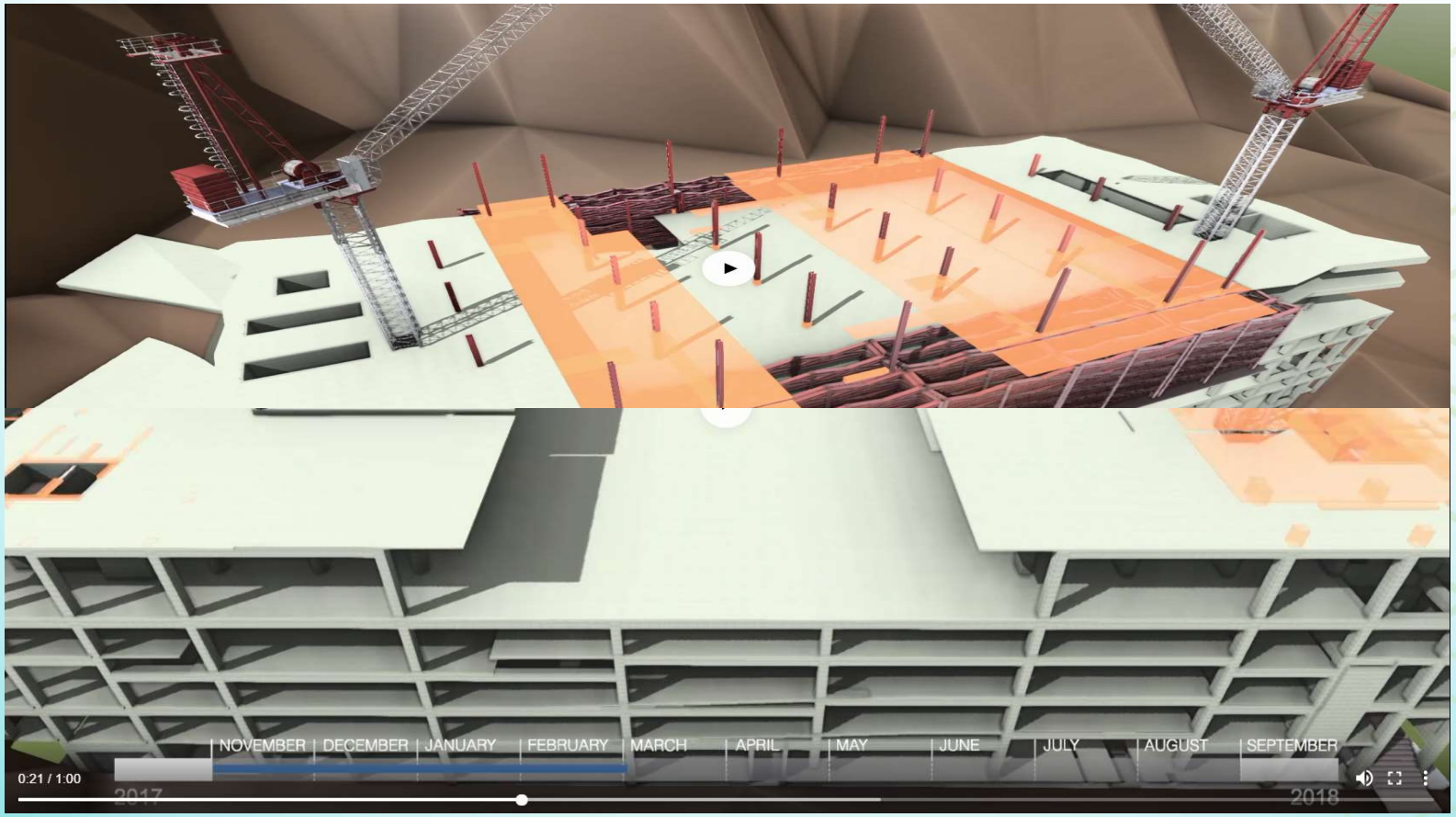
's "stop light" variance classification gives you a quick overview of construction quality

41. Construction 4D



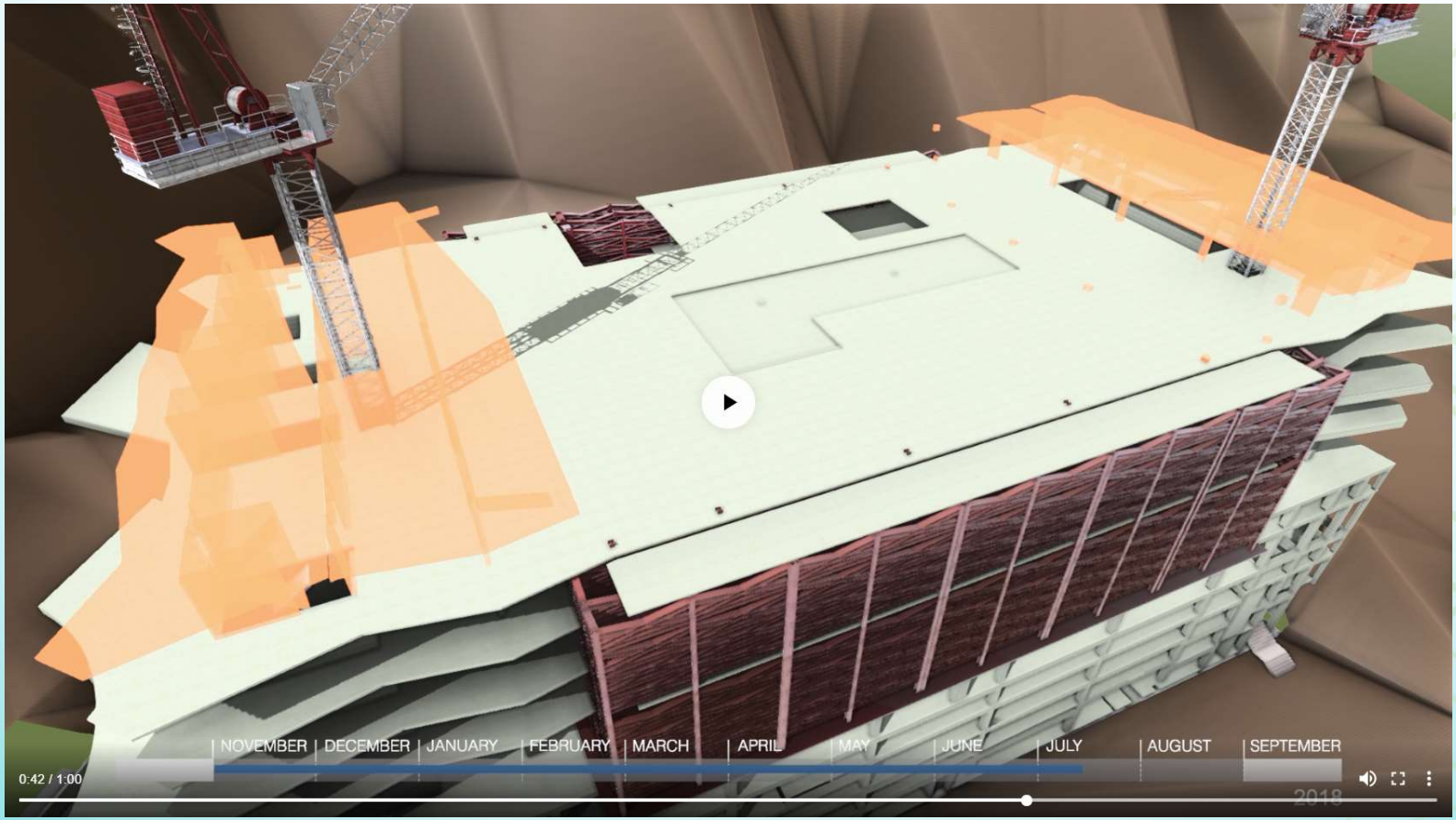
- Simulate the construction sequence with time arrangement
- Construction site transportation can be shown before commencement of site works
- Temporary works can be simulated

42. Construction 4D



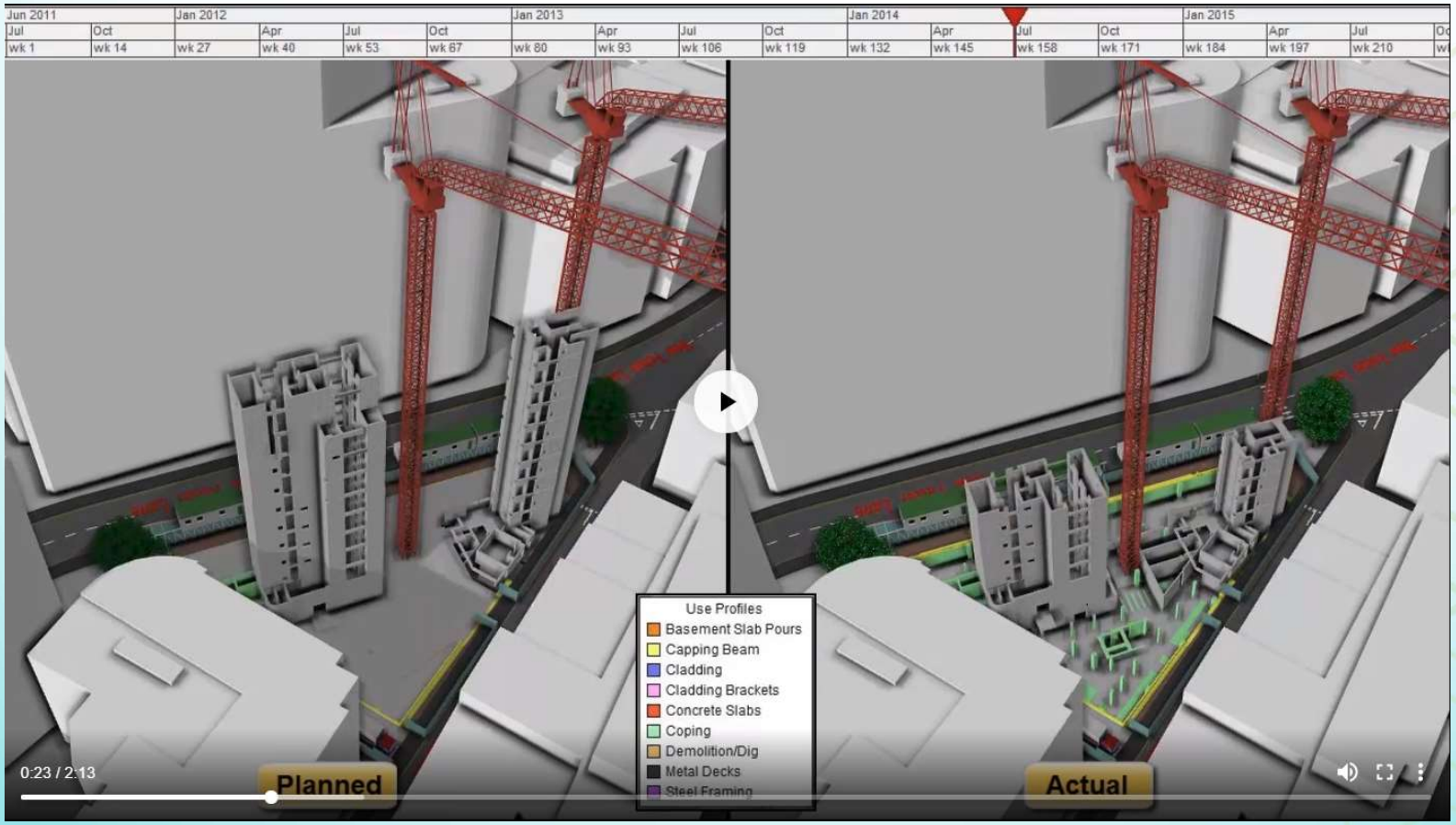
- Simulate the construction sequence with time arrangement
- Construction site transportation can be shown before commencement of site works
- Temporary works can be simulated

43. Construction 4D



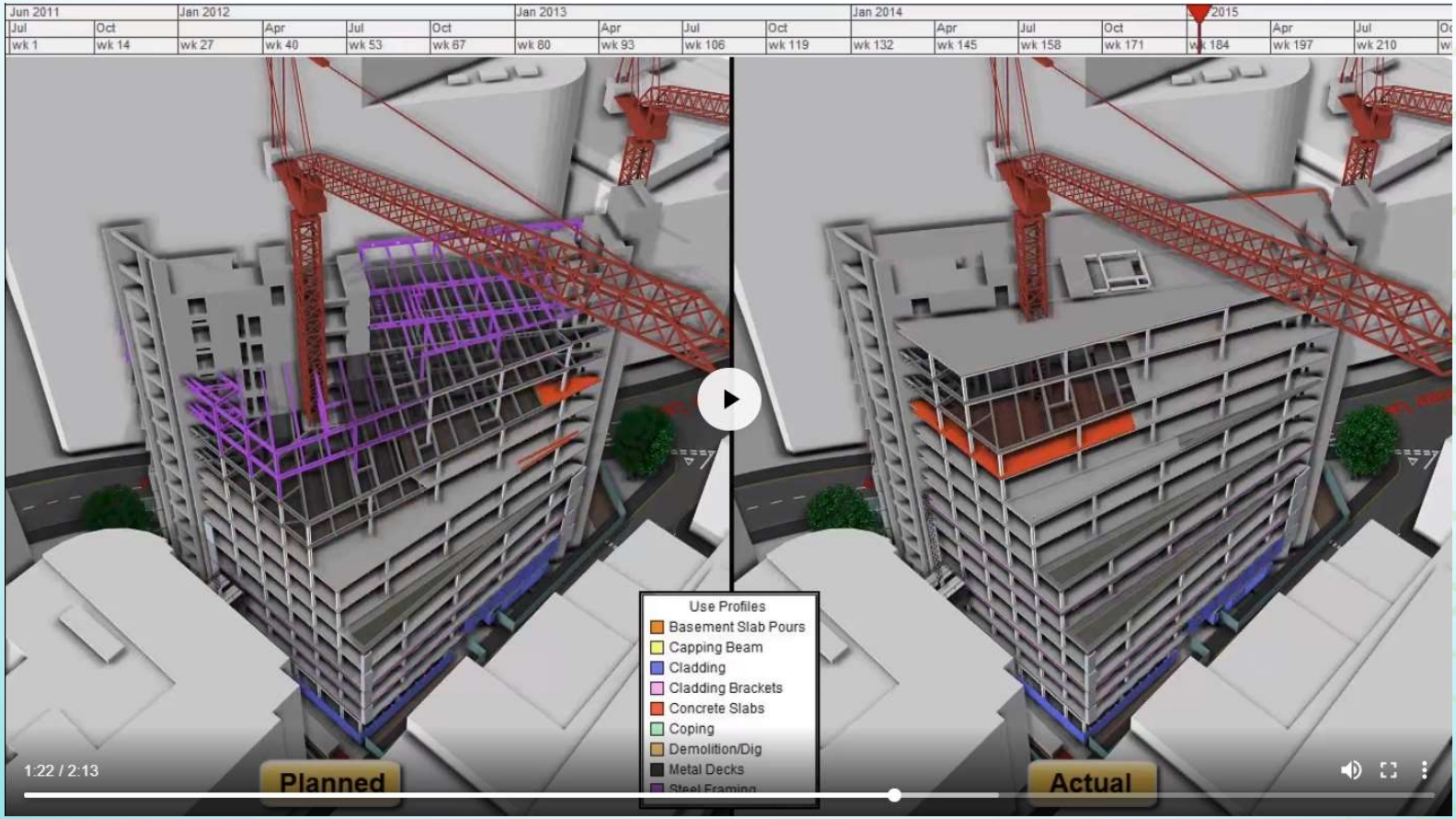
- Simulate the construction sequence with time arrangement
- Construction site transportation can be shown before commencement of site works
- Temporary works can be simulated

44. Construction 4D



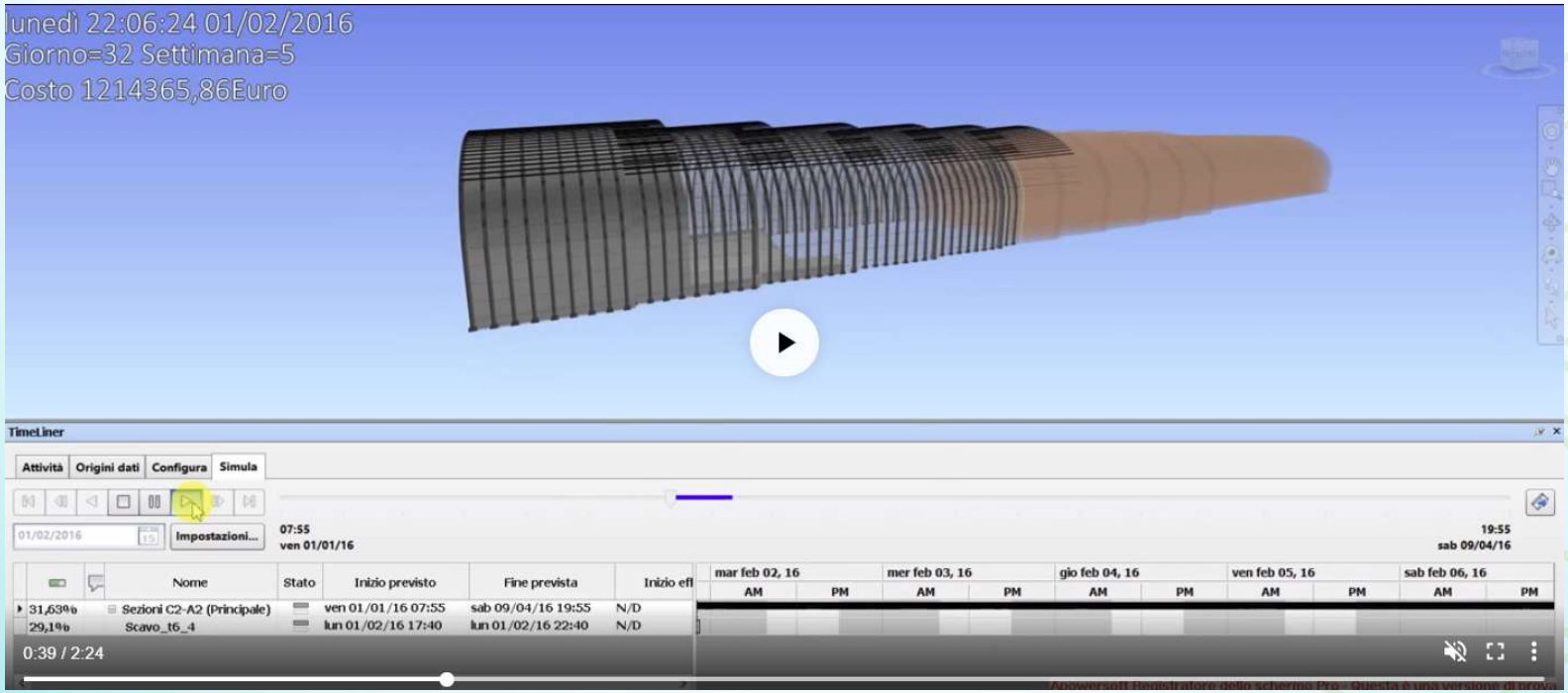
- The Simulation can be used as a supervision tool for supervise the construction progress
- Construction progress on site to be recorded by Clerk of Works day to day

45. Construction 4D



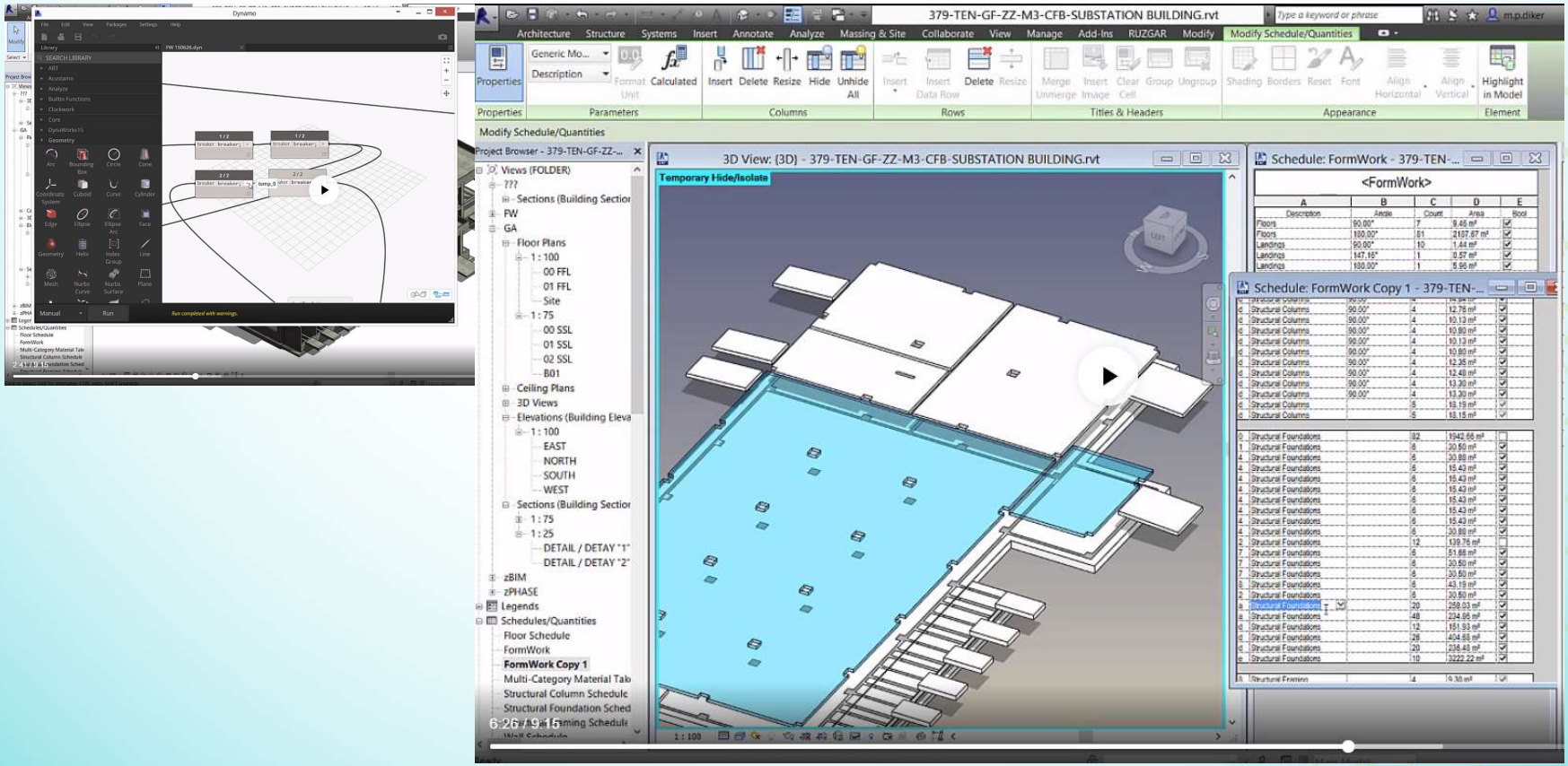
- The Simulation can be used as a supervision tool for supervise the construction progress
- Construction progress on site to be recorded by Clerk of Works day to day

46. Construction 4D / 5D



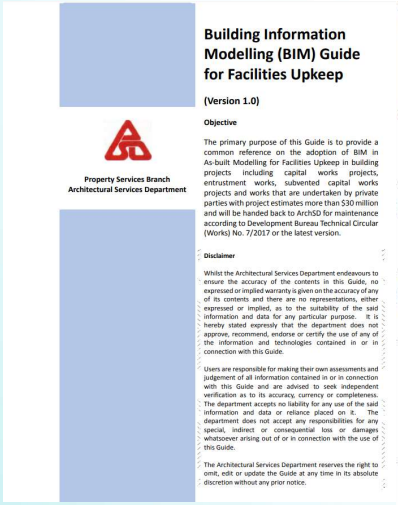
- The information in BIM can be contributed into 5D in cost control aspect
- Information extract from BIM can only consider as Raw Data only
- Raw data need further edit and analyze by QS

47. Construction 4D / 5D



- E.g. Formwork of RC Works cannot be calculated directly
- Further edit by Dynamo can be used for modelling the formwork
- Information of RC formwork can be quantified for QS

48. Construction 4D and FM



Building Information Modelling (BIM) Guide for Facilities Upkeep

(Version 1.0)

Objective

The primary purpose of this Guide is to provide a common reference on the adoption of BIM in As-built Modelling for Facilities Upkeep in building projects including capital works projects, entrustment works, subvented capital works projects and works that are undertaken by private parties with project estimates more than $30 million and will be handed back to ArchSD for maintenance according to Development Bureau Technical Circular (Works) No. 7/2017 or the latest version.

Disclaimer

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Users are responsible for making their own assessments and judgement of all information contained in or in connection with this Guide and are advised to seek independent verification as to its accuracy, currency or completeness. The department accepts no liability for any use of the said information and data or reliance placed on it. The department does not accept any responsibilities for any special, indirect or consequential loss or damages whatsoever arising out of or in connection with the use of this Guide.

The Architectural Services Department reserves the right to omit, edit or update the Guide at any time in its absolute discretion without any prior notice.

Property Services Branch
Architectural Services Department

Item	Element	Graphic Model Element *Level of Development (LOD)*	Non-graphic information *Level of Development (LOD)*	3D Animation	BIM Object from original manufacturer	Photo record *(other than 360° photos)*	Other Modelling Requirements	Other Supporting Information
6.3	Acoustic door, panel, fixtures	350	500	×	✓ (if available)	✓	1) Showing fixing details including all accessories, ironmongeries, etc.	1) Ditto (to Item 6.1). 2) Warranty and certificate. 3) Specification of the acoustic properties.
7.0	**Ironmongery**							
7.1	Elements under this trade	350	500	×	✓ (if available)	×		1) Brand name and model information. 2) Technical literature. 3) O&M manual.
8.0	**Steel and Metal Work**							
8.1	Elements under this trade (unless otherwise specified below)	350	500	×	✓ (if available)	×		1) Brand name and model information. 2) Technical literature.
8.2	Fall arrest system	350	500	×	✓ (if available)	×		1) Ditto (to Item 8.1). 2) Contractor / Specialist Contractor information. 3) O&M manual. 4) Particular specification for examination, testing and operation training.
8.3	Steel sheet / composite aluminium cladding	350	500	×	✓ (if available)	✓	1) Showing fixing details including joints, supporting frames, insulation layer, etc.	1) Ditto (to Item 8.1). 2) Contractor / Specialist Contractor information. 3) Guarantee and warranty. 4) O&M manual.
8.4	Proprietary shutter, swing and sliding door	350	500	×	✓ (if available)	✓	1) Showing fixing details including joints, supporting frames, rail / track, etc.	1) Ditto (to Item 8.1). 2) Contractor / Specialist Contractor information. 3) Guarantee and warranty. 4) O&M manual.
8.5	Aluminium windows and doors	350	500	×	✓ (if available)	×		1) Ditto (to Item 8.1).
9.0	**Plastering and Finishes**							
9.1	Elements under this trade (unless otherwise specified below)	350	500	×	✓ (if available)	×		1) Brand name and model information. 2) Technical literature.

Property Services Branch, ArchSD
BIM Guide for Facilities Upkeep (Version 1.0)
Page 19
First Issue Date – June 2018
Current Issue Date – June 2018

- Guideline for BIM to Facility Management upkeeping
- The Standard of Naming Component to be confirmed by BIM Manager
- Facility Management team can use the information to maintain the continue of upkeeping by the benefit of BIM input

49. Construction 4D and FM

香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

政府總部
發展局
工務科

Works Branch
Development Bureau
Government Secretariat

Ref : DEVB(W) 430/80/01
Group : 2, 5, 6

1 December 2017

Development Bureau
Technical Circular (Works) No. 7/2017

Adoption of Building Information Modelling
for Capital Works Projects in Hong Kong

Scope

This Circular sets out the policy and requirements on the adoption of Building Information Modelling (BIM) technology.

2. This Circular applies to works either by in-house government staff, consultants or contractors.

Effective Date

3. This Circular takes effect on 1 January 2018.

Effect on Existing Circulars and Circular Memoranda

4. This Circular has no effect on existing circulars.

10	Space Programming	O	O	
11	Phase Planning (4D Modelling)		O	M
12	Digital Fabrication		O	O
13	Site Utilization Planning			O
14	3D Control and Planning			O
15	As-Built Modelling			M
16	Project Systems Analysis			O
17	Maintenance Scheduling			O
18	Space Management and Tracking			O
19	Asset Management			O
20	Drawing Generation (Drawing Production)		M	M

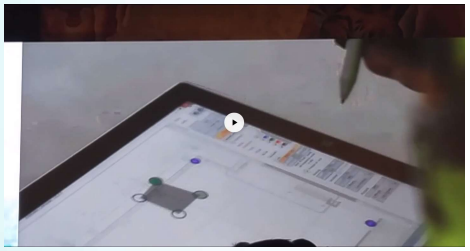
Legend:

M – Mandatory BIM Use for the mentioned stage, including that carried forward from previous stage.

O – Optional BIM Use

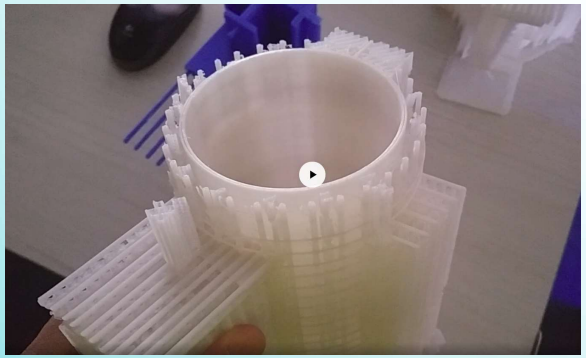
- The 4D Modelling is Mandatory according to Development Bureau circular letter

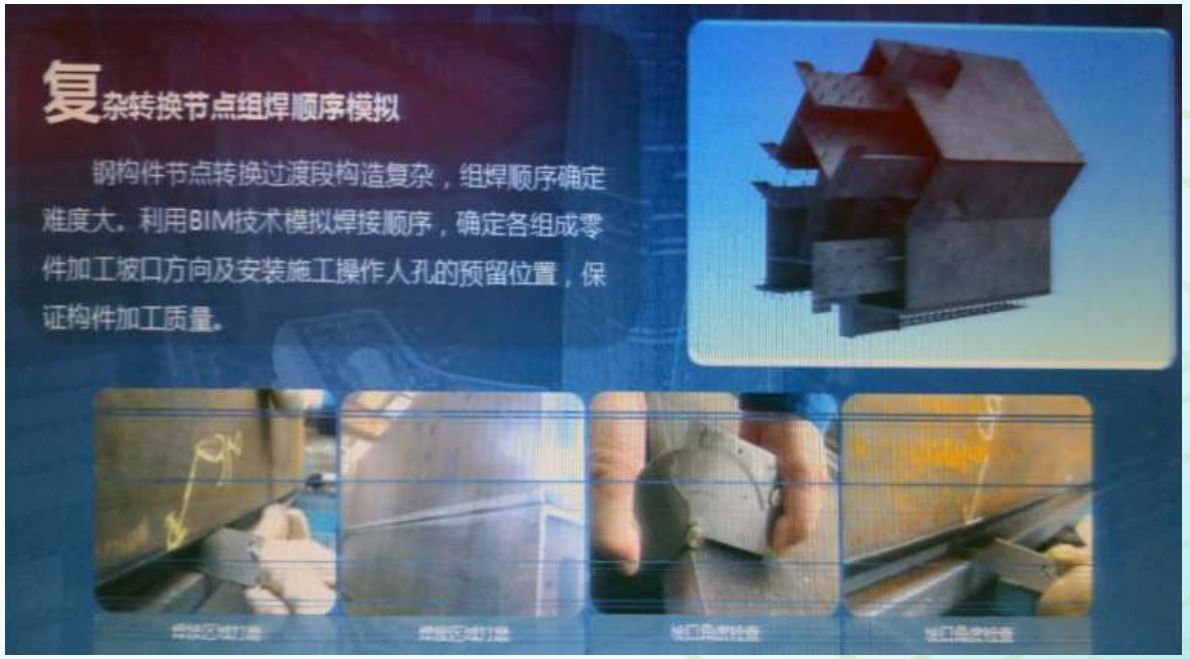
50. BIM for Construction Safety



- Unsafety area can be defined by Site Safety Manager
- Anyone enter unsafety can be detected immediately
- It can contribute the safety control on site during construction

51. BIM for Manufacture Component



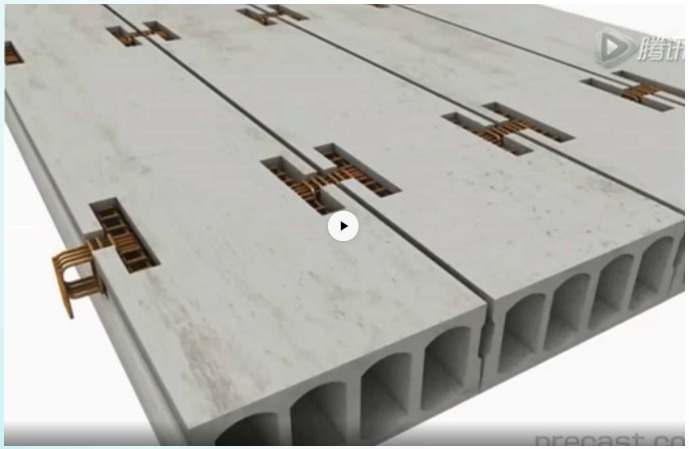


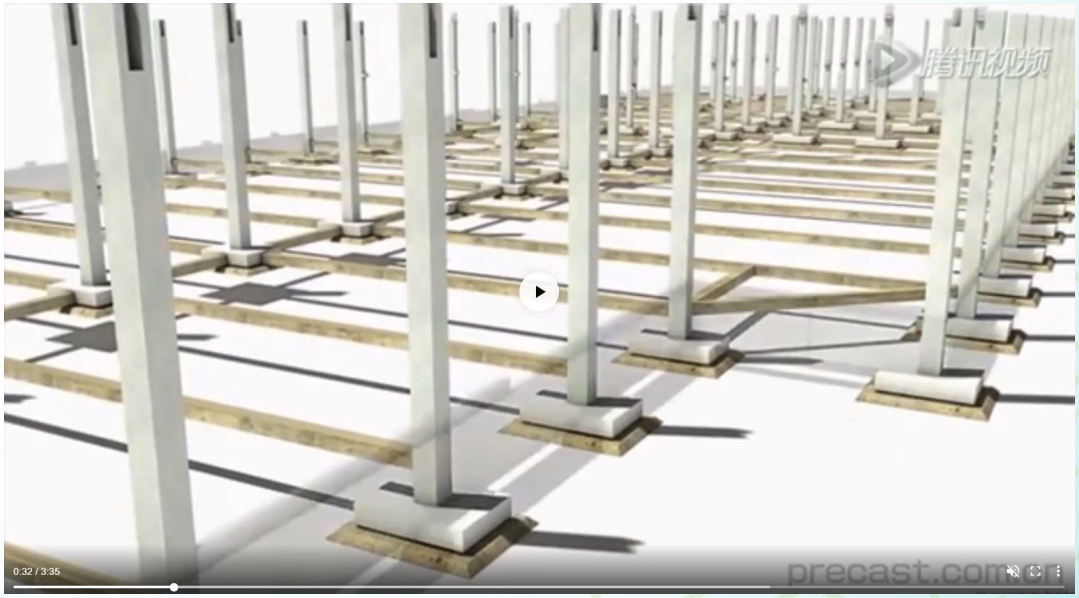
- Complex Structural Joint can be simulated in BIM
- Structural Model in BIM can be 3D printed as a mockup for site coordination
- Manufactured Component can be scanned to compare the tolerance between BIM model and Construction Component

52. BIM in Complex Geometry Construction

- Complex Structural Joint can be simulated in BIM
- Structural Model in BIM can be 3D printed as a mockup for site coordination
- Manufactured Component can be scanned to compare the tolerance between BIM model and Construction Component

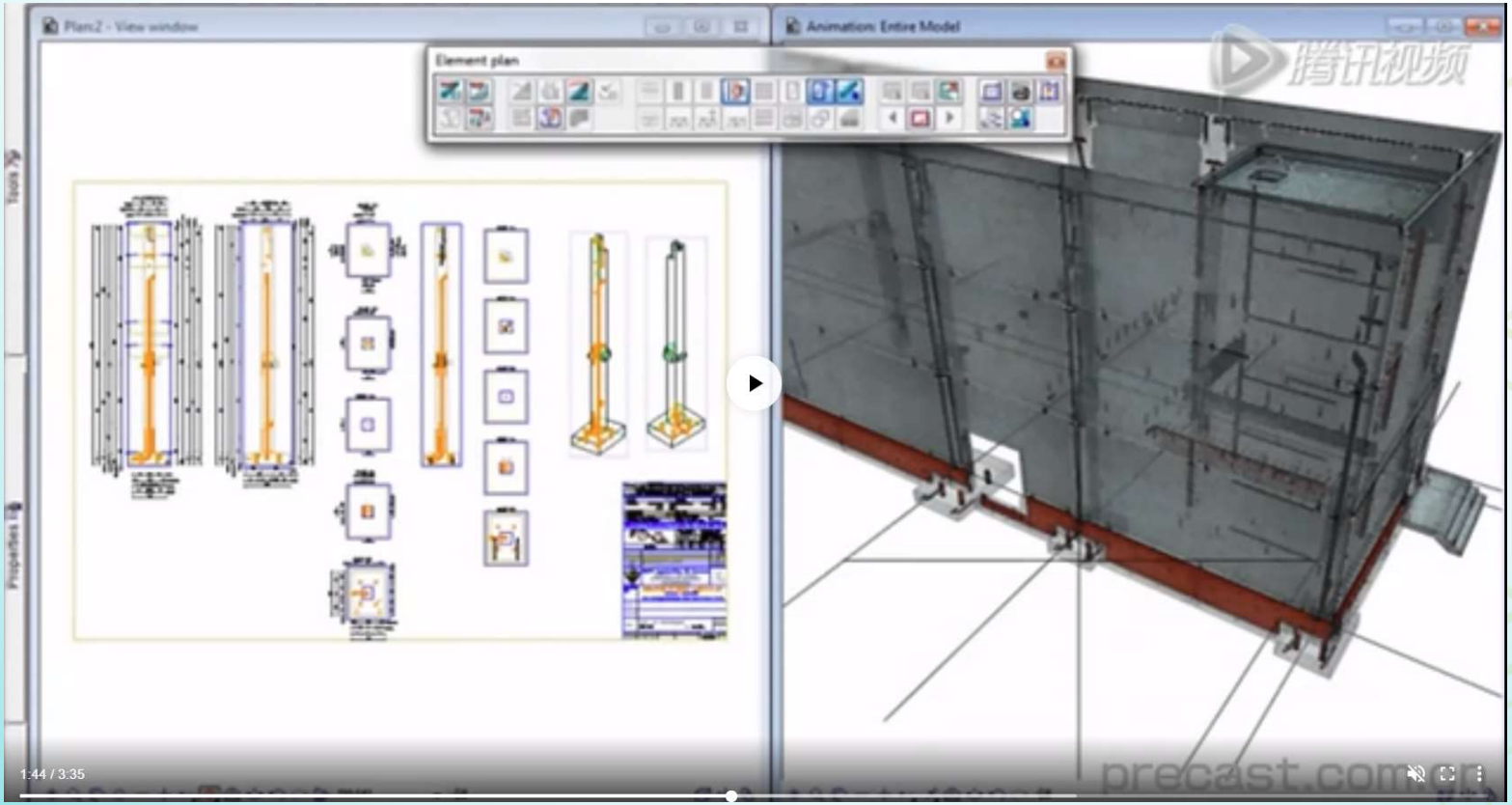
53. BIM for Precast Construction





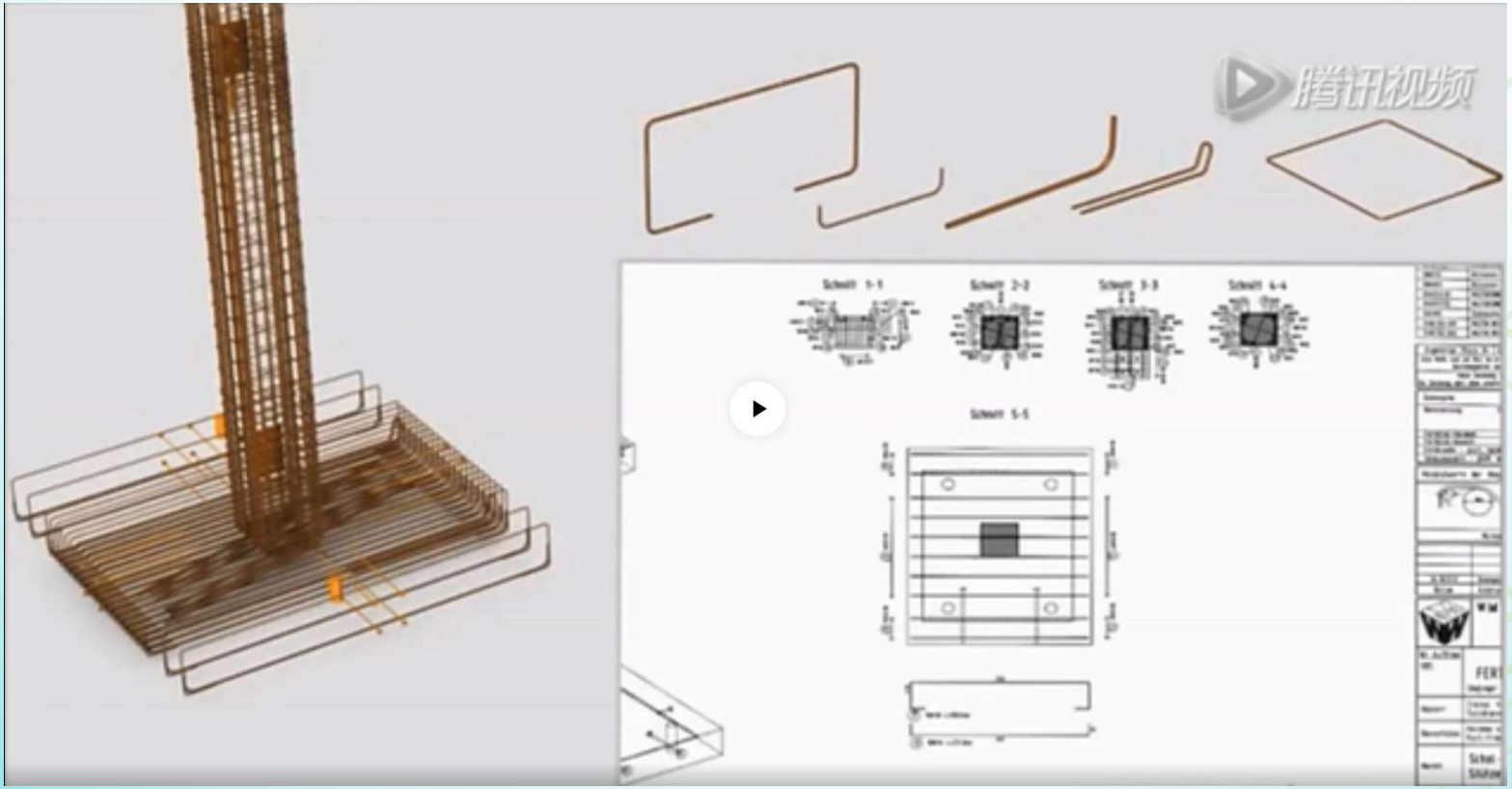
- Component extracted from BIM
- Divided into different components for production
- Connection Joint can be modified before production

54. BIM for Manufacturing



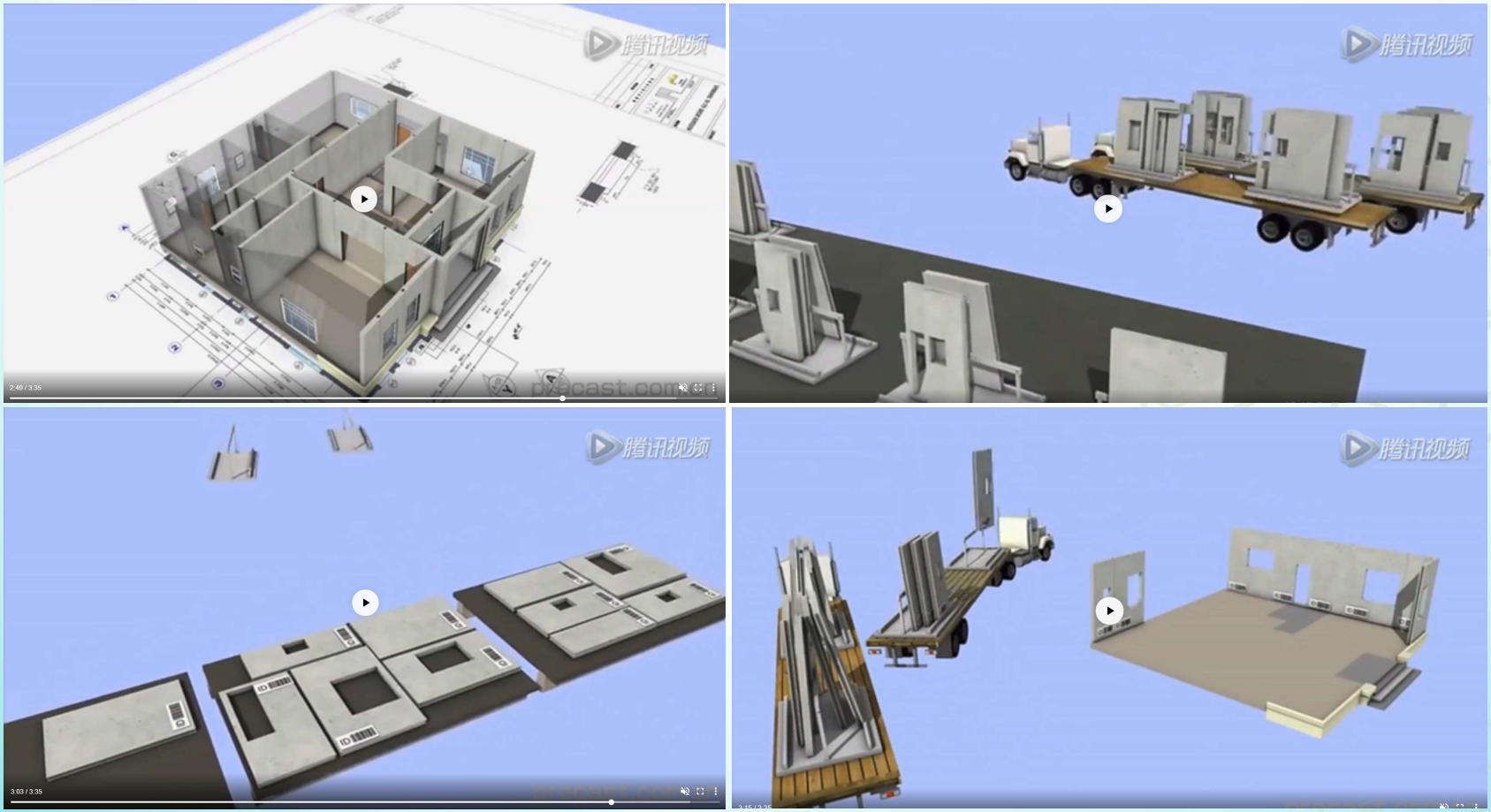
- Division of component can be divided in BIM with details construction joint
- Change of design can be reflected from BIM to drawings consistently
- Construction sequences and transportation can be planned on earlier stage for the project

55. BIM for Manufacturing



- Division of component can be divided in BIM with details construction joint
- Change of design can be reflected from BIM to drawings consistently
- Construction sequences and transportation can be planned on earlier stage for the project

56. BIM for Manufacturing



- Construction and Assembly sequence can be simulated in BIM
- Transportation from manufacturing to site can be simulated in BIM in order to avoid wastage of space
- Assembly on site can be smoothed with label and simulation in BIM

57. BIM for Manufacturing

- Early involved in BIM to the project result in accuracy of construction since the process of simulation is a completed result and potential clash should be resolved before on site construction
- Enough of manpower should be involved

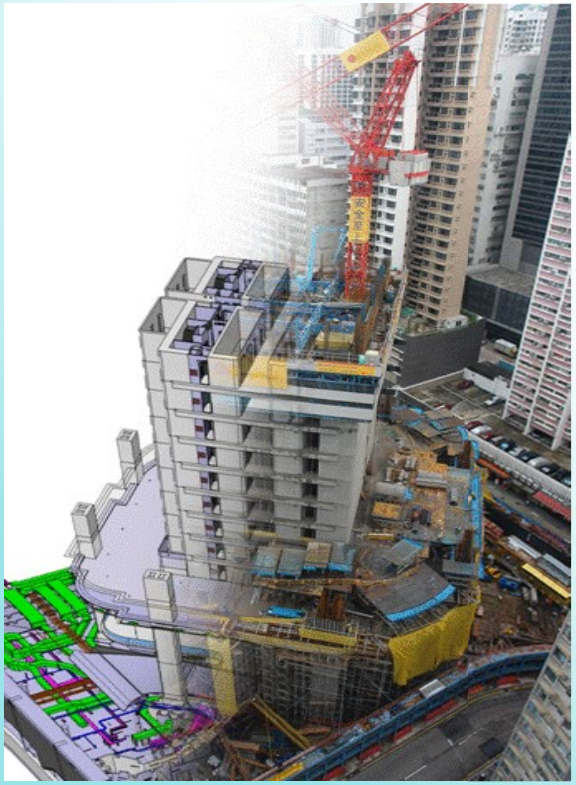
58. BIM for Manufacturing

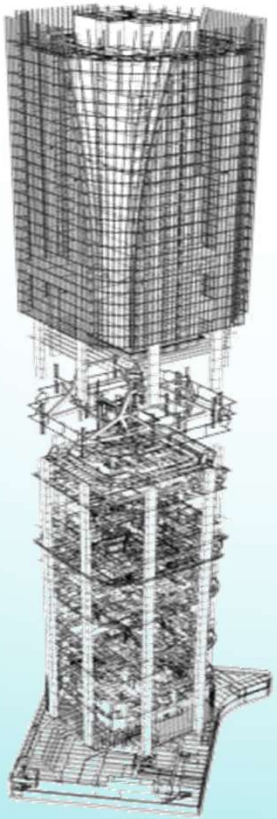
- Early involved in BIM to the project result in accuracy of construction since the process of simulation is a completed result and potential clash should be resolved before on site construction
- Enough of manpower should be involved

59. BIM Adoption – Private Project

HIGH RISE BUILDING PROJECT

Name of Building: One Island East
Client: Swire Properties
Main Contractor: Gammon Construction
Completion: 2008
Description: 1.5 million sq. ft. 70-storey Hong Kong office building.





Andrew Baldwin, David Bordoli (2014). A Handbook for Construction Planning and Scheduling, John Wiley & Sons, Ltd.

60. BIM Adoption – Public Project

HONG KONG HOUSING AUTHORITY PROJECT

Autodesk Far East Ltd. (2010), Autodesk BIM Award 2010, Hong Kong, Macau and Taiwan

61. BIM Adoption – Public Project

HONG KONG HOUSING AUTHORITY PROJECT

Autodesk Far East Ltd. (2010), Autodesk BIM Award 2010, Hong Kong, Macau and Taiwan

62. BIM Adoption – Public Project

HONG KONG HOUSING AUTHORITY PROJECT

Autodesk Far East Ltd. (2010), Autodesk BIM Award 2010, Hong Kong, Macau and Taiwan

63. BIM Adoption – Public Project

HONG KONG HOUSING AUTHORITY PROJECT

Autodesk Far East Ltd. (2010), Autodesk BIM Award 2010, Hong Kong, Macau and Taiwan

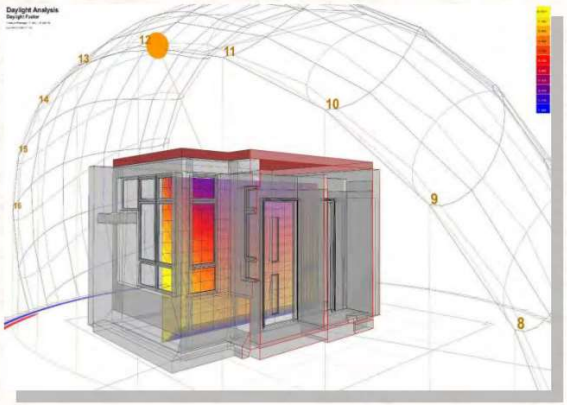
64. BIM Adoption – Public Project

HONG KONG HOUSING AUTHORITY PROJECT

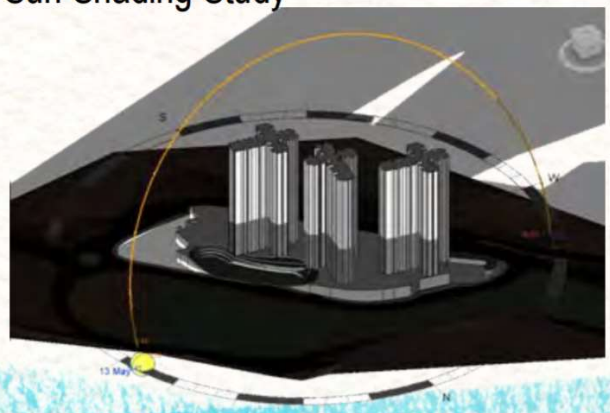
BIM Technology in HA – Current Applications

Visual Assessment

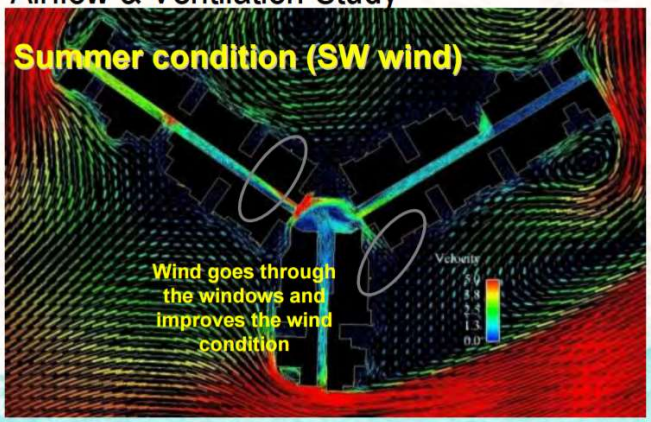
Daylight Analysis



Sun Shading Study



Airflow & Ventilation Study



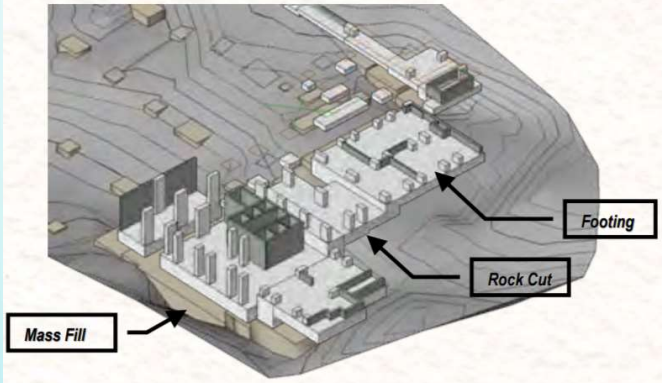
Ada Fung (2013). Application of BIM and RFID Application of BIM and RFID in Public Housing Projects in Public Housing Projects, CICID 10th Anniversary Conference

65. BIM Adoption – Public Project

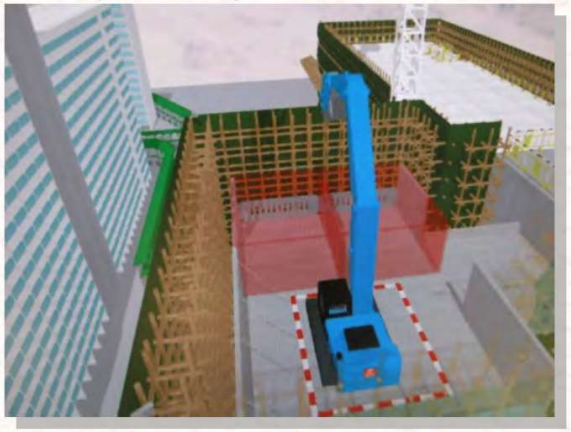
HONG KONG HOUSING AUTHORITY PROJECT

BIM Technology in HA – Current Applications

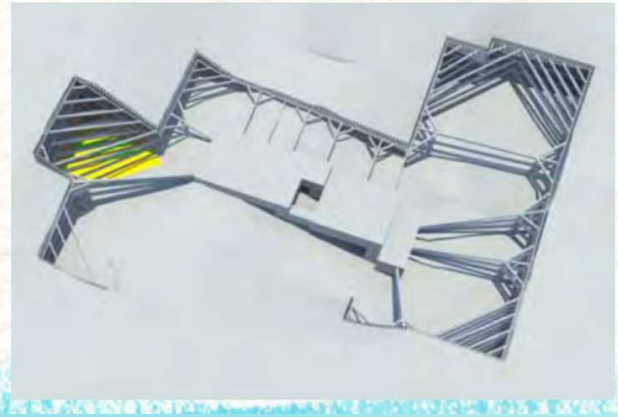
Optimization of Foundation Design



Site Safety Planning for Construction, Demoliti



Excavation and Lateral Support Simulation



Demolition Simulation

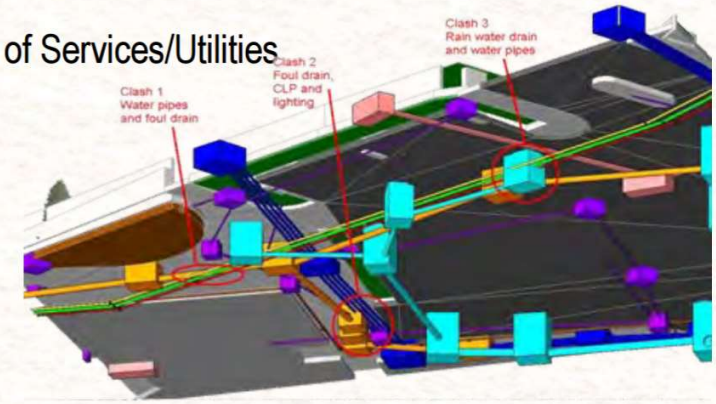
Ada Fung (2013). Application of BIM and RFID Application of BIM and RFID in Public Housing Projects in Public Housing Projects, CICID 10th Anniversary Conference

66. BIM Adoption – Public Project

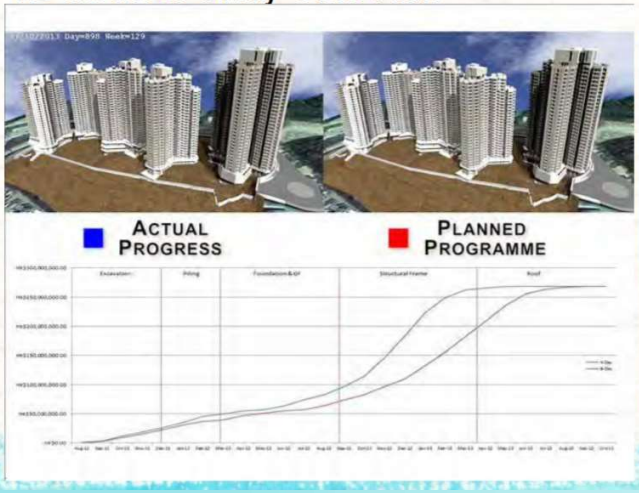
HONG KONG HOUSING AUTHORITY PROJECT

BIM Technology in HA – Current Applications

Co-ordinations of Services/Utilities Design



5D Model to Study Cash Flow



6-Day Typical Floor Construction Cycle

Ada Fung (2013). Application of BIM and RFID Application of BIM and RFID in Public Housing Projects in Public Housing Projects, CICID 10th Anniversary Conference

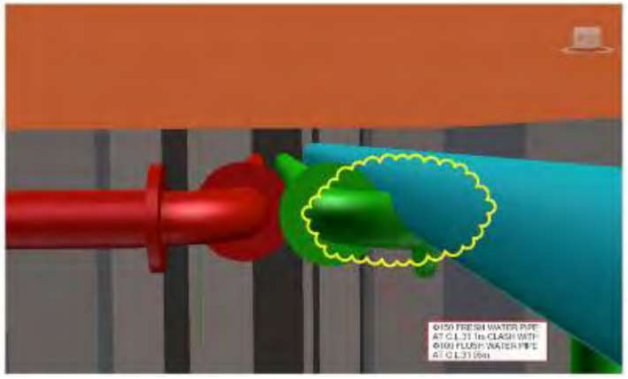
67. BIM Adoption – Public Project

HONG KONG HOUSING AUTHORITY PROJECT

Contractor's Applications

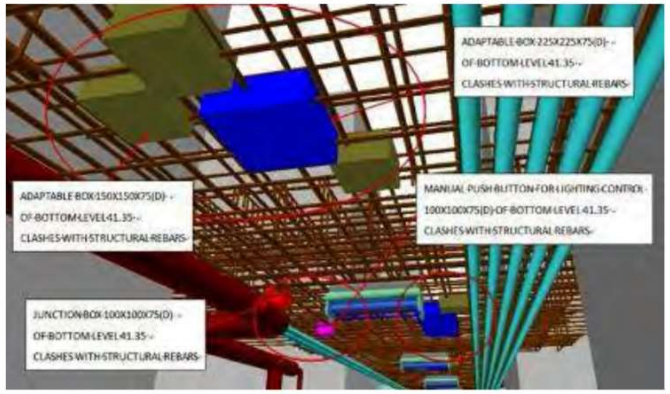
Site Layout Planning

Clashes Study



Virtual Rehearsal : Six-day Cycle for Typical Floor

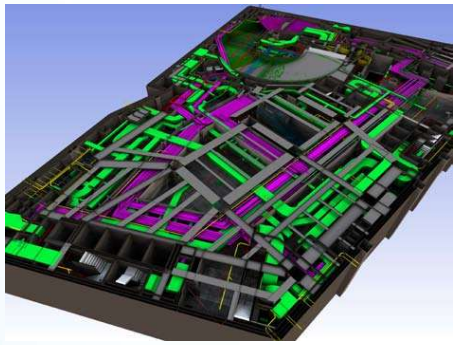
Rebars Fixing & Services Installation Collaboration

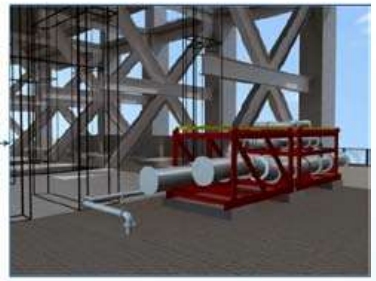


Ada Fung (2013). Application of BIM and RFID Application of BIM and RFID in Public Housing Projects in Public Housing Projects, CICID 10th Anniversary Conference

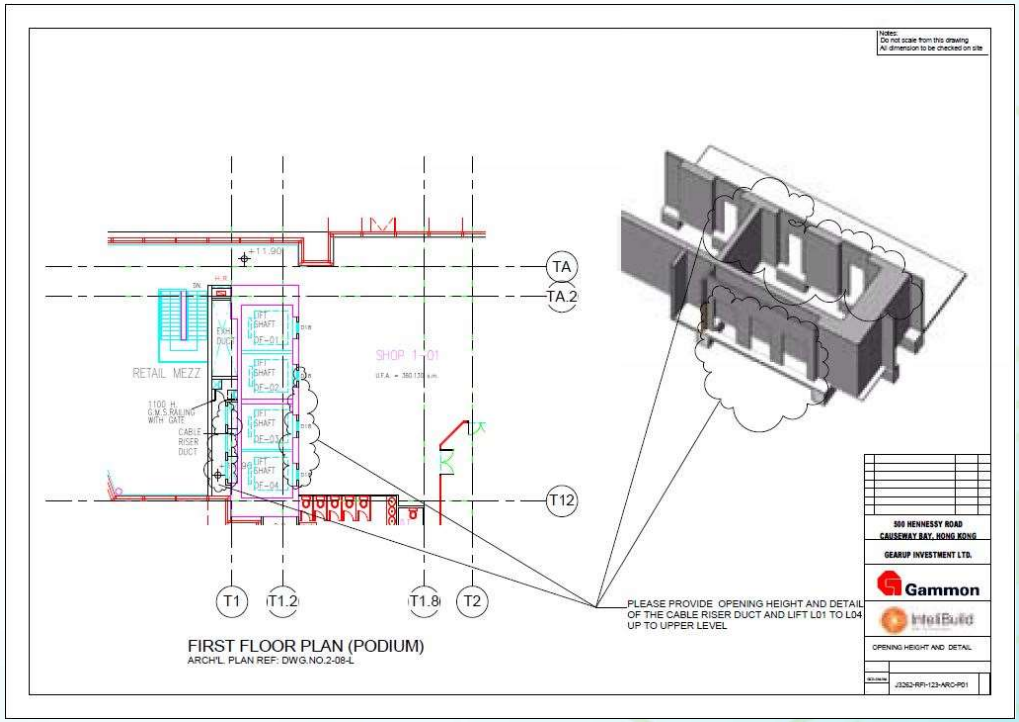
68. BIM Adoption – Commercial Office

Redevelopment of Hennessy Centre



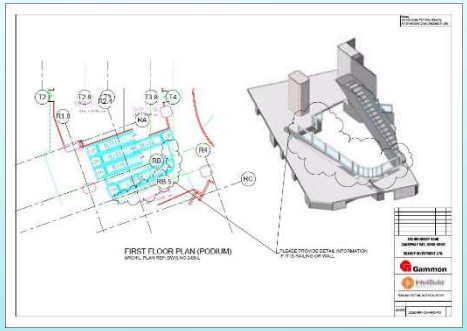


Pipe Module Installation



FIRST FLOOR PLAN (PODIUM)
ARCH'L PLAN REF: DWG.NO.2-08-L

Pipe Rack Units

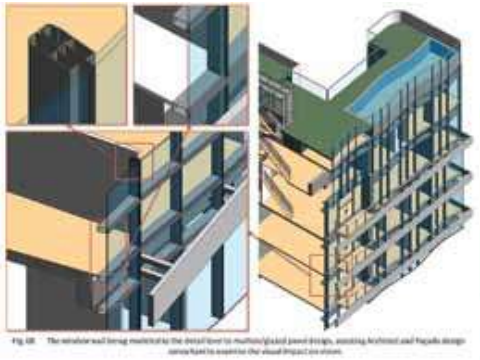


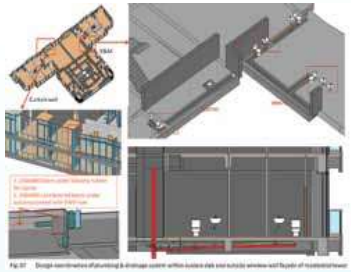
Company: Gammon Construction Limited
Project: Redevelopment of Hennessy Centre
Location: Causeway Bay, Hong Kong
Type: Commercial
Scheduled Time of Completion: 2012

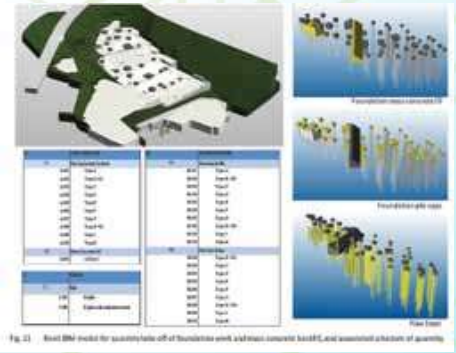
Autodesk Far East Ltd. (200), Autodesk BIM Award 2010, Hong Kong, Macau and Taiwan

69. BIM Adoption – Private Residential Project

The University Heights Redevelopment







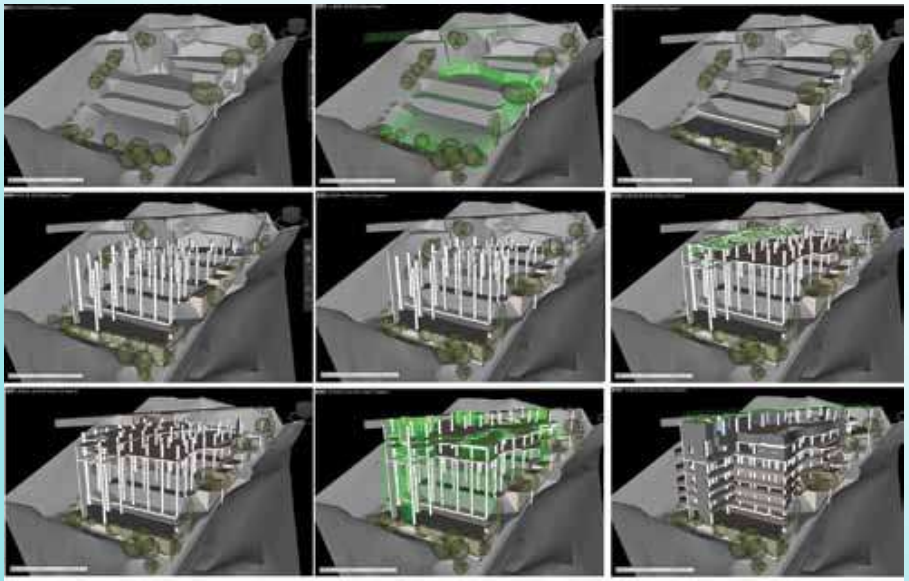


Fig. 05 Captured views of Navisworks 4D simulation to visualize the construction process of site formation work and basement structure.

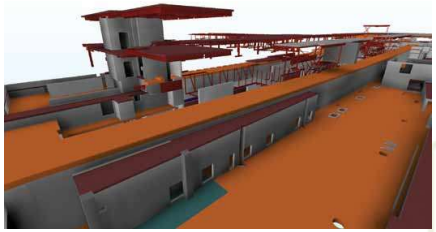
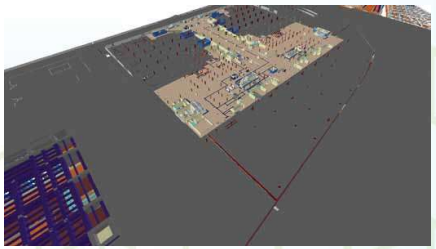
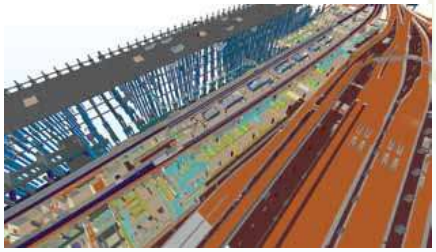
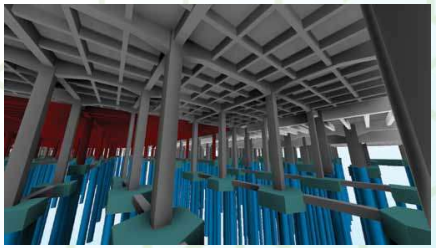
Autodesk Far East Ltd. (2013), Autodesk BIM Award 2013, Hong Kong, Macau and Taiwan

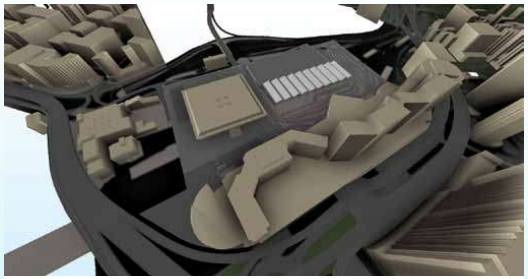
Company: Chinachem Group
Project: The University Heights Redevelopment
Location: No.42-44, Kotewall Road, Mid-levels West, Hong Kong
Type: Luxury High-end Residential Development
Scheduled Time of Completion: 2017

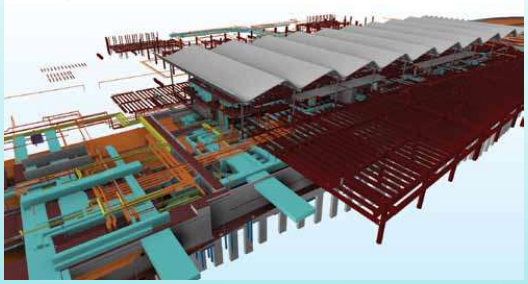
BIM Partners:
• Andrew Lee King Fun & Associates Architects Limited
• Far East Consulting Engineers Limited • CM Wong & Associates Limited • Rider Levett Bucknall Limited • Atkins China Limited
• Vircon Limited

70. BIM Adoption – Metro Station

Hung Hom Station & Approach Tunnels





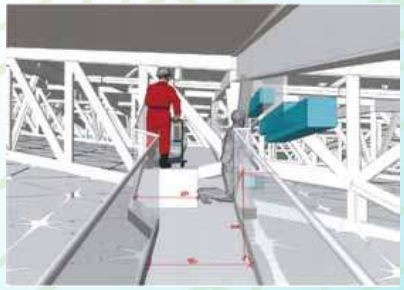
Company: MTR Corporation Limited
Project: Hung Hom Station & Approach Tunnels
Location: Hung Hom, Hong Kong
Type: Civil Infrastructure
Scheduled Time of Completion: 2018

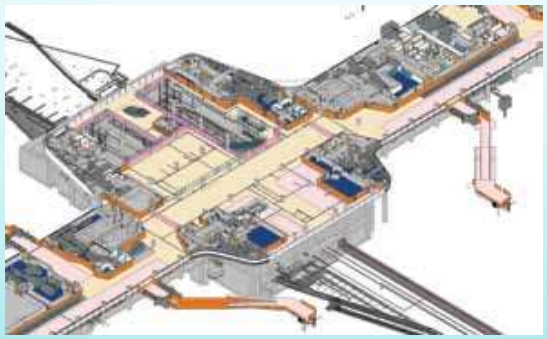
BIM Partners:
- Aedas Limited • Parsons Brinckerhoff
- Atkins • Sweett Limited • InteliBuild
- Leighton Contractor (Asia) Limited
- Gammon Kaden Joint Venture

Autodesk Far East Ltd. (2013), Autodesk BIM Award 2013, Hong Kong, Macau and Taiwan

71. BIM Adoption – Airport

Hung Hom Station & Approach Tunnels





Company: Mott MacDonald and Arup
Project: Midfield Development Design Consultancy Services
Location: Hong Kong International Airport
Type: Infrastructure
Scheduled Time of Completion: Q3, 2015

BIM Partners:
• Airport Authority Hong Kong • Aedas Limited • OTC Limited • Atkins China Limited • Bo Steiber Lighting Design

Autodesk Far East Ltd. (2009), Autodesk BIM Award 2009, Hong Kong, Macau and Taiwan

72. BIM Adoption – Design and Build

Renovation of 1/F Main Block APB Centre Architectural Services Department

- Use of BIM for renovation project

PLATINUM
鉑金級 BI 室內建築 V1.0 2015
HKGBC
BEAM Plus
綠建環評

Total Score: **89.0**

BEAM Plus
Interiors V1.0
Platinum

Completion Year: 2015
IFA: 794sqm

Owner: Architectural Services Department
Architect: Llewelyn-Davies HK Ltd.
M&E: Wong & Ouyang (BS) Ltd.
Sustainable Design: Ove Arup
BIM Consultant: Vircon Ltd.

From Hong Kong Green Building Council (2016)

73. BIM Adoption – Full BIM

Xiqu Centre

Image courtesy of BTA & RLP Company Ltd.

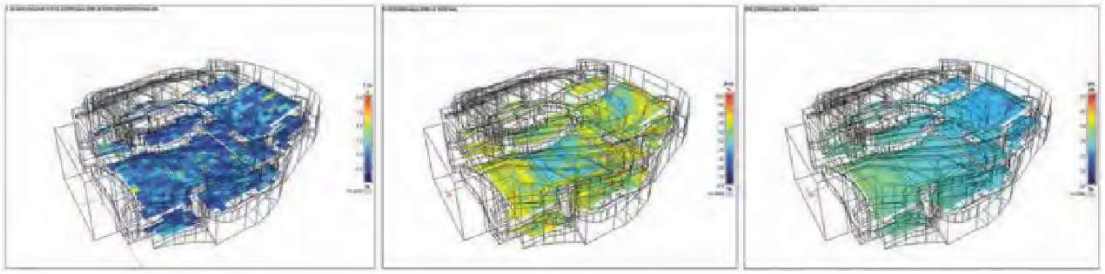
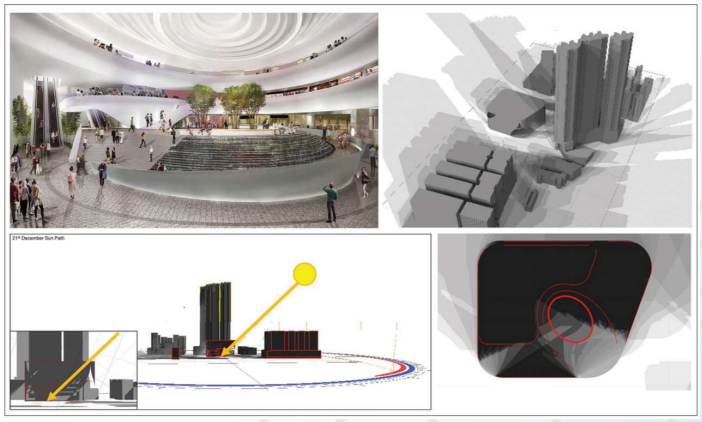


Image courtesy of BTA & RLP Company Ltd.



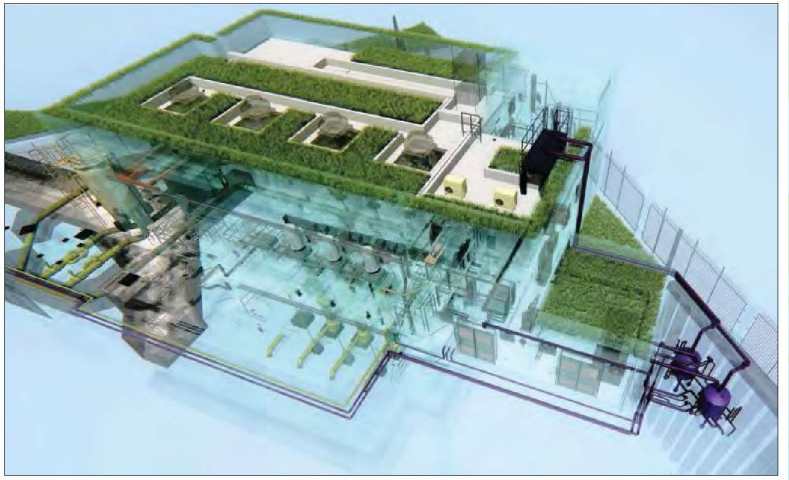
Company: BTA & RLP Company Limited
Project: Xiqu Centre
Location: West Kowloon Cultural District, Hong Kong
Type: Theatre and Retail
Scheduled Time of Completion: 2017

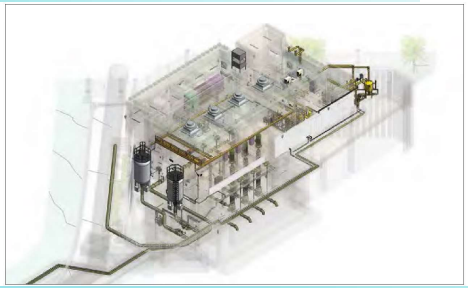
BIM Partners:
- West Kowloon Cultural District Authority
- Buro Happold International
- Rider Levett Bucknall
- Atkins China Ltd.
- Front Inc.
- Hip Hing Construction Co. Ltd.
- Kingsfield Engineering Ltd.

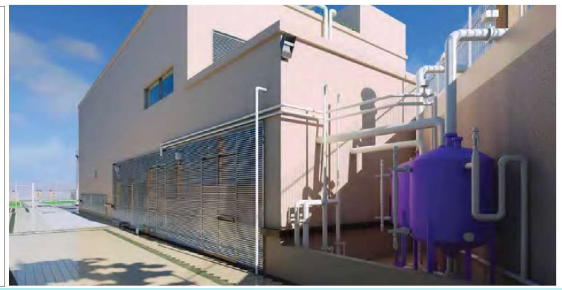
Autodesk Far East Ltd. (2015), Autodesk BIM Award 2015, Hong Kong, Macau and Taiwan

74. BIM Adoption – Asset Management

Study on the Trial Use of Building Information Modelling (BIM) for Asset Management







Company: Water Supplies Department, HKSAR Government
Project: Study on the Trial Use of Building Information Modelling (BIM) for Asset Management
Location: Tai Po and Telegraph Bay Salt Water Pumping Stations
Type: Waterworks
Scheduled Time of Completion: 2015

BIM Partners:

- Summit Technology (HK) Ltd • Sino-iTech Holdings Co Ltd.

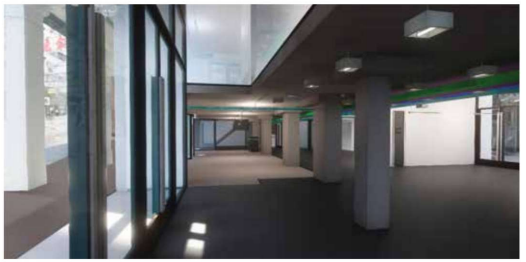
Autodesk Far East Ltd. (2015), Autodesk BIM Award 2015, Hong Kong, Macau and Taiwan

75. BIM Adoption – Revitalization Project

Revitalization of Shophouses at 600-626 Shanghai Street, Mong Kok

Enabling a more efficient building life cycle through the use of Building Information Modelling
Image courtesy of Urban Renewal Authority

To adopt the use of BIM in the building life cycle: Design, Build and Operate
Image courtesy of Urban Renewal Authority



Enhanced Design Communication, Closer Collaboration and quality of the buildings

3D digital representation of building data
Image courtesy of Urban Renewal Authority

Interface of the entrance, covered cloister, finishes of old and new façade can be evaluated easily
Image courtesy of Urban Renewal Authority

Company: Urban Renewal Authority
Project: Revitalization of Shophouses at 600-626 Shanghai Street, Mong Kok
Location: Mong Kok, Hong Kong
Type: Revitalization and Preservation
Scheduled Time of Completion: 2018/2019

BIM Partners:

- Chau Lam Architects & Associates Architects & Engineers (HK) Limited
- Ben Tse & Associates Limited • Far East Consulting Engineers Limited
- China Point Consultants Limited • Beria Consultants Limited
- Team 73 HK Limited • Wan Chung Construction Company Limited
- Vircon Limited

Autodesk Far East Ltd. (2017), Autodesk BIM Award 2015, Hong Kong, Macau and Taiwan

76. BIM Adoption – Landscape

The Use of BIM for Landscape Design – Landscape Information Modelling

Image courtesy of Architectural Services Department, HKSAR Government

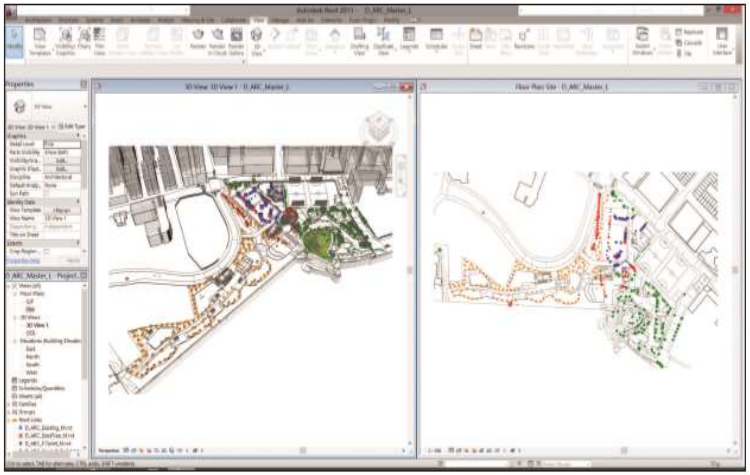


Image courtesy of Architectural Services Department, HKSAR Government

Company: Architectural Services Department, HKSAR Government
Project: The Use of BIM for Landscape Design – Landscape Information Modelling
Location: Victoria Park, Causeway Bay; Parks in To Kwa Wan & Kwun Tong
Type: Landscape Design and Construction
Scheduled Time of Completion: 2015-2018

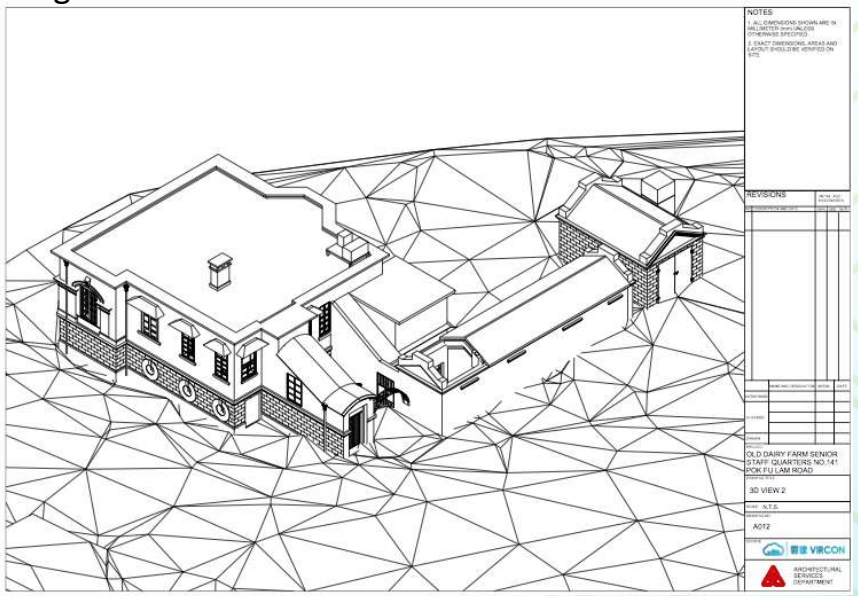
BIM Partners:
• Vircon Ltd. • Kalloc Studios Asia Ltd.

Autodesk Far East Ltd. (2015), Autodesk BIM Award 2015, Hong Kong, Macau and Taiwan

77. BIM Adoption – Heritage

HERITAGE

- Use of BIM for Heritage Record and Further Design



Year Built: 1887
Grading: Grade 1
Selected Applicant: Caritas-Hong Kong
Project Title: The Pokfulam Farm Project
Content: The project will present the history of the Old Dairy Farm and introduce the culture of Pokfulam village and the surrounding area through exhibitions, guided tours and workshops

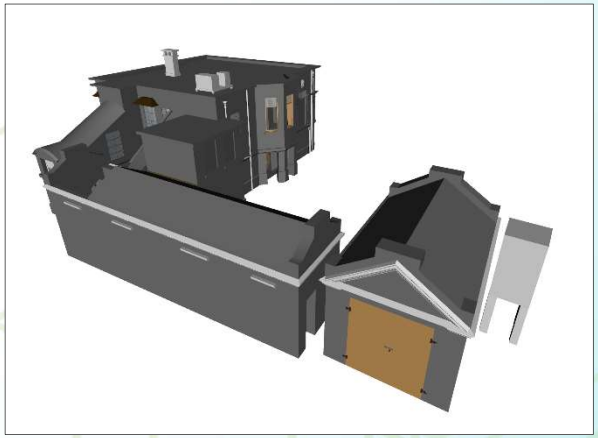
Conserve and Revitalise Hong Kong Heritage Department (2013), Revitalising Historic Buildings Through Partnership Scheme, Resource Kit

78. BIM Adoption – Heritage

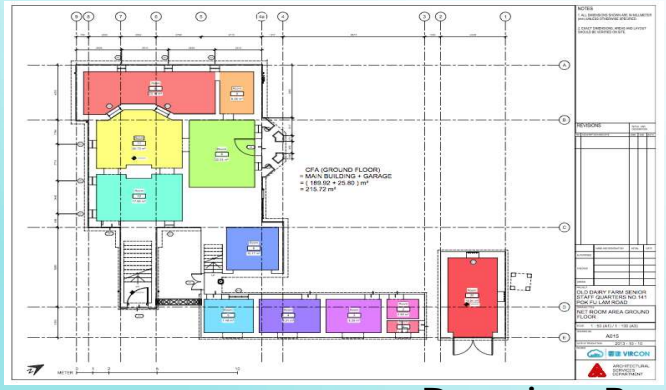
TERRESTRIAL LASER SCANNING AND BIM

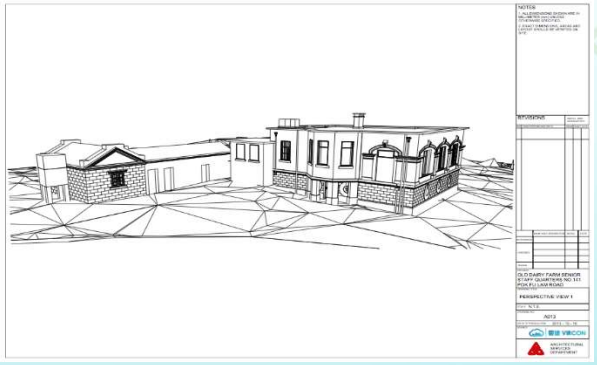
3D Scanning

Point Cloud Data



BIM Model

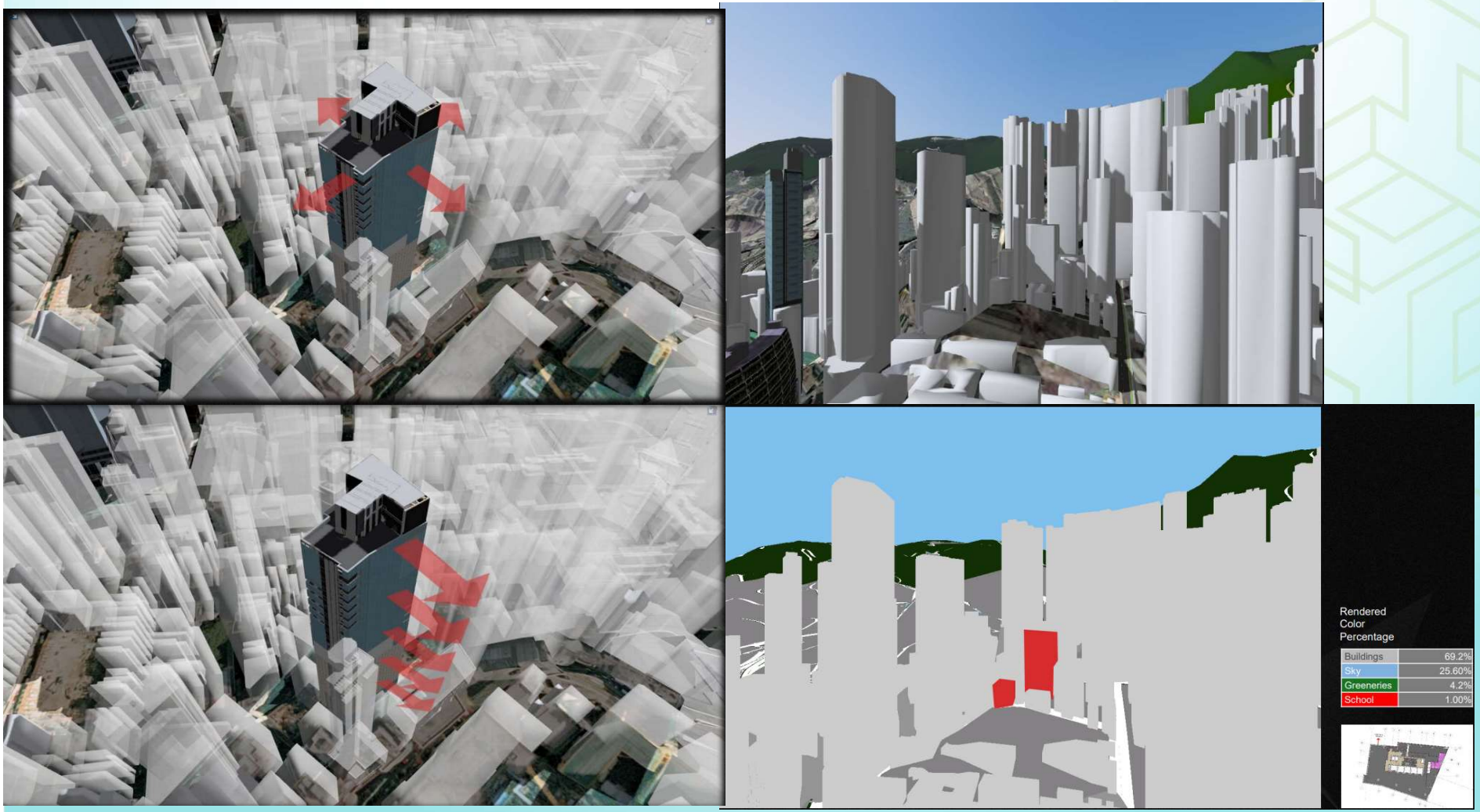




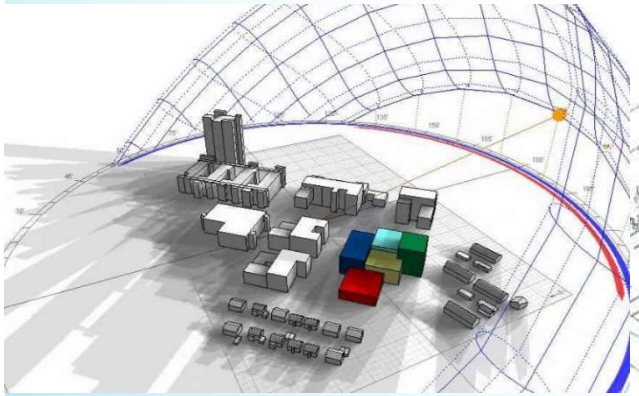
Room Schedule	
Name	Area
Room 01	10.37 m²
Room 02	6.65 m²
Room 03	24.67 m²
Room 04	24.61 m²
Room 05	4.53 m²
Room 06	21.89 m²
Room 07	24.25 m²
Room 08	23.20 m²
Room 09	10.55 m²
Room 10	7.48 m²
Room 11	25.21 m²
Room 12	24.35 m²
Room 13	21.31 m²
Room 14	9.55 m²
Room 15	4.30 m²
Room 16	9.73 m²
Room 17	7.48 m²
Room 18	1.84 m²

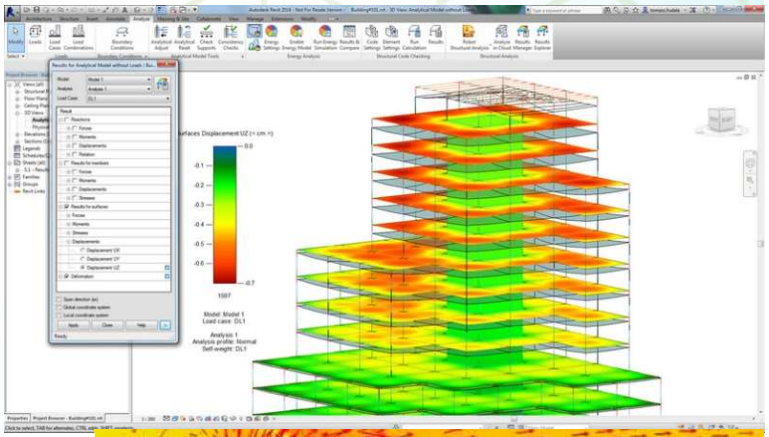
Drawing Production and Quantity Take-off

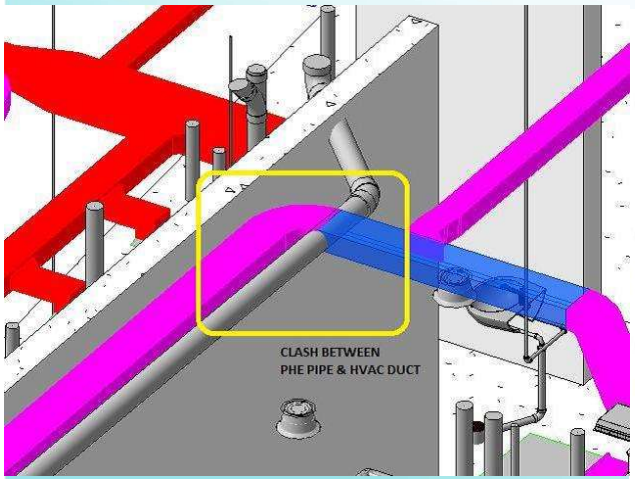
79. Constraints of conceptual analytical tools and decisions made on their basis

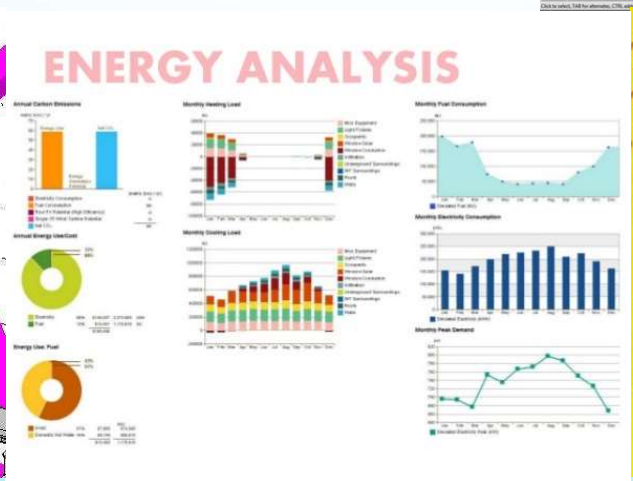


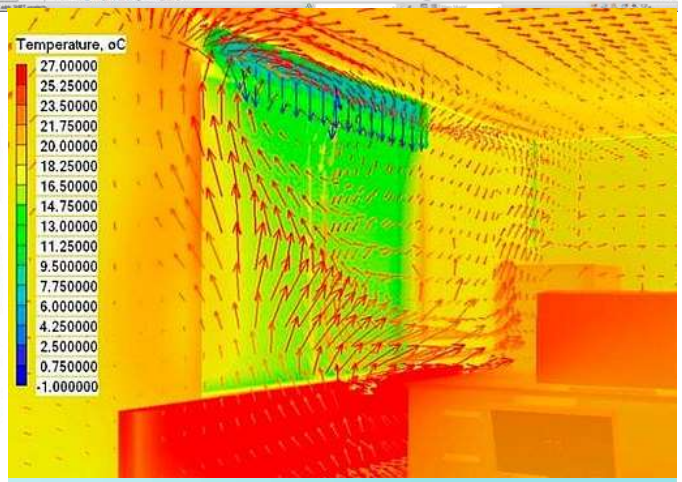
80. Applying selected analytical tools to a validated model











81. Understanding the results of analyses and drawing conclusions for the project

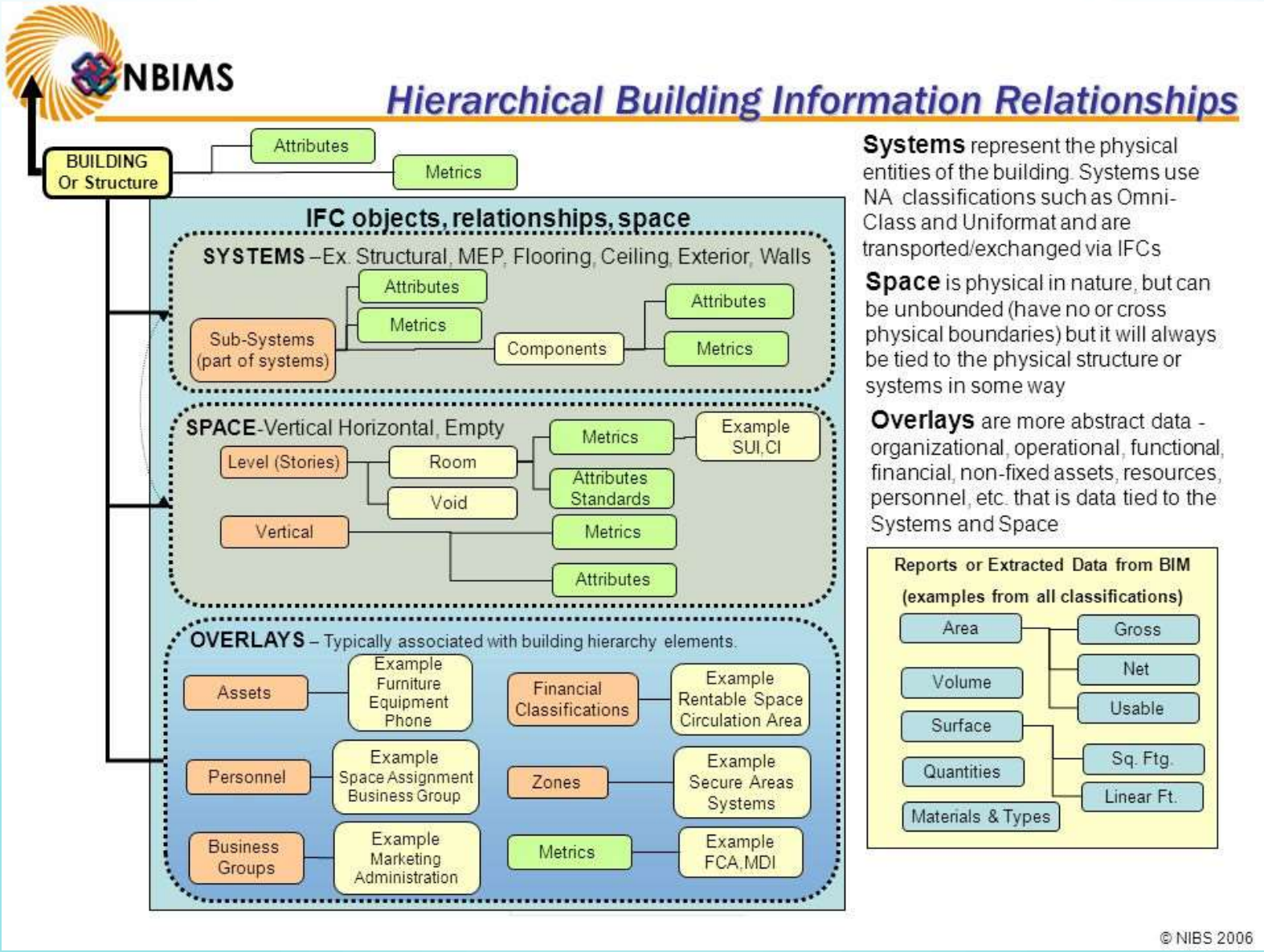
82. Basic application of BIM model as a/an database/ objective database

- 3D - 三維資訊模型 – 3D Model
- 4D - 建設規劃 – Scheduling
- 5D - 工料測量 – Quantity Surveying
- 6D - 可持續性分析 - Sustainability
- 7D - 設施管理應用 – Facility Management

……

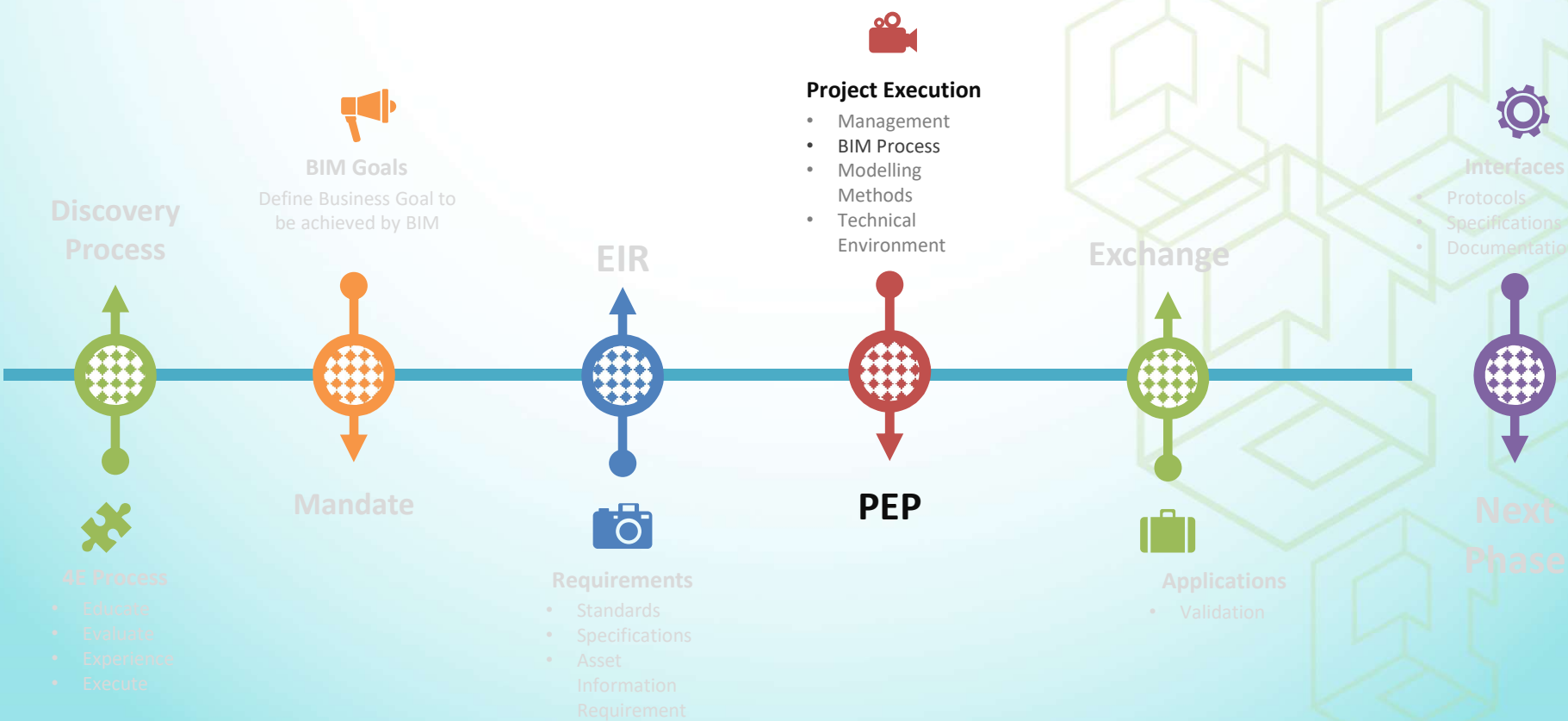
Addition of Information in BIM!

83. Hierarchy and organization of a project database

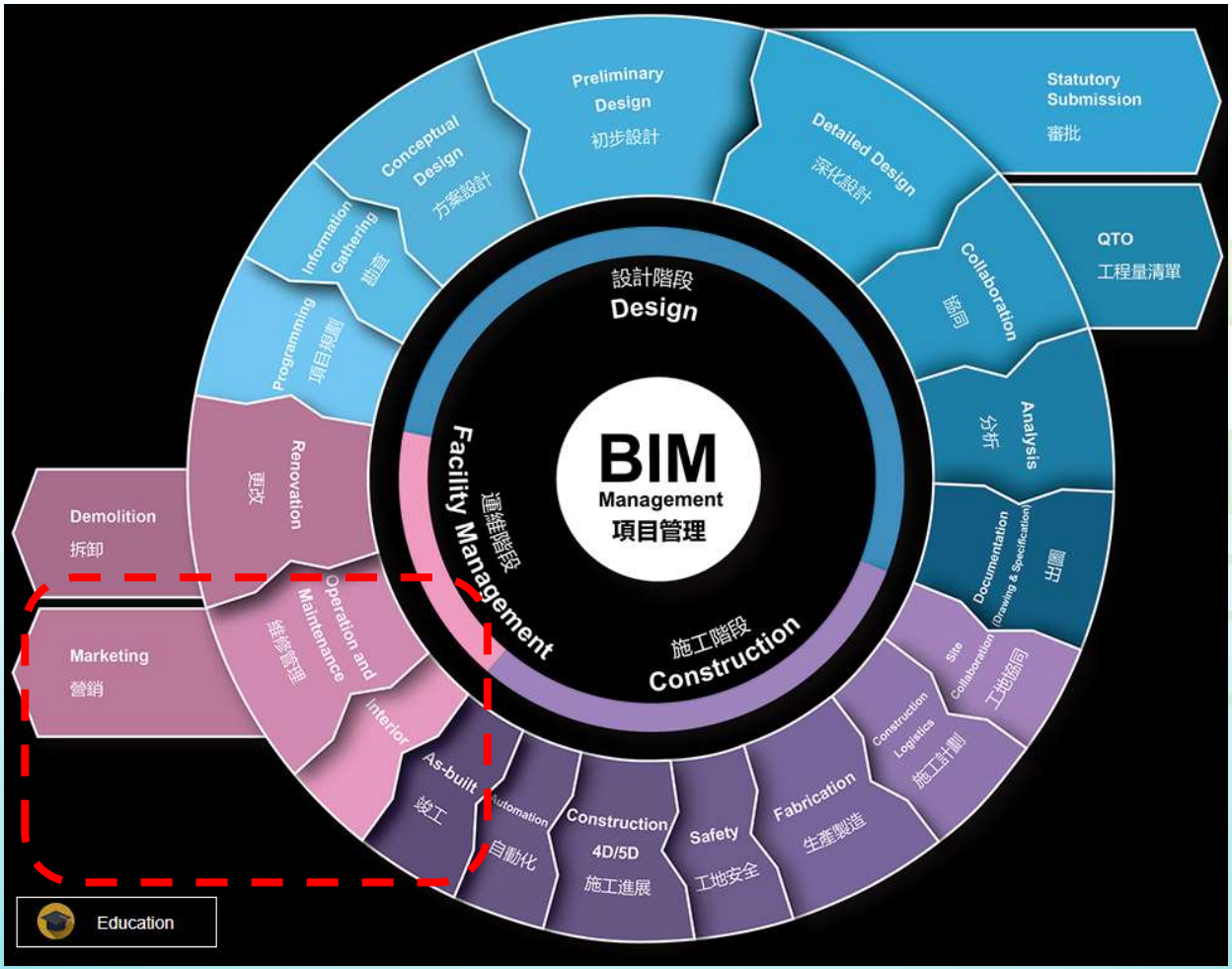


Day 4 - Standards and Practice for Projects Implementation of BIM Technology (Full Day)

1. Project management at different stages (from design to asset/facility management)

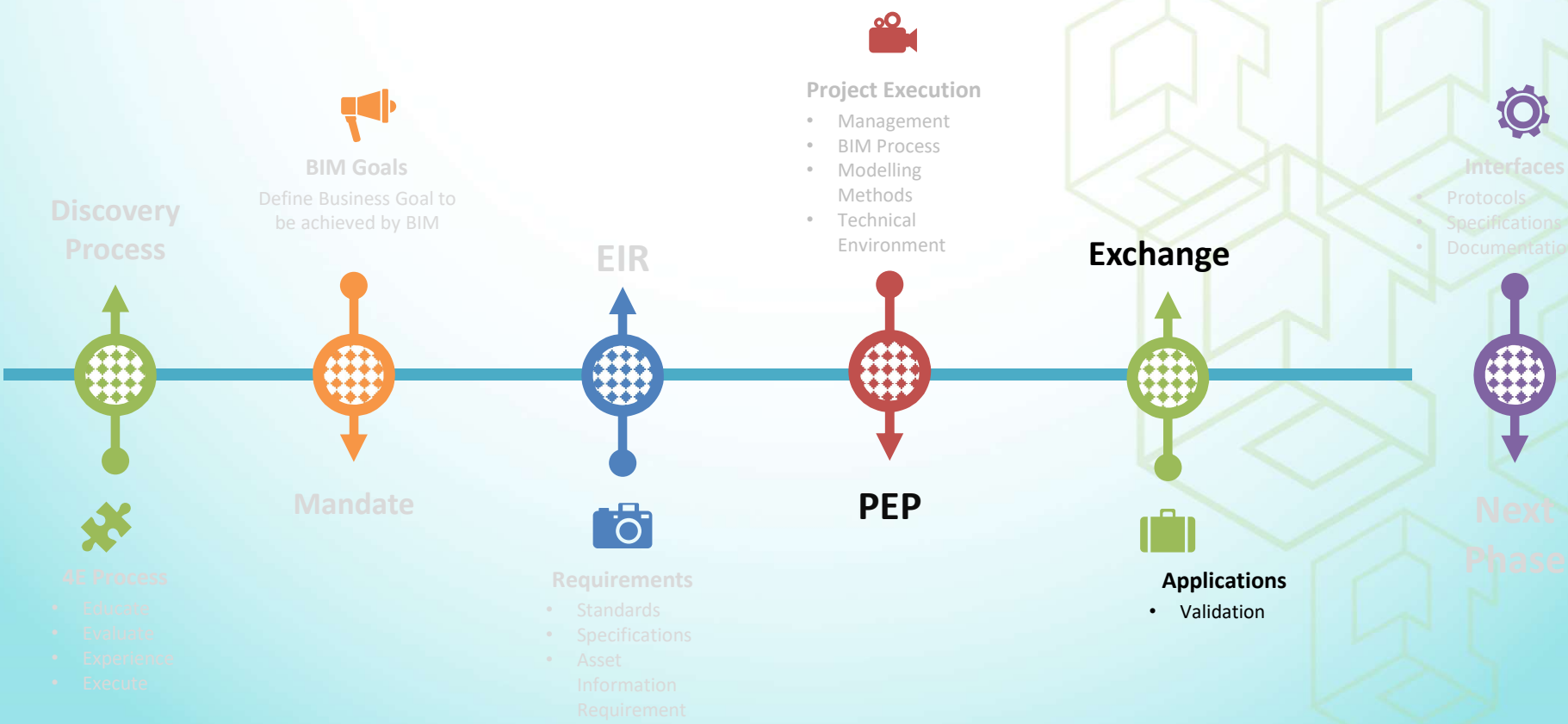


2. Project management at different stages (from design to asset/facility management)



- From As-Built to Facility Management

3. Project Execution – Exchange for BIM Application



4. Format and Software

	C3D	RVT	ORD	ABD	Open Format	Shared Format	Related Tools
Alignment-based Road Model	Y		Y		IFC	XML	
Topography-related Site formation Model	Y		Y			XML	
Strata Models (Plugins)	GEO		GINT			XML	HolebaseSI
Utilities Model	Y	Y	SSU	Y	IFC	XML	
Bridge Segment Model	Y		OBD		IFC		
Bridge Substructure/Superstructure		G		G	IFC		
Tunnel Model	Y				IFC		Sub Assem composer
Retaining Wall Model	Y	G	Y	G	IFC		
4DMS						MP4	NWD/ Sychro
Drawings/Site Sketches	*	*	*	*	DXF	PDF	
3DVR						EXE	3DS/LRT
Asset Information (COBie)		Y		Y		COBIE	

- IFC 4.0
  - Latest Version support ALG
  - XML-based Text file
- COBie
  - BIM/FM Standard
  - PAS 1192-4
  - XLS file 13 tables
- XML
  - Terrain and alignments
  - XML-base Text files

Y - Default Function
G– Generic Solid

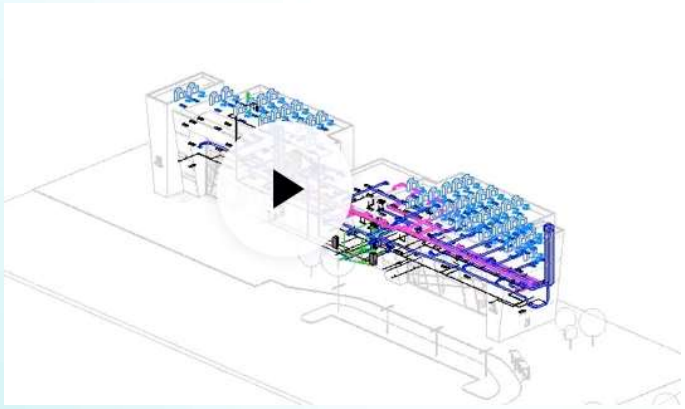
GEO – Geotechnical Module
GINT – GINT Module

SSU: SubSurface Utilities
OBD: OpenBridge Designer

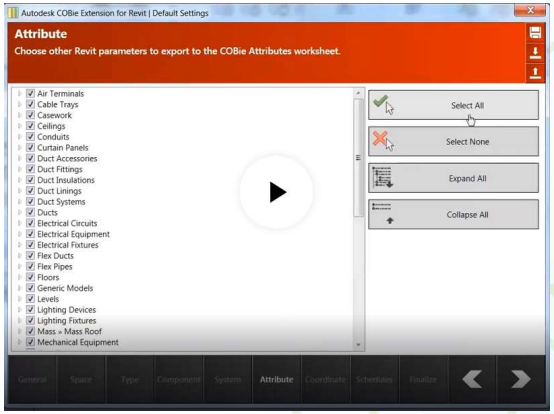
3DS: 3Ds Max
LDT: LumenRT

5. Delivery Information to Facility Management

Construction Operations Building Information Exchange (COBie)

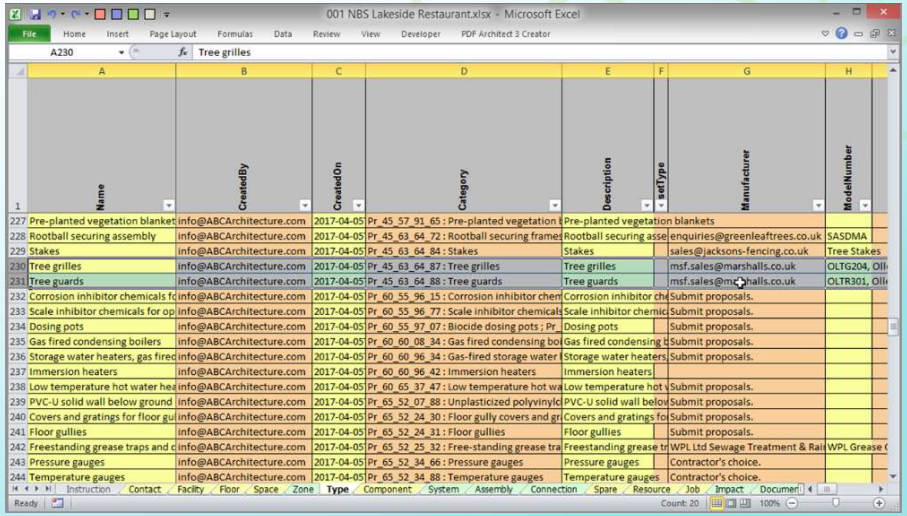


1. Selected attribute in BIM



2. Convert in COBie

- Export Selected Information for Facility Management
- Facility Management team can use the information to check / access for further maintenance



3. Information in Excel format

6. Interchange/inter-linkage of data between BIM database and other applications

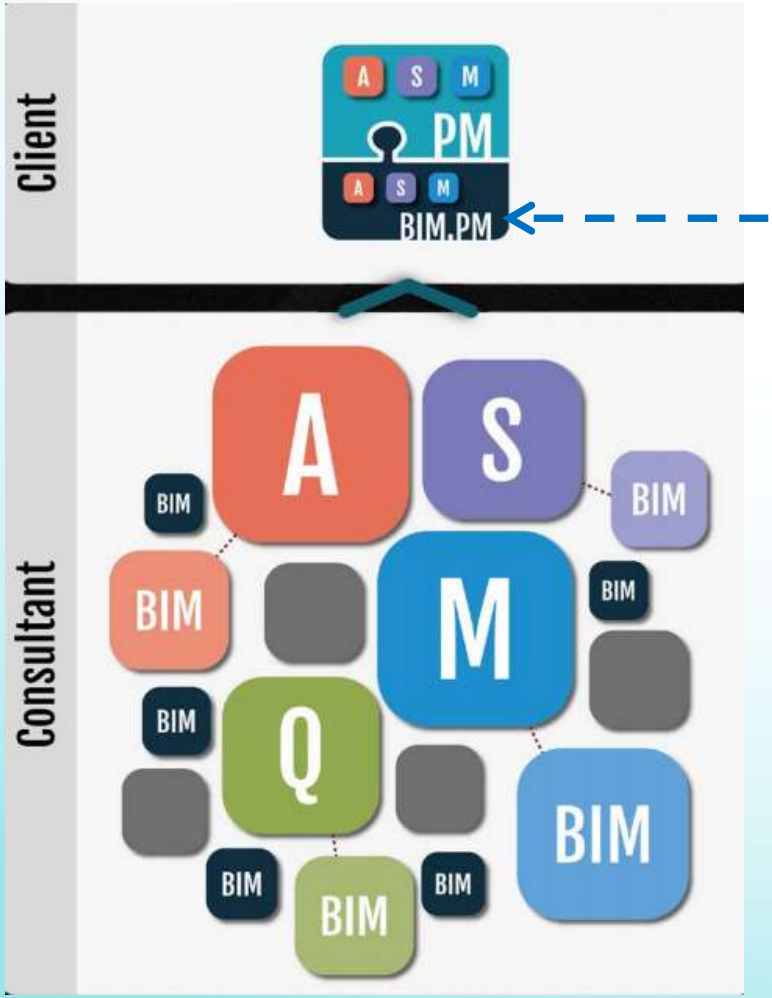
	A	B	C
1	Title	COBie	
2	Version	2	
3	Release	4	
4	Status	IFC2x3	
5	Region	en-UK	
6	Purpose		This COBie spreadsheet is an example file that comes with the COBie Extension 1.0
7	Outline		Individual worksheets are organized by project phase as shown below
8			
9	All Phases	Sheet	Contents
10		Contact	People and Companies
11			
12	Early Design Worksheets	Sheet	Contents
13		Facility	Project, Site, and Facility
14		Floor	Vertical levels and exterior areas
15		Space	Spaces
16		Zone	Sets of spaces sharing a specific attribute
17		Type	Types of equipment, products, and materials
18			
19	Detailed Design Worksheets	Sheet	Contents
20		Component	Individually named or schedule items
21		System	Sets of components providing a service
22		Assembly	Constituents for Types, Components and others
23		Connection	Logical connections between components

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Name	CreatedBy	CreatedOn	TypeName	Space	Description	ExtSystem	ExtObject	ExtIdentifier	SerialNumber	InstallationDate	WarrantyStartDate	TagNumber	BarCode	AssetIdentifier	Area	Length
22	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
23	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
24	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
25	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
27	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
28	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	2bf19293-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
29	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	44772ab3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
30	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	e895d30d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
31	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	e895d30d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
32	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	d6d1a613	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
33	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	b1d85879	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
34	Lighting D	dave@aut	2016-03-1	Lighting D	n/a	n/a	Autodesk	Lighting D	b1d85879	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
35	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	badde294	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
36	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	badde294	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
37	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	29d80c5d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
38	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	29d80c5d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
39	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	49433253	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
40	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	49433253	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
41	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	49433253	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
42	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	49433253	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
43	Lighting F	dave@aut	2016-03-1	Lighting F	Spaces_2	n/a	Autodesk	Lighting F	49433253	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Instruction | Contact | Facility | Floor | Space | Zone | Type | Component | System | Assembly | Connection | Spare | Re ...

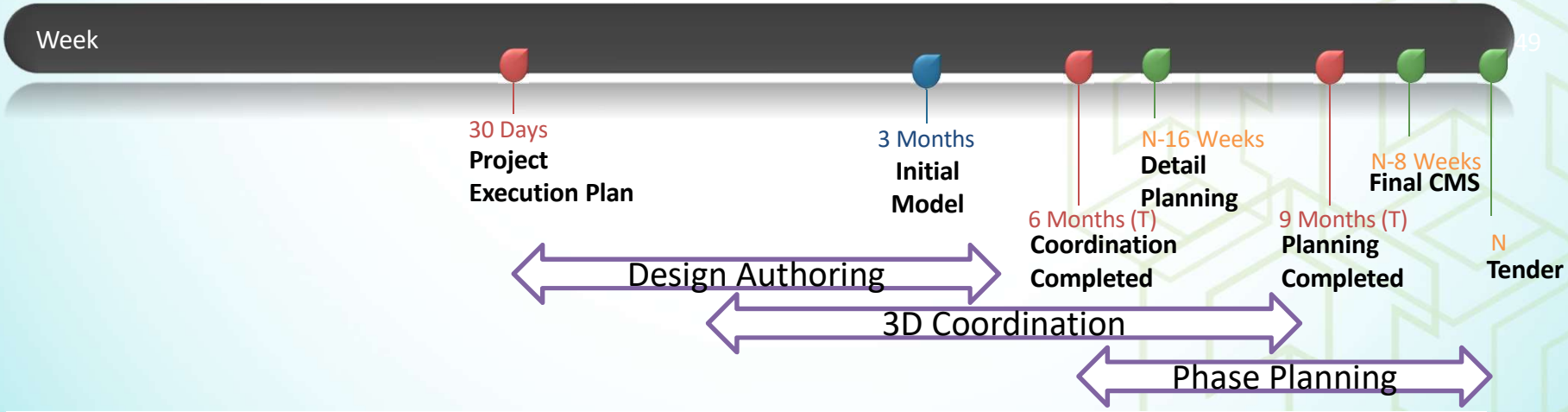
7. Delivery Information to Facility Management

How to select information to Facility Management?



- BIM Manager assist to set up Project Execution Plan with the employer
- The required information for Facility Management team shall ne implied from the design stage
- BIM Manager to supervise the selective information from as-built BIM to transfer / export information to Facility Management Team

8. Challenges managing Process and Deliverables (Design Phase)

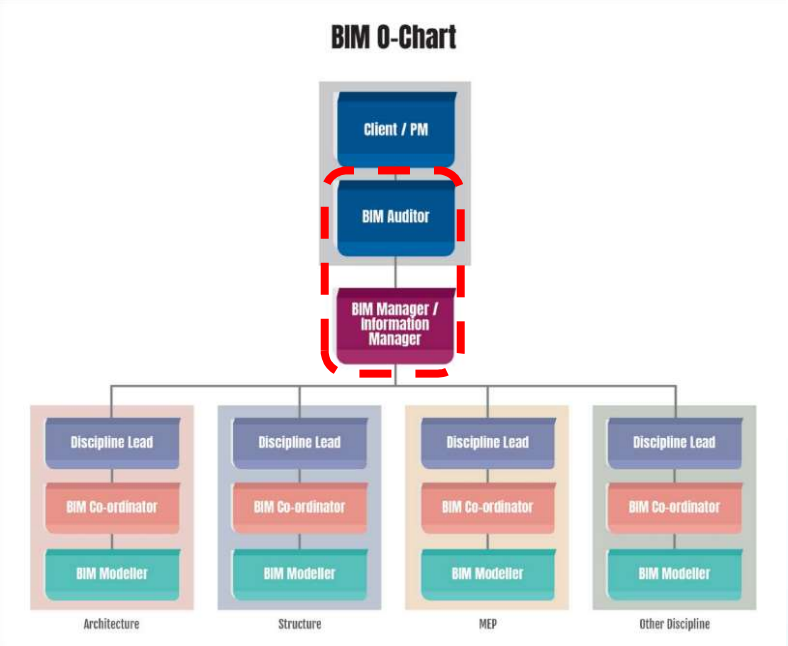


ID	Disciplinary Model	Conceptual Model	Design, Analytical, Visualization Model	Coordinated & Planning Model	Tender Model
ES	Existing Site Model	100	200 - 250	250	250
ER	Road Model	200	200 -300	300 - 350	300 ~ 350
BR	Bridge Model	100	200 - 300	300 - 350	300 ~ 350
UP	Underpass Model	100	200 - 300	300 - 350	300 ~ 350
BD	Building Model	200	200 ~ 300	200 - 300	300 ~ 350

Parallel Iterative Process

- BIM Manager shall set up Project Execution Plan with the employer at the beginning of the project

9. Q : How to make a LOD standard in the PXP?



MEETING TYPE	PROJECT STAGE	FREQUENCY	PARTICIPANTS	LOCATION
BIM REQUIREMENTS KICK-OFF				
BIM EXECUTION PLAN DEMONSTRATION				
DESIGN COORDINATION				
CONSTRUCTION OVER-THE-SHOULDER PROGRESS REVIEWS				
ANY OTHER BIM MEETINGS THAT OCCURS WITH MULTIPLE PARTIES				

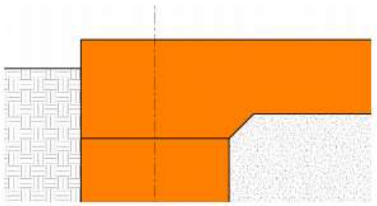
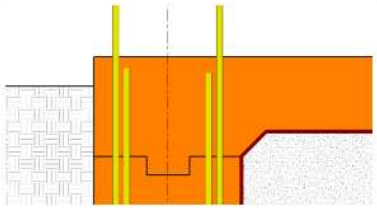
MODEL DELIVERY SCHEDULE OF INFORMATION EXCHANGE FOR SUBMISSION AND APPROVAL:

Document the information exchanges and file transfers that will occur on the project.

INFORMATION EXCHANGE	FILE SENDER	FILE RECEIVER	ONE-TIME or FREQUENCY	DUE DATE or START DATE	MODEL FILE	MODEL SOFTWARE	NATIVE FILE TYPE	FILE EXCHANGE TYPE
DESIGN AUTHORING - 3D COORDINATION	STRUCTURAL ENGINEER	(FTP POST) (COORDINATION LEAD)	WEEKLY	[DATE]	STRUCT	DESIGN APP	.XYZ	.XYZ .ABC
	MECHANICAL ENGINEER	(FTP POST) (COORDINATION LEAD)	WEEKLY	[DATE]	MECH	DESIGN APP	.XYZ	.XYZ .ABC

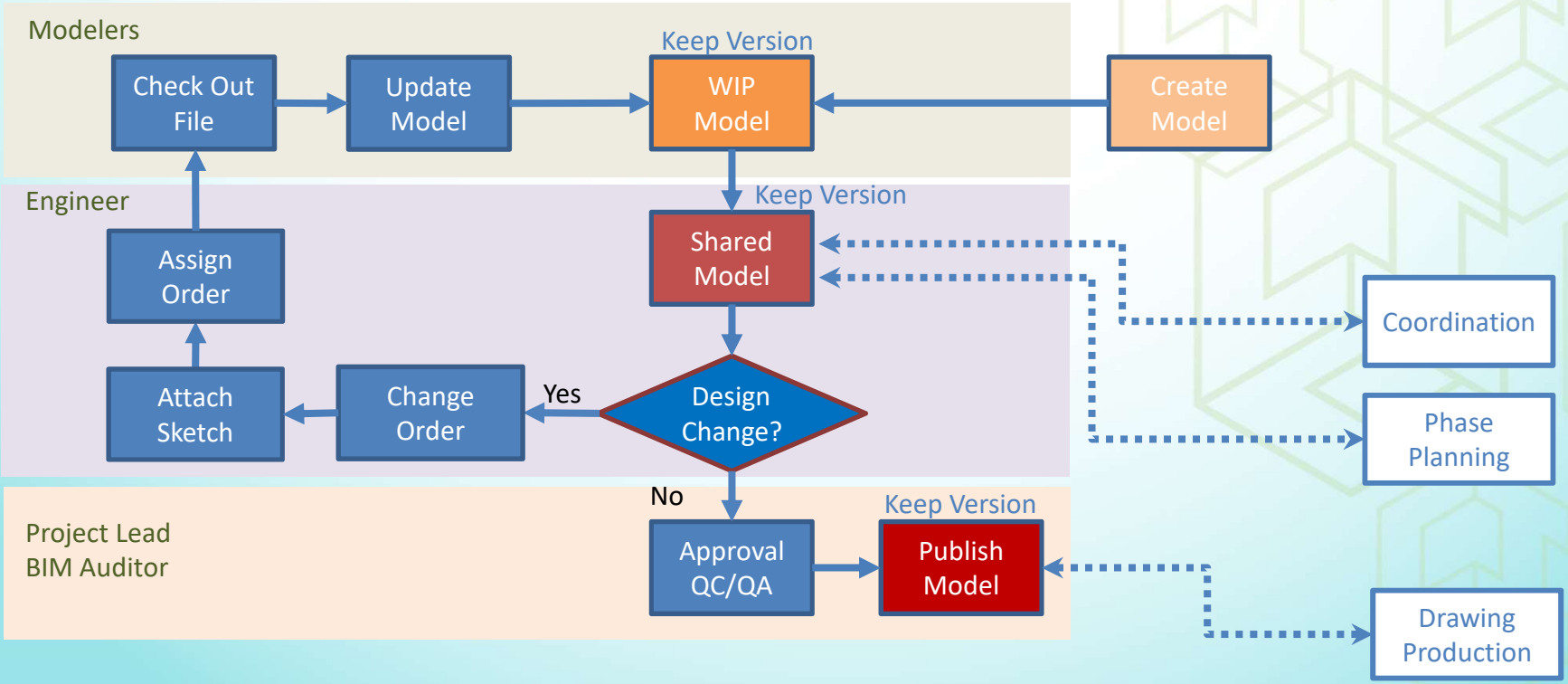
- Project Execution Plan shall be listed out by the BIM Manager / Auditor
- The LOD Standard to be executed in different stages during the project
- Each stages of LOD Standard delivery to be agreed in the PXP

10. Q : How to make a LOD standard in the PXP?

300	Element modeling to include: • Overall size, thickness and geometry of the slab-on-grade • Major openings such as large mechanical elements modeled to nominal dimensions. • Slab depressions • Edge turn downs • All sloping surfaces included in model element with exception of elements affected by manufacturer selection which are not known at this LOD. Such conditions could include floor geometry differences where different specified manufacturers will not be known until the actual system is selected.	 13 A4020-LOD-300 Structural Slabs-on-Grade
350	Element modeling to include: • All penetrations modeled to rough opening dimensions. • Pour joints • Control joints • Expansion joints • Water Stops • Rebar and any embedded elements modeled at congested areas where specified by project BXP which is typically with in a set distance from the area of congestion. • Void boxes • Anchor rods • Moisture retarder • Dowels • Post-tension profile and strands modeled if required by the BXP	 14 A4020-LOD-350 Structural Slabs-on-Grade
400	Element modeling to include: • Fully modeled rebar • Actual slab dimensions and profiles with fully modeled rebar • Post tensioning components • All joints • Water proofing • Finish	

- The use of CIC Standard / LOD Specification by BIM Forum shall be agreed in PXP
- The LOD Standard shall be specified in different stages during the project
- Each discipline shall achieved their own LOD Standard according to the PXP
- BIM Manager / Auditor to review each discipline model to ensure the LOD Standard can be transferred from one stage to another

11. Design/Changes/Deliverables Management



12. Folder structure, Control Spreadsheets, & Naming Convention

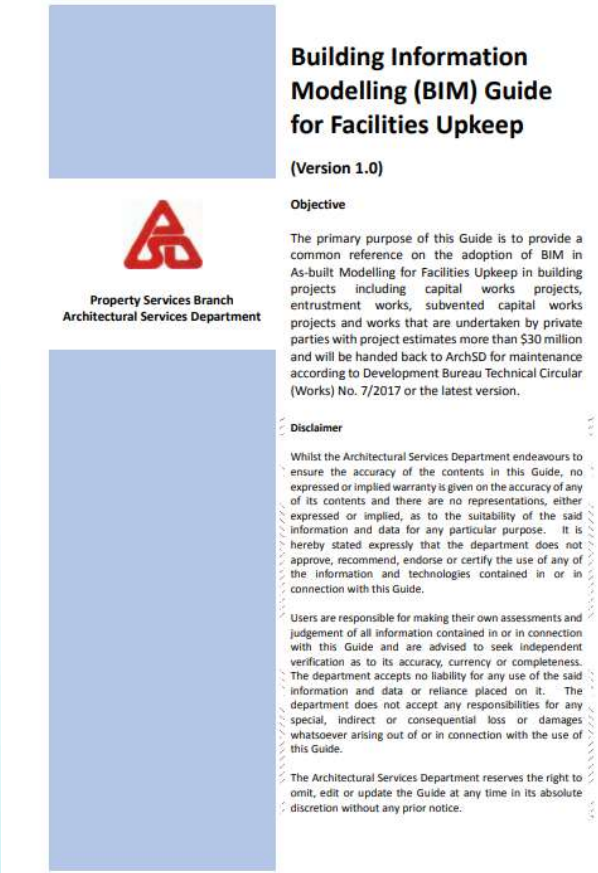
Electrical & Mechanical Services Department

機電工程署
EMSD

Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines

Version 1.0

Nov 2017



Building Information Modelling (BIM) Guide for Facilities Upkeep

(Version 1.0)

Property Services Branch
Architectural Services Department

Objective

The primary purpose of this Guide is to provide a common reference on the adoption of BIM in As-built Modelling for Facilities Upkeep in building projects including capital works projects, entrustment works, subvented capital works projects and works that are undertaken by private parties with project estimates more than $30 million and will be handed back to ArchSD for maintenance according to Development Bureau Technical Circular (Works) No. 7/2017 or the latest version.

Disclaimer

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Users are responsible for making their own assessments and judgement of all information contained in or in connection with this Guide and are advised to seek independent verification as to its accuracy, currency or completeness. The department accepts no liability for any use of the said information and data or reliance placed on it. The department does not accept any responsibilities for any special, indirect or consequential loss or damages whatsoever arising out of or in connection with the use of this Guide.

The Architectural Services Department reserves the right to omit, edit or update the Guide at any time in its absolute discretion without any prior notice.

- ASD & EMSD issued naming standard for Facilities Upkeep

13. Folder structure, Control Spreadsheets, & Naming Convention

10	**Radar and Navigation System**	Radar and Navigation System (^)	RNS
		Antenna	BRR
		Turning unit	TUU
		Display and processing unit	DPU
		Network Equipment	NEE
		Video camera	VIC
		Accessories	ACC
11	**Microwave Link System**	Microwave Link System (^)	MLS
		Antenna	ANT
		Transceiver	TRAN
		RF Interface Unit	RIU
		Processing unit	PRU
		Network Equipment	NEE
		Accessories	ACC
12	**Timing & Display System**	Timing & Display System (^)	TDS
		Operator Control Console / Workstation, PC	OCC
		Control Unit / Server	CUS
		Sensing Unit	SEU
		Master Clock Unit	MCU
		Video Display Unit	VDU
		Video & Audio Equipment	VAE
		Network Equipment	NEE
		Queue Management Unit	QMU
		Uninterruptible Power Supply	UPS

2.2 Definition of LOD for As-built Model

The LOD requirements are referred to the CIC Building Information Modelling Standard. Apart from the CIC requirements, supplementary definition and interpretation of the LOD requirements, if applicable, are listed below. The as-built model shall follow the definition and interpretation as shown in this Guide in order to achieve the required purpose of the as-built model in facilities upkeep.

LOD 350

CIC Building Information Modelling Standard's Definition

The model element is graphically represented within the model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and interfaces with other building systems.

Interpretations in this Guide

Element / object is modeled at sufficient detail and accuracy in terms of quantity, size, shape, location, and orientation for construction coordination.

LOD 400

CIC Building Information Modelling Standard's Definition

The model element is graphically represented within the model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information.

Interpretations in this Guide

Element / object is modeled at sufficient detail and accuracy in terms of quantity, size, shape, location, and orientation for fabrication

LOD 500

CIC Building Information Modelling Standard's Definition

The model element is a field verified representation in terms of size, shape, location, quantity, and orientation.

Interpretations in this Guide

The existence, exact quantity, exact physical dimension, exact shape, approximate orientation, approximate spatial location of the element / object in the model was verified on site. Accuracy of the element / object's setting-out location and its spatial location should be within ± 50mm between the model and the actual verified site installation. The 3D geometry details of the element / object is not less than LOD400 and the shape should be modelled for easy identification. Essential information, such as data of fittings, manufacturer, model number, etc. and other as specified in Appendix 1 and Appendix 3, should be embedded in the model element / object for facilities upkeep use.

- Naming Standard under EMSD
- Definition of LOD for As-built model

14. Folder structure, Control Spreadsheets, & Naming Convention

3.6.1. Line Styles

Category	Line Weight Projection	Line Color	Line Pattern
Lines	3	RGB 000-166-000	Solid
<Area Boundary>	12	RGB 128-000-255	Solid
<Beyond>	3	Black	Dash
<Centerline>	3	Black	AEC_Centre
<Demolished>	3	Black	Demolished
<Fabric Envelope>	1	RGB 127-127-127	Dash
<Fabric Sheets>	1	RGB 064-064-064	Solid
<Hidden>	3	Black	Hidden
<Overhead>	2	Black	Overhead
<Room Separation>	12	Cyan	AEC_Dash_3.0mm
<Sketch>	6	Magenta	Solid
<Space Separation>	12	Green	AEC_Dash_3.0mm
AEC_1-Soild	1	Black	Solid
AEC_3-Soild	3	Black	Solid
AEC_5-Soild	5	Black	Solid
AEC_6-Soild	6	Black	Solid
AEC_7-Soild	7	Black	Solid
AEC_8-RNF_Mesh	8	Black	AEC_DashDot_6.0mm
AEC_8-Soild	8	Black	Solid
AEC_9-Soild	9	Black	Solid
AEC_10-DPC	10	Magenta	Solid
AEC_10-DPM	10	RGB 000-128-000	AEC_DoubleDash
AEC_10-Soild	10	Black	Solid
AEC_11-Rebar	11	Black	Solid
Axis of Rotation	12	Blue	AEC_Centre
Centre	1	Black	AEC_Centre
Dash_1.5	1	Black	AEC_Dash_1.5mm
Dash_3.0	1	Black	AEC_Dash_3.0mm
Dash_3.0_Loose	1	Black	AEC_Dash_3.0mm_Loose
Dash_9.0	1	Black	AEC_Dash_9.0mm
DashDot_3.0	1	Black	AEC_DashDot_3.0mm
DashDot_6.0	1	Black	AEC_DashDot_6.0mm
DashDotDot_6.0	1	Black	DashDotDot_6.0
Demolished	1	Black	Demolished
Dot_1.0	1	Black	Dot_1.0
Dot_2.0	1	Black	Dot_2.0
Dot_4.0	1	Black	AEC_Dot_4.0mm
DoubleDash	1	Black	AEC_DoubleDash
ElevationSwing	1	Black	Elevation Swing
GridLine	1	Black	Grid Line
Hidden	1	Black	Hidden
Hidden Lines	3	RGB 000-161-000	AEC_Dash_3.0mm
Hidden_2.0	1	Black	AEC_Hidden_2.0mm
Insulation Batting Lines	3	Black	Solid
Lines	3	RGB 000-161-000	Solid
Medium Lines	5	Black	Solid
Overhead	1	Black	Overhead
Red Line	8	Red	Aligning Line
Thin Lines	1	Black	Solid
TripleDash	1	Black	AEC_TripleDash
Wide Lines	10	Black	Solid
WindowSwing	1	Black	Window Swing

- Line Styles Standard

3.6.4. E&M Systems Colour Coding

The colour coding shall be assigned for the system types below by configuration of corresponding "Filters" under "Visibility/Graphics Override". For system types not listed below, consultants or contractors are advised to propose new colour coding for new system types with substantiation, where deemed necessary.

System Type	Color Palette	RGB Code
Primary Air Duct		0,255,255
Exhaust Air Duct		0, 255, 0
Fresh Air Duct		0, 0, 255
Supply Air Duct		255, 0, 0
Return Air Duct		255, 0, 255
Transfer Air Duct		0, 128, 255
Smoke Extraction Duct		128, 128, 0
Make Up Air Duct		192, 192, 192
Staircase Pressurization Duct		192, 192, 192
Condensate Drain Pipe		255, 128, 0
Chilled Water Return Pipe		0, 255, 0
Chilled Water Supply Pipe		0, 0, 255
Condening Water Supply Pipe		0, 128, 64
Condening Water Return Pipe		0, 128, 255
Chemical Dosing Pipe		192, 192, 192
Make-up Water Pipe		192, 192, 192
Heating Hot Water Supply Pipe		128, 0, 0
Heating Hot Water Return Pipe		255, 128, 64
Waste Pipe		128, 128, 0
Soil and Waste Pipe		128, 0, 0
Vent Pipe		0, 128, 255
Rain Water Pipe		0, 255, 255
Pumped Soil & Waste Pipe		64, 0, 0
Pumped Waste Pipe		64, 64, 0
Pumped Rainwater Pipe		0, 128, 128
Cleaning Water Pipe		0, 0, 255

- Color Standard

15. Folder structure, Control Spreadsheets, & Naming Convention

2.3.3 3D Animation

The as-built model shall be provided with video clip files with 3D animation showing the assembly, disassembly, repair and replacement method for special component or special building system such as curtain wall system, etc. as specified in the contract and Appendix 3 for viewing in the AIS. The objective of the 3D animation is to illustrate how the special component or special building system can be maintained.

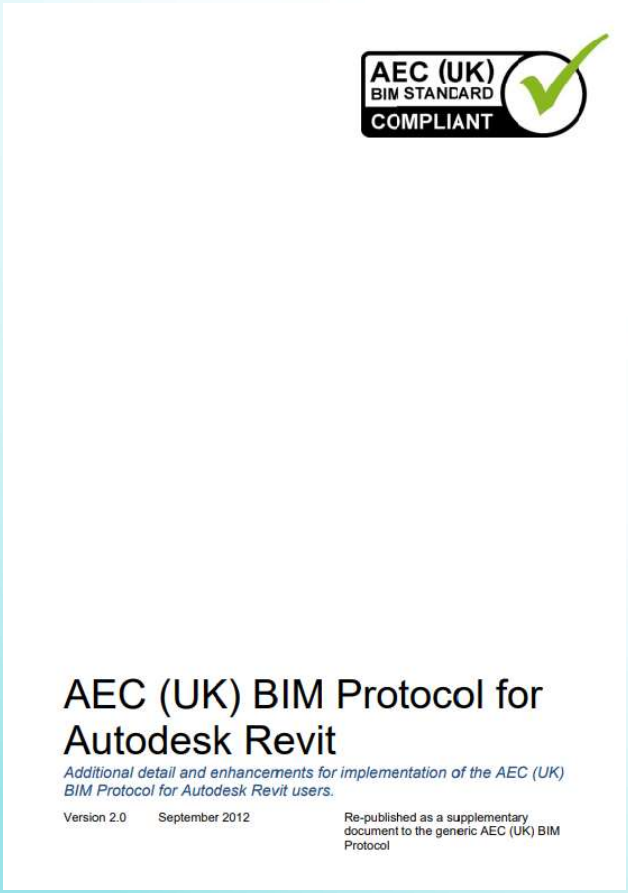
In general, the 3D animation shall be generated with LOD ranged from LOD350 to LOD500 following Appendix 3. The 3D animation converted from the as-built model shall be in mp4 format with resolution not lower than 1080p HD 30 fps or alternative format requested by PSB. As the extent of the 3D animation required is depended on the actual design of the building, proposal of the 3D animation shall be subject to PSB's approval.

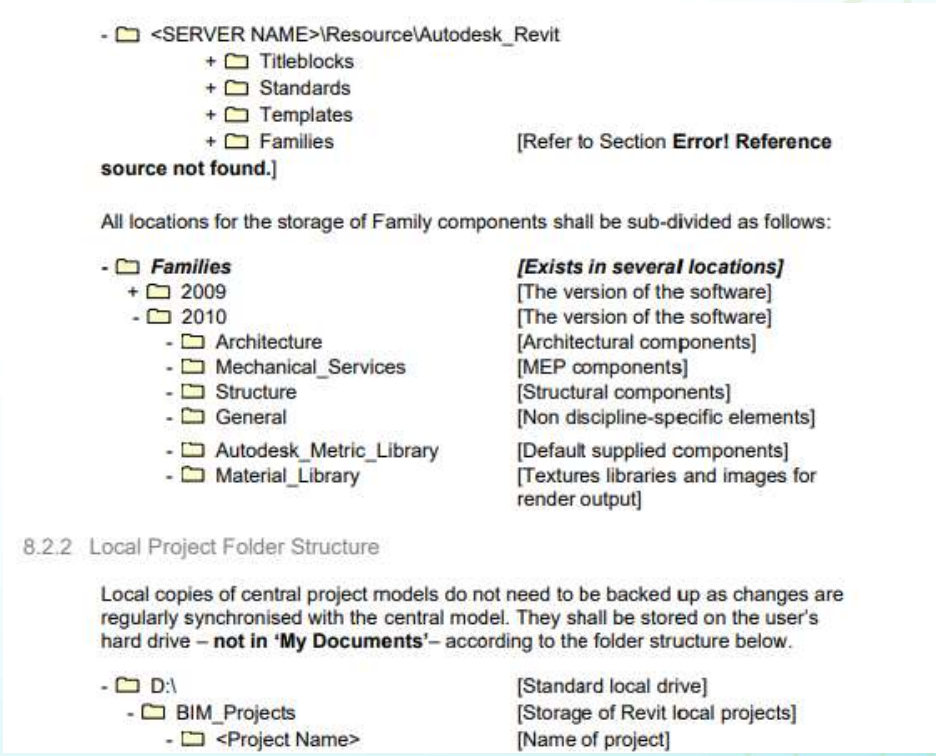
2.3.4 Model Requirement for Graphic & Non-graphic Information

The model requirement of the architectural, plumbing and drainage as-built model shall follow the requirement in Appendix 3. In case another requirement in the same contract requests for a higher LOD, a higher LOD of the concerned as-built model shall be provided. Besides, for plumbing and drainage as-built model, the requirements stated in the Building Information Modelling for Asset Management (BIM-AM) – Standards and Guidelines issued by Electrical & Mechanical Services Department (EMSD) shall also be followed.

- 3D Animation is required for special building system such as: Curtain Wall system which can be delivery to Facility Management for further maintenance if needed.

16. Folder structure, Control Spreadsheets, & Naming Convention





- <SERVER NAME>\Resource\Autodesk_Revit
  - + Titleblocks
  - + Standards
  - + Templates
  - + Families [Refer to Section **Error! Reference source not found.**]

All locations for the storage of Family components shall be sub-divided as follows:

- ***Families***	***[Exists in several locations]***
+ 2009	[The version of the software]
- 2010	[The version of the software]
- Architecture	[Architectural components]
- Mechanical_Services	[MEP components]
- Structure	[Structural components]
- General	[Non discipline-specific elements]
- Autodesk_Metric_Library	[Default supplied components]
- Material_Library	[Textures libraries and images for render output]

8.2.2 Local Project Folder Structure

Local copies of central project models do not need to be backed up as changes are regularly synchronised with the central model. They shall be stored on the user's hard drive – **not in 'My Documents'**– according to the folder structure below.

- D:\	[Standard local drive]
- BIM_Projects	[Storage of Revit local projects]
- <Project Name>	[Name of project]

- Folder Structure according to AEC (UK) BIM Standard for family

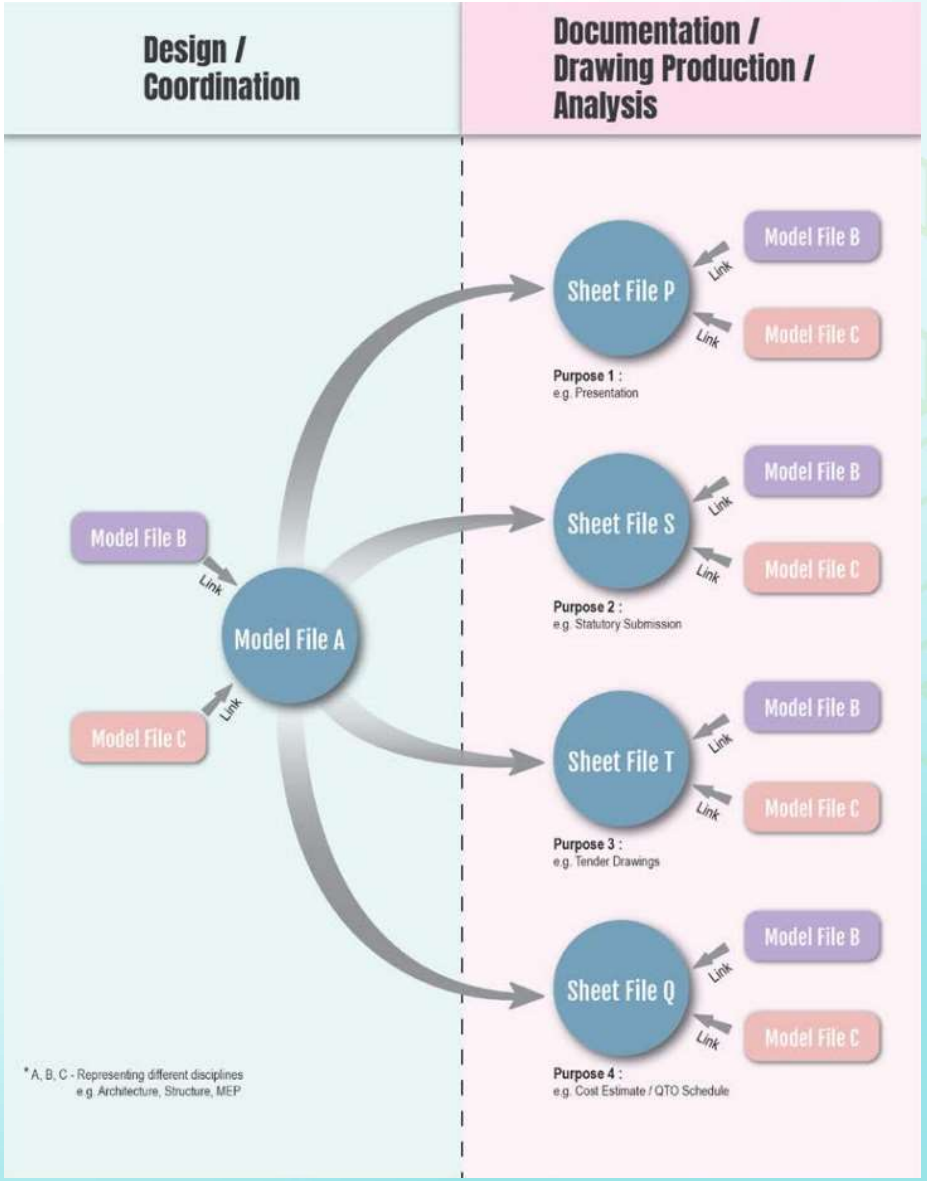
17. Generation of Documentation

- General Concept
  - Link Models > Generate Views > Generate Sheets
  - EXPORT to CAD (civil) /PDF / Light Format
- Extracted from Model
  - Layout
  - General arrangement
  - Sections
- Hybrid CAD/BIM
  - Standard drawings
  - Detail drawings (or in BIM)
- CAD Standard compliance is a BIG Issue

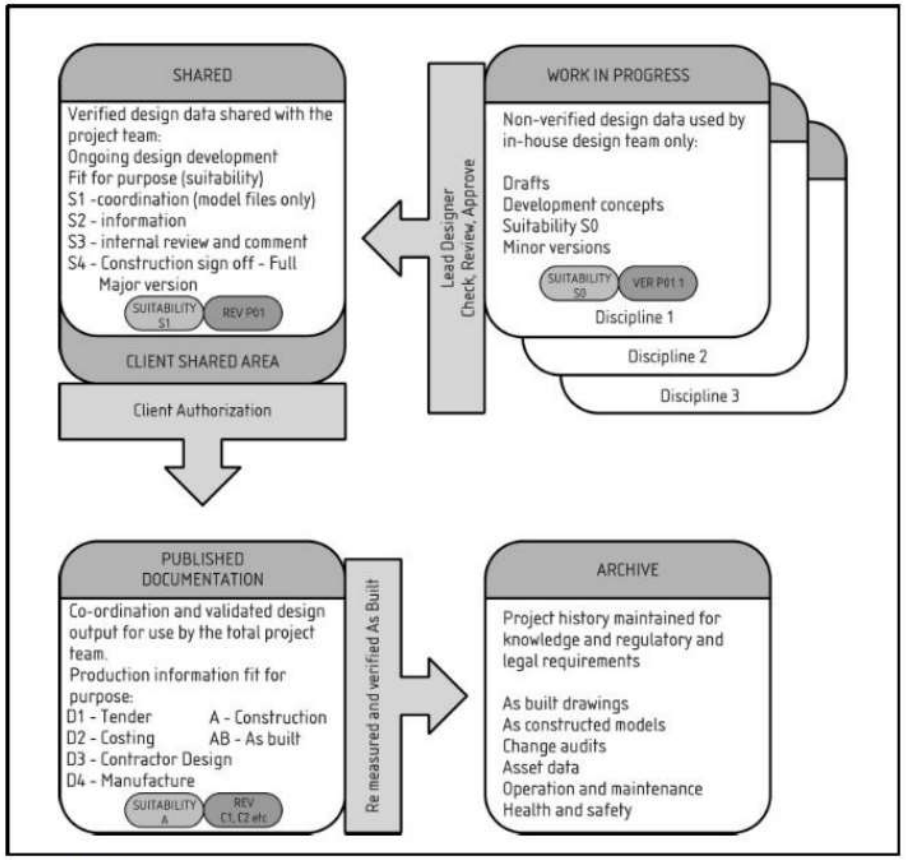
18. BIM Documentation

Model Files vs Drawing Files

Drawing / Model Register



19. Folder structure, Control Spreadsheets, & Naming Convention



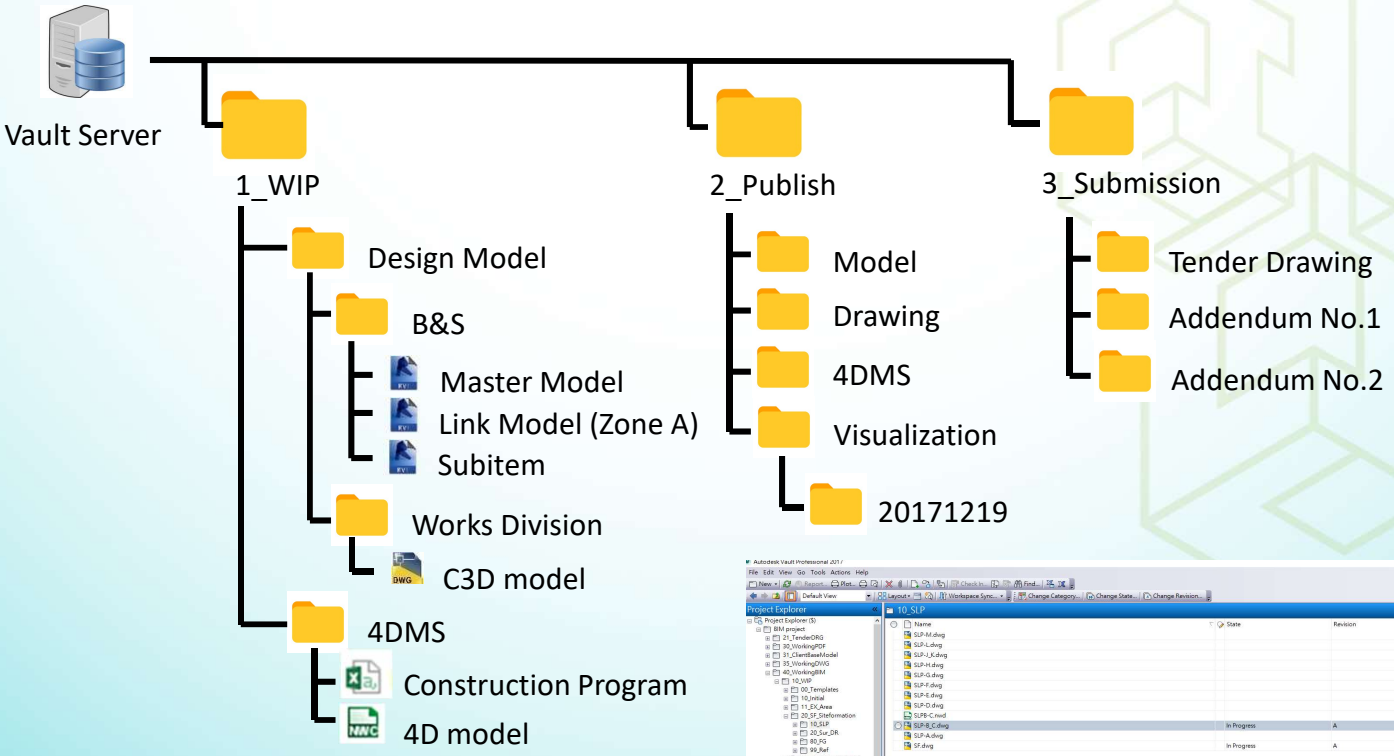
© 2007 BSi

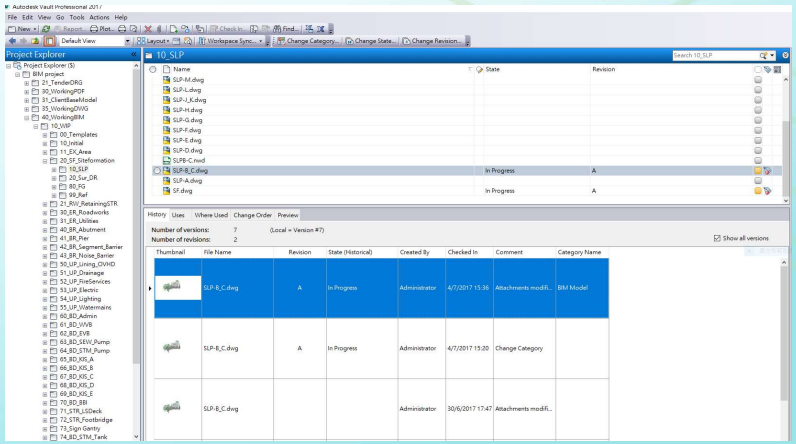
- 🗀 ***[Project Folder]***
  - 🗀 BIM — [BIM data repository]
    - 🗀 **01-WIP** — **[WIP data repository]**
      - 🗀 CAD — [CAD files (incl. 'Modified')]
      - 🗀 BIM — [Design models (incl. 'Modified')]
      - 🗀 SheetFiles — [Sheet/dwg files]
      - 🗀 Export — [Export data e.g. IFC or images]
      - 🗀 Families — [Components created during this project]
      - 🗀 WIP_TSA — [WIP Temporary Shared Area (TSA)]
    - 🗀 **02-Shared** — **[Verified Shared data]**
      - 🗀 CAD — [CAD data/output files]
      - 🗀 BIM — [Design models]
      - 🗀 CoordModels — [Compilation models]
    - 🗀 **03-Published** — ***[Published Data]***
      - + 🗀 YYYYMMDD-Description — [Sample submission folder]
      - + 🗀 YYYYMMDD-Description — [Sample submission folder]
    - 🗀 **04-Archived** — **[Archived Data repository]**
      - + 🗀 YYMMDD-Description — [Archive folder]
      - + 🗀 YYMMDD-Description — [Archive folder]
    - 🗀 **05-Incoming** — **[Incoming Data repository]**
      - 🗀 Source — [Data originator]
        - + 🗀 YYYYMMDD-Description — [Incoming folder]
      - + 🗀 Source — [Data originator]
    - 🗀 **06-Resource** — **[Project BIM Resources Library]**
      - + 🗀 Titleblocks — [Drawing borders/titleblocks]
      - + 🗀 Logos — [Project logos]
      - + 🗀 Standards — [Project standards]

No spaces are to be used in the folder naming as this can potentially interfere with certain file management tools and collaboration across the internet.

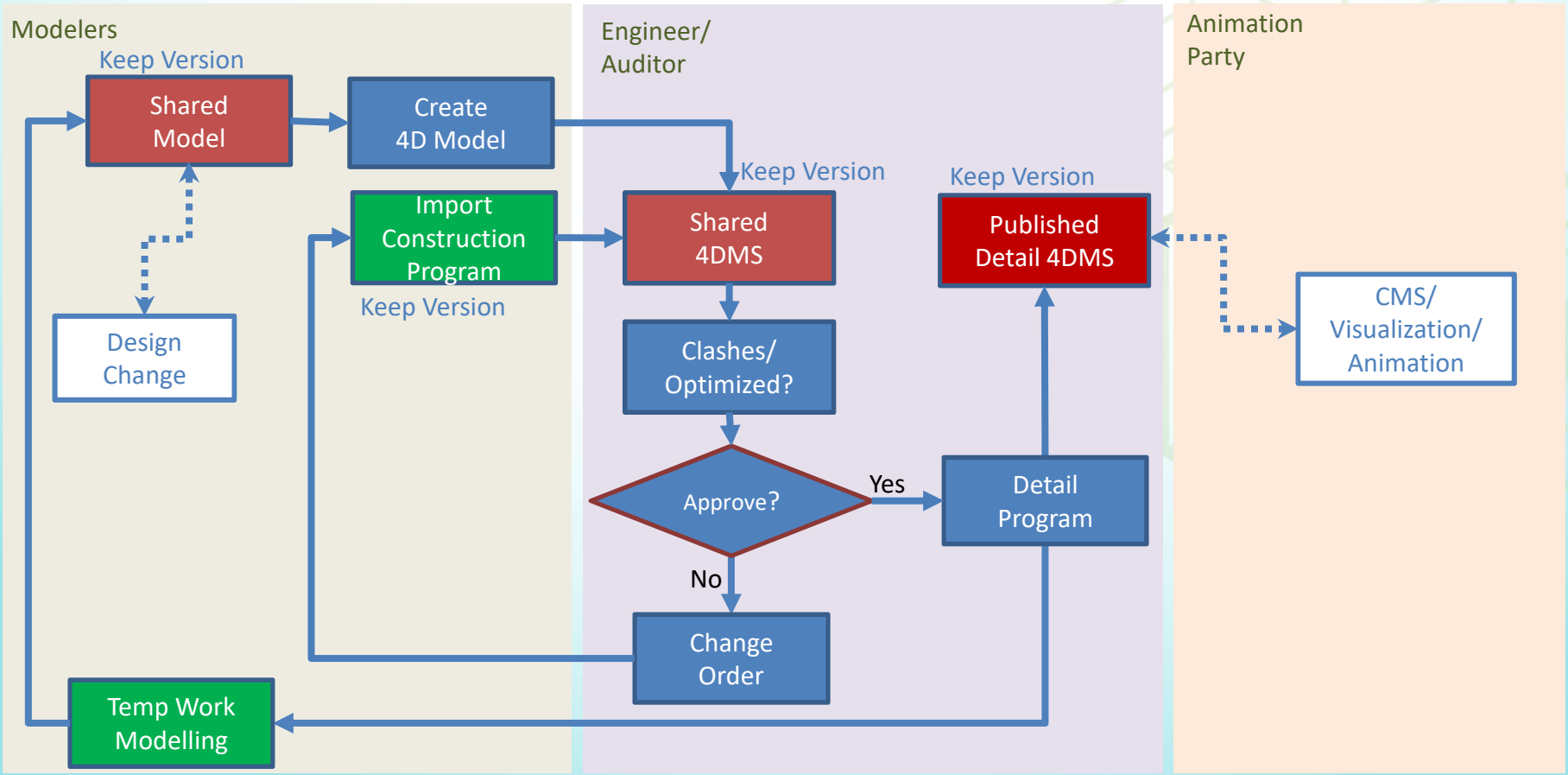
- Common Data Environment (CDE) to define the Folder Structure

20. Common Data Environment

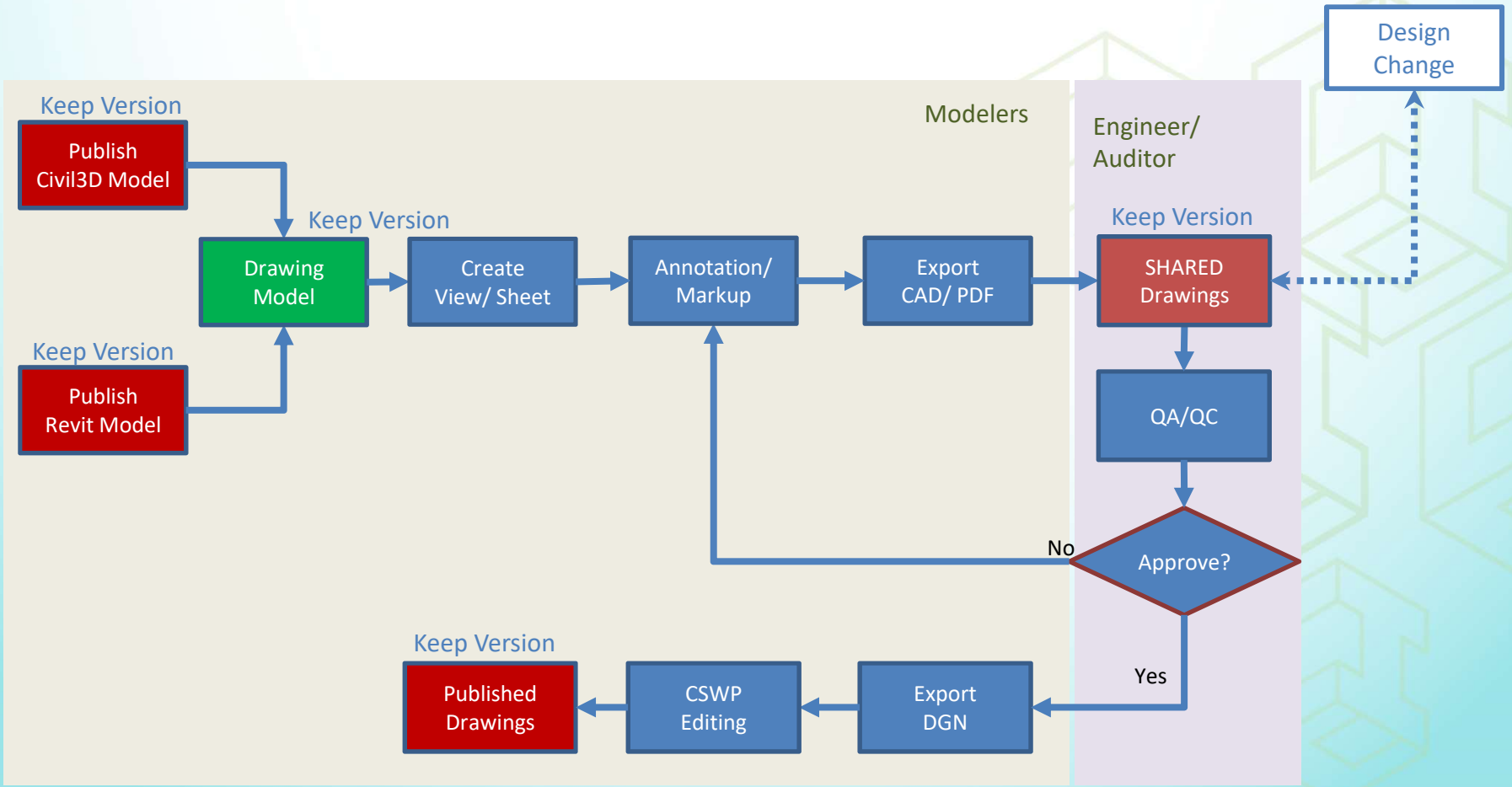




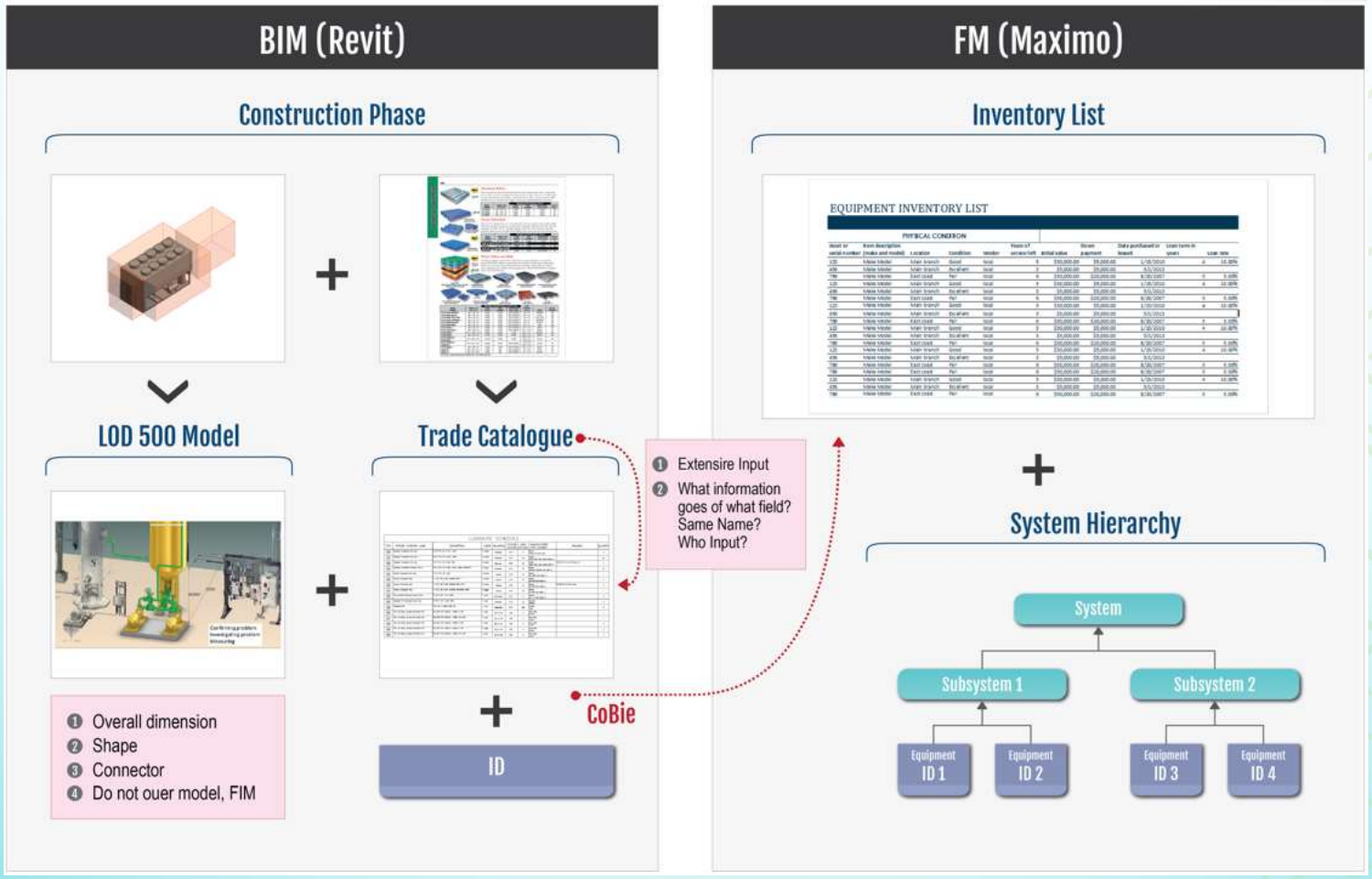
21. Phase Planning Management



22. Drawing Production Process

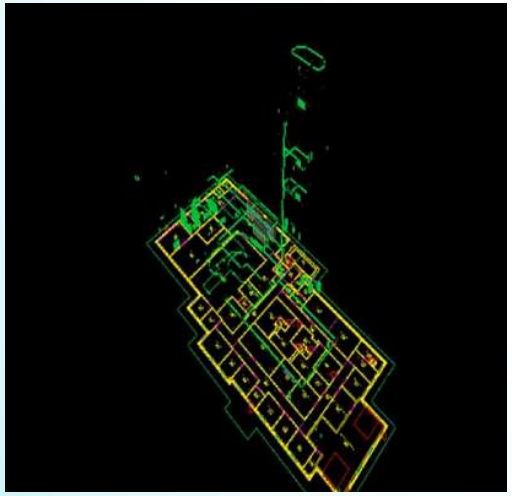


23. Drawing Production Process



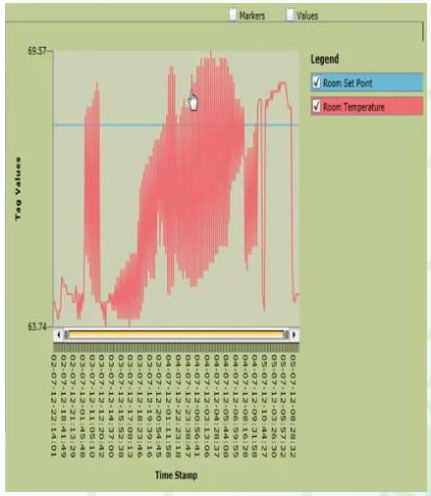
- Drawings production can be filter and generate from BIM to FM by COBie
- The FM shall setup the Standard from the design stage

24. FM Operation

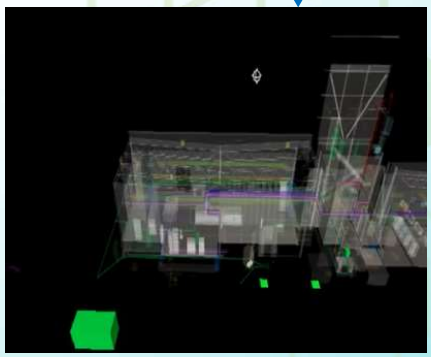


1. Filter to select the area

2. Locate the problem area



3. Check the data



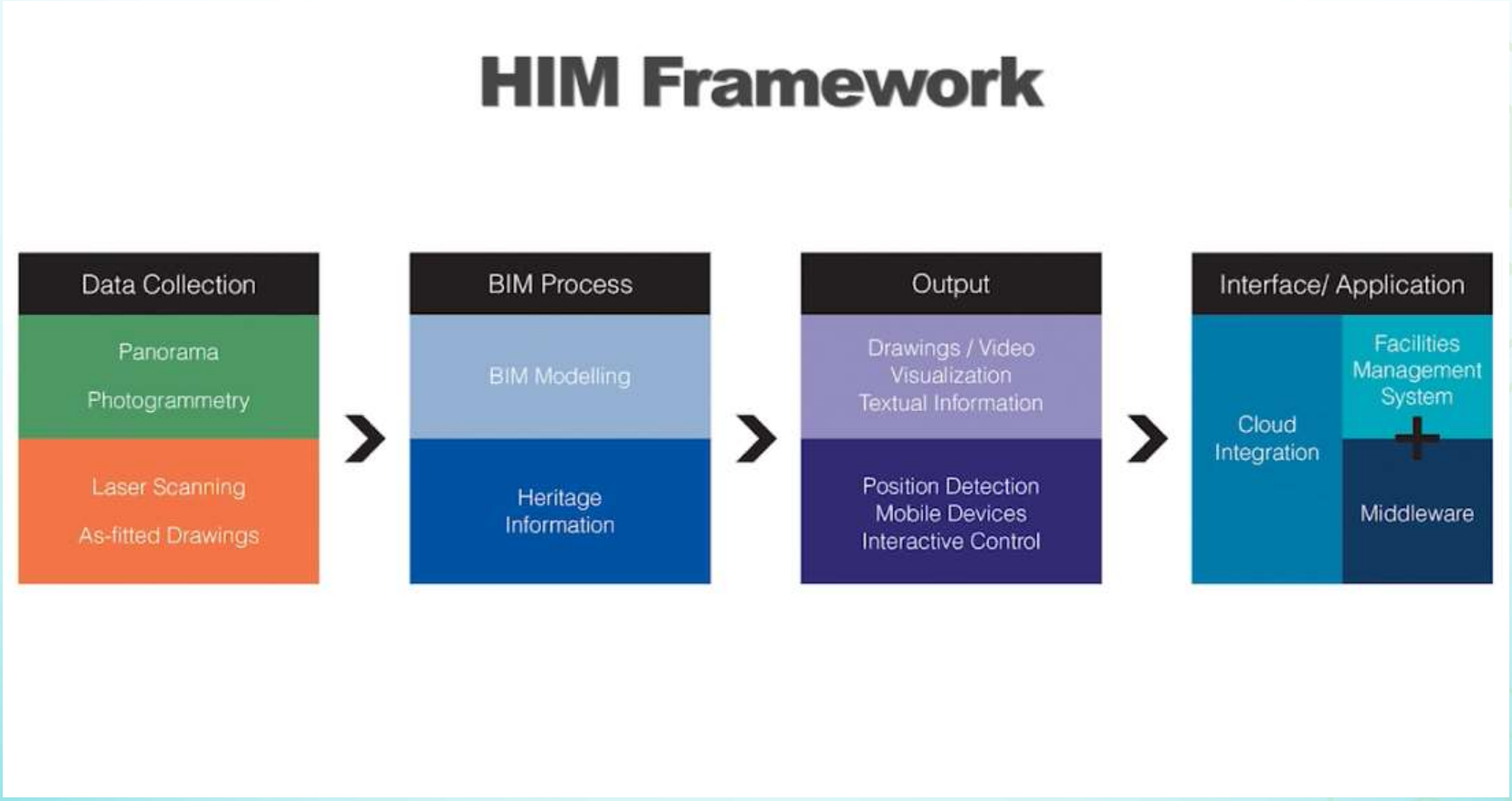
4. Find the source

5. Information of the model

6. Place the order

- BIM allow the information can be trackable in 3D virtual world
- Information contained in the model can be referred as a record for FM
- Any replacement of component can be scheduled in FM operator

25. Drawing Production Process



- Output of information can be placed in Cloud for public access
- A Middleware platform between Real & the Virtual World

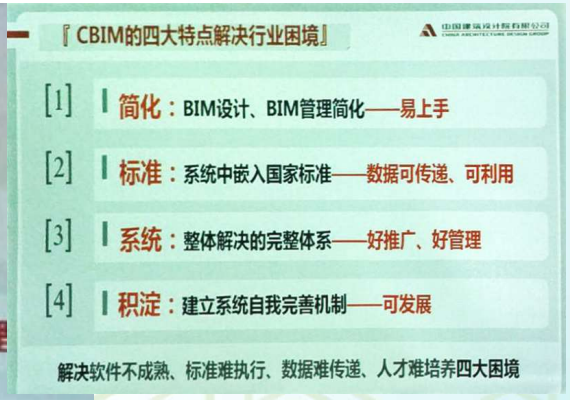
26. CBIM (China BIM) Development

- Project cycle development have divided into six stages categories
- Cloud Platform allow accessibility from different devices
- Extend of Library and Components are extended for China use

27. CBIM (China BIM) Development

- Extend of Library and Components are extended for China use

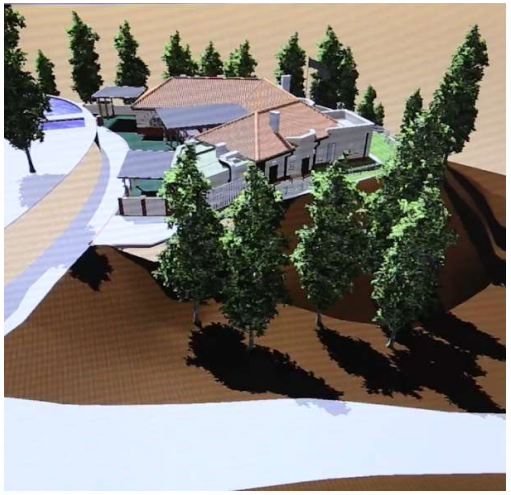
28. CBIM (China BIM) Development



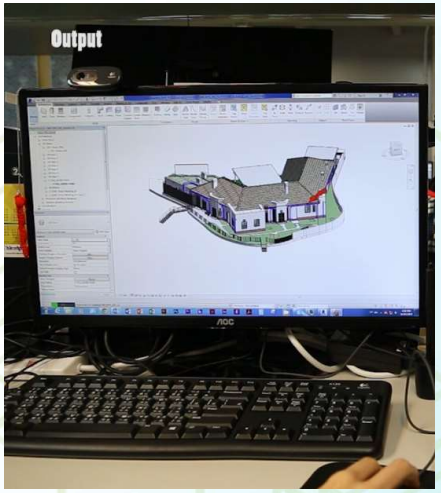
- Online BIM Library in China Standard
- CBIM development : Simplify BIM Platform, BIM Standard, System Management and Self-Improvement System

29. FM in Heritage

1. Laser Scan on site



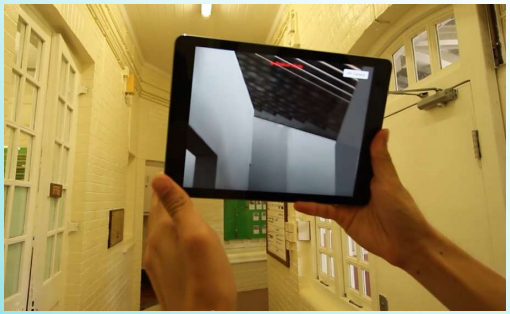
2. Simulate in BIM



3. Input the data

4. VR in the real world

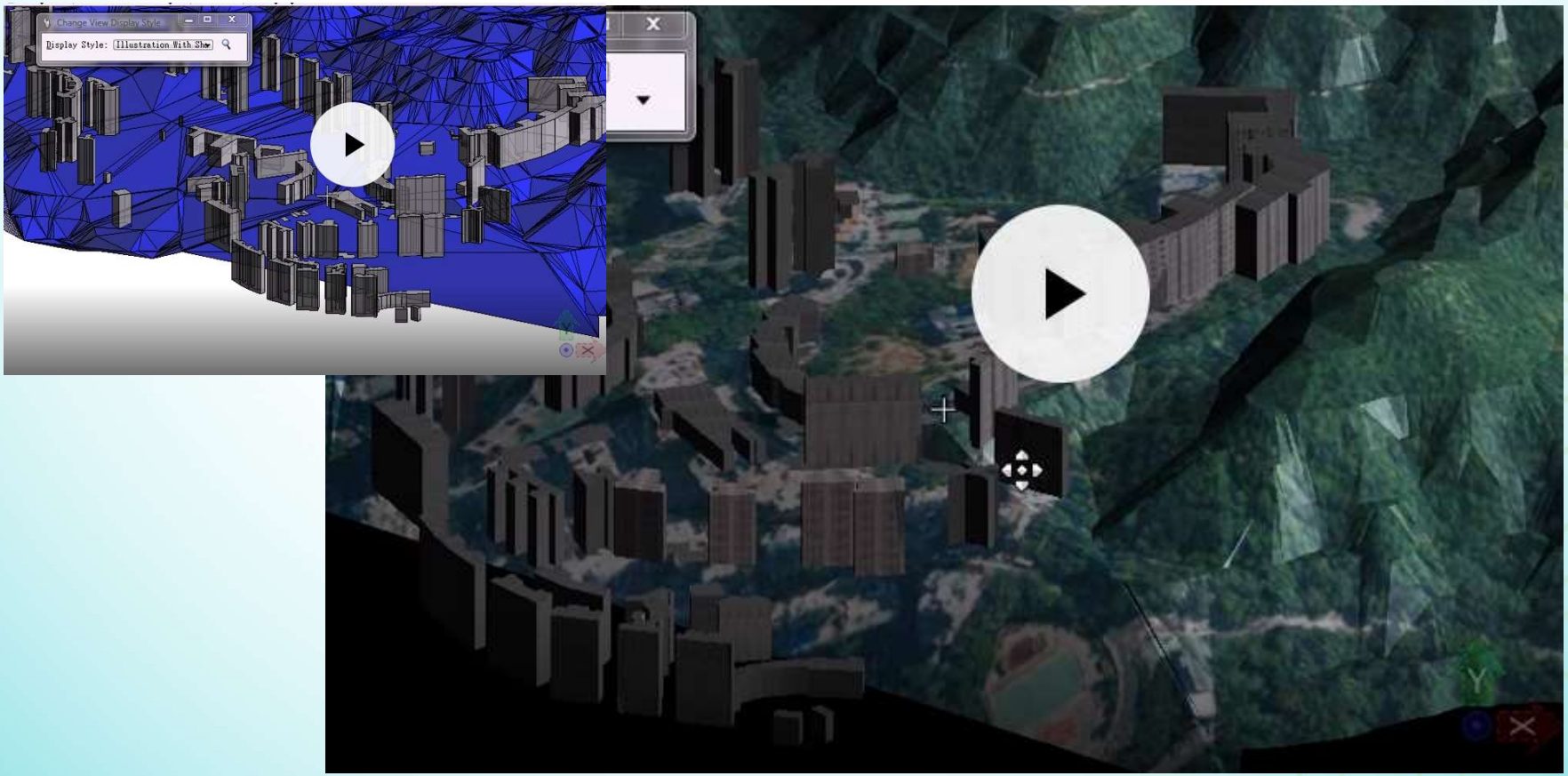
5. Information can be shared



6. Information can be used for checking

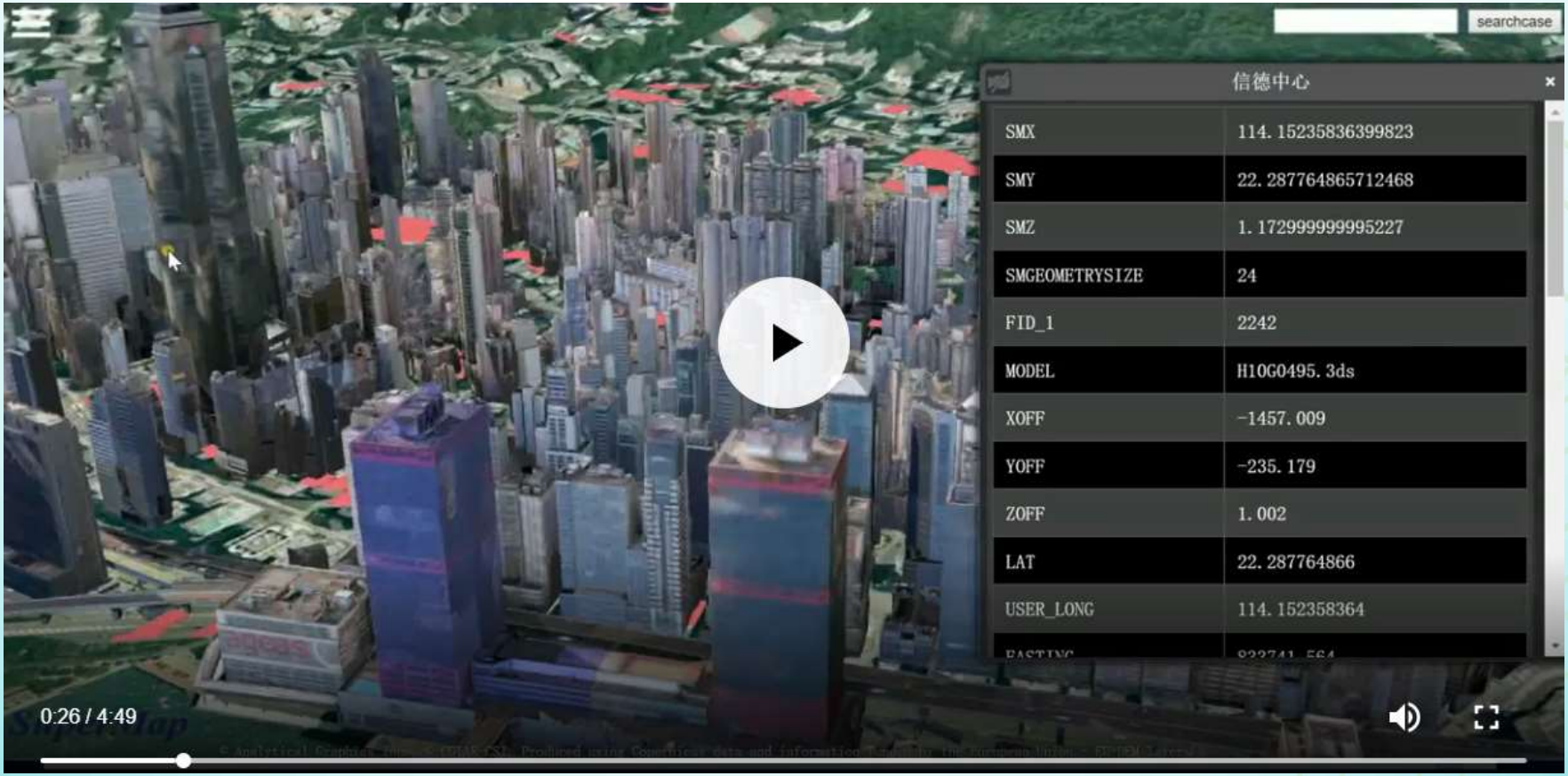
- BIM allow the information can be trackable in 3D virtual world
- Information contained in the model can be referred as a record for FM
- Any replacement of component can be scheduled in FM operator

30. GIS? Smart City



- Hong Kong 3D City GIS
- Information with disposition and topography

31. GIS? Smart City



- Building Massing with basic information

32. GIS? Smart City

智慧城市报告:中国在建数量最多已超过500座

2018-04-02 绚云科技

德勤最新发布的一份《超级智慧城市报告》(Super Smart City:Happier Society with Higher Quality)表示,目前全球已启动或在建的智慧城市已达1000多个,中国在建500个,远超排名第二的欧洲(90个)。

德勤报告称,中国拥有比其他国家更多的智能城市,试点已达290个。

所谓"智慧城市",就是采用物联网技术,例如互联传感器、计量器和路灯,来采集并分析数据,进而改进公共基础设施和服务。智慧城市有望大大改变市民生活、工作和出行方式。

当前智慧城市现状

- China become the fastest growing country to adopt Smart City

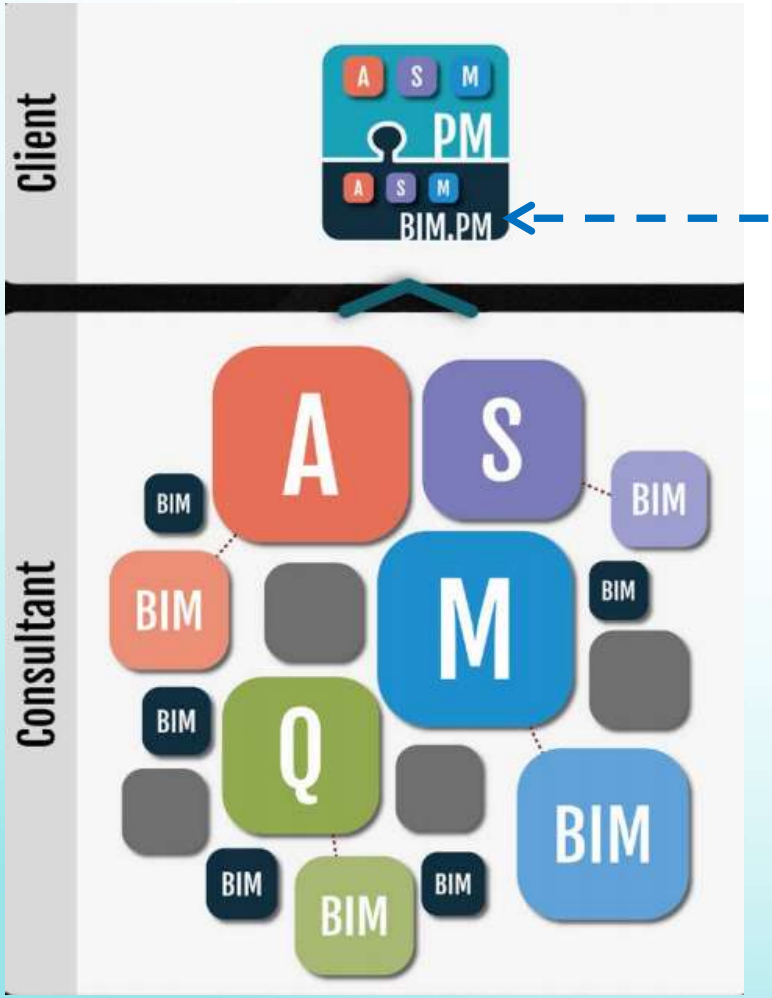
33. VR and Reality

- Mircosoft Hololens to allow BIM/Model to project in reality

https://www.youtube.com/watch?v=qym11JnFQBM

34. BIM Management

BIM Manager to check cross discipline for the whole project

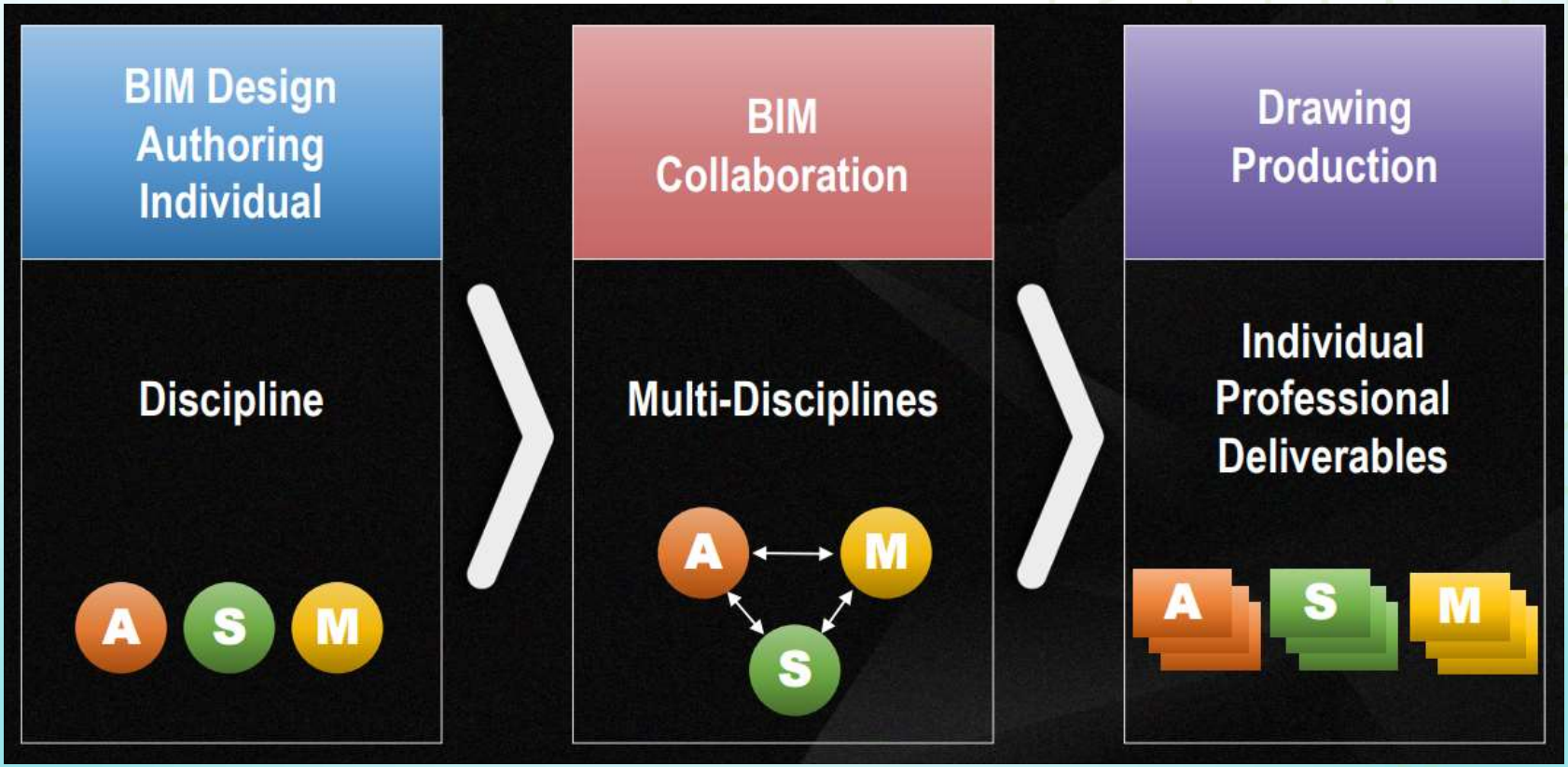


- BIM Manager assist to set up Project Execution Plan with the employer
- Set up requirement in the tender stage for the consultants
- BIM Manager to check each discipline delivery for the project

Question to be answered in future :

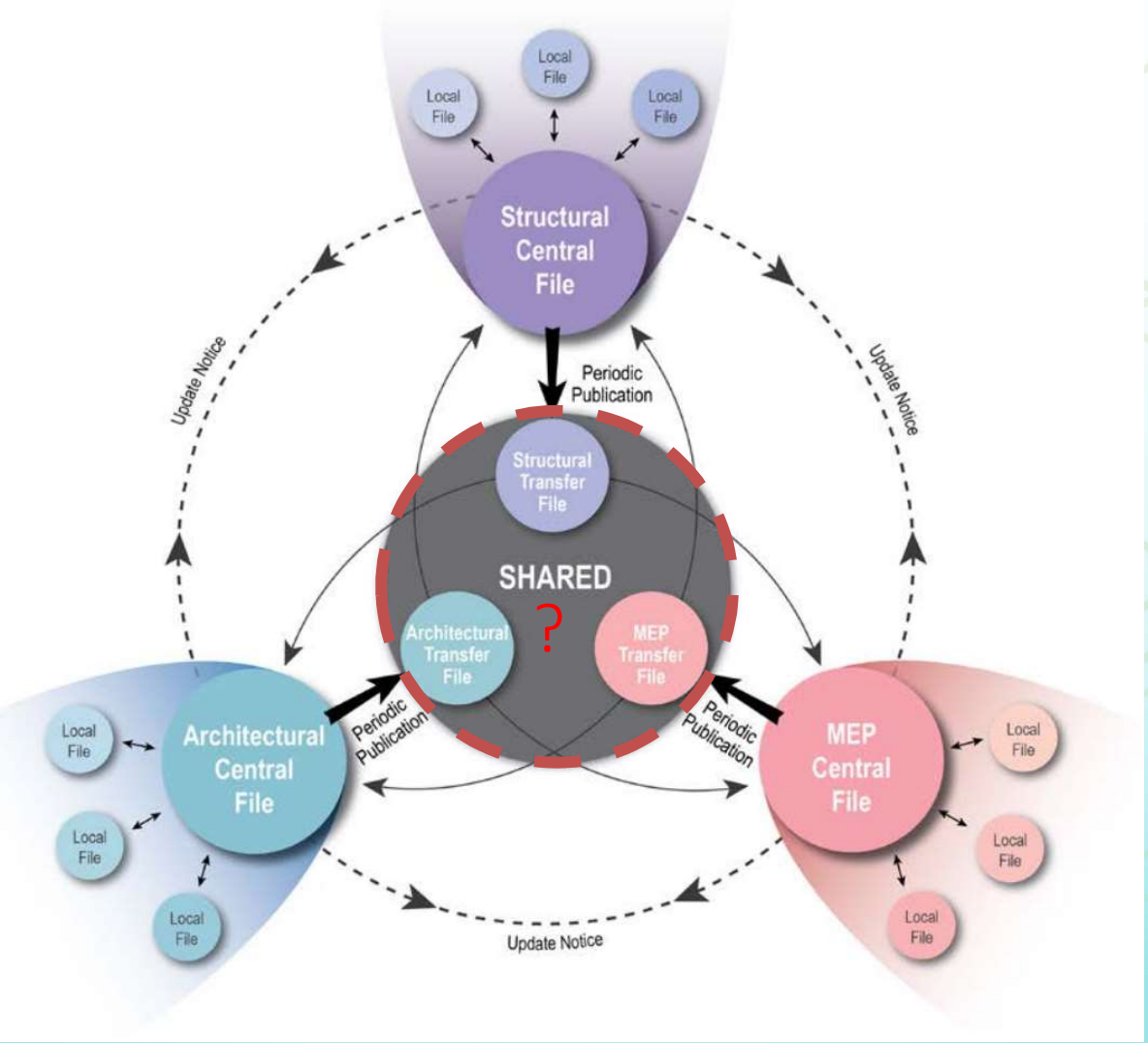
- What if the BIM only imply in construction phase?
- If AI change of design? How to instruct the contractor by BIM?

35. Understanding of cross-disciplinary model collaboration, office standards compliance check, dataset validation, clash analysis and detection

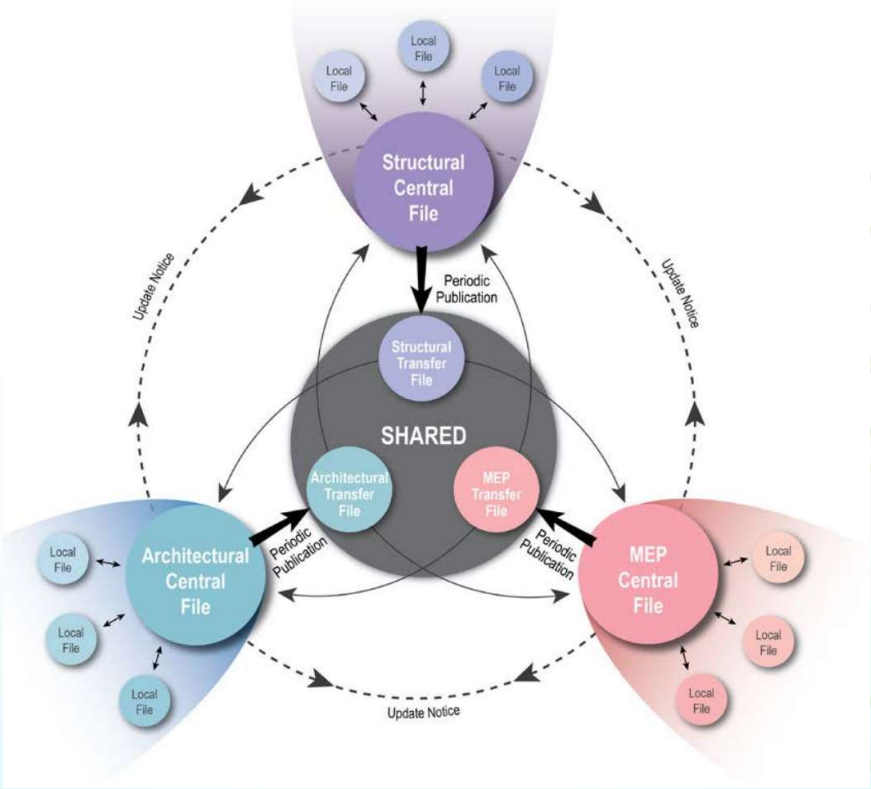


36. CDE (Common Data Environment)

How to share information for collaboration?



37. CDE (Common Data Environment)



Concept of CDE:

- WIP (Work in progress) to share with other discipline / to construction phase
- Publish Information for all discipline to review
- SSOT with record of date and author
- Archive of information from design to completion of project

38. CDE (Common Data Environment)

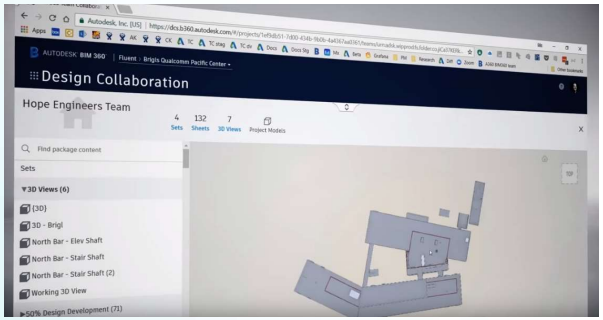
Commercial Platform – BIM360

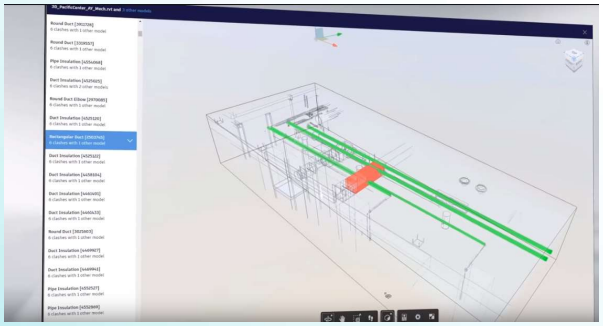
- Common share platform for multi discipline to exchange information
- Can access by different devices online

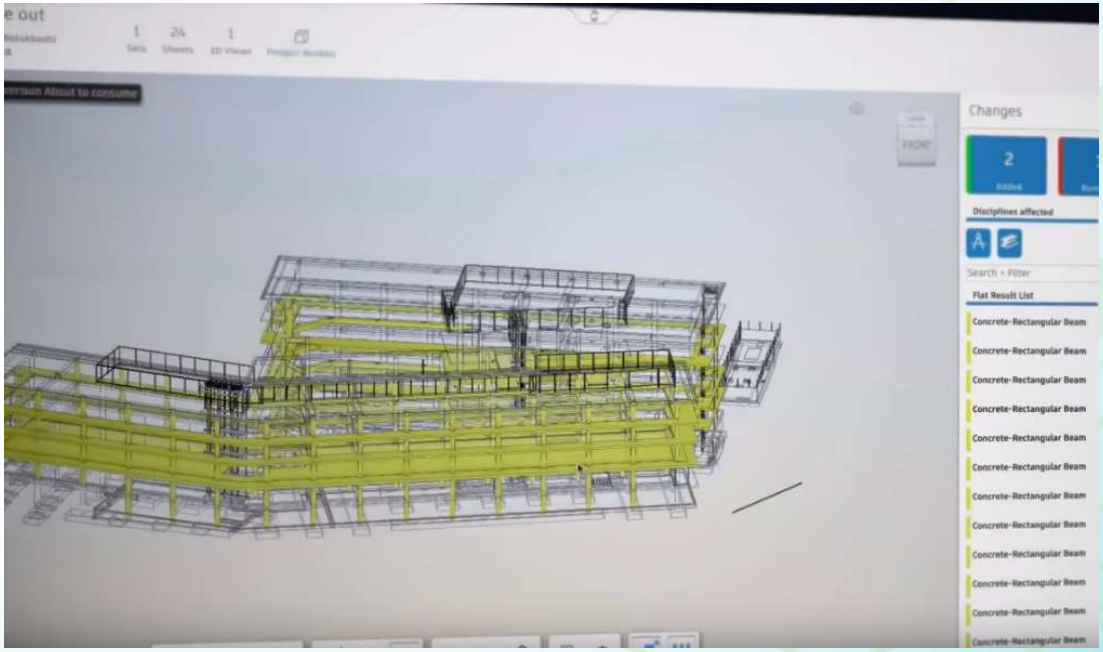
https://www.youtube.com/watch?v=U20tciM4gBk

39. CDE (Common Data Environment)

Commercial Platform – BIM360



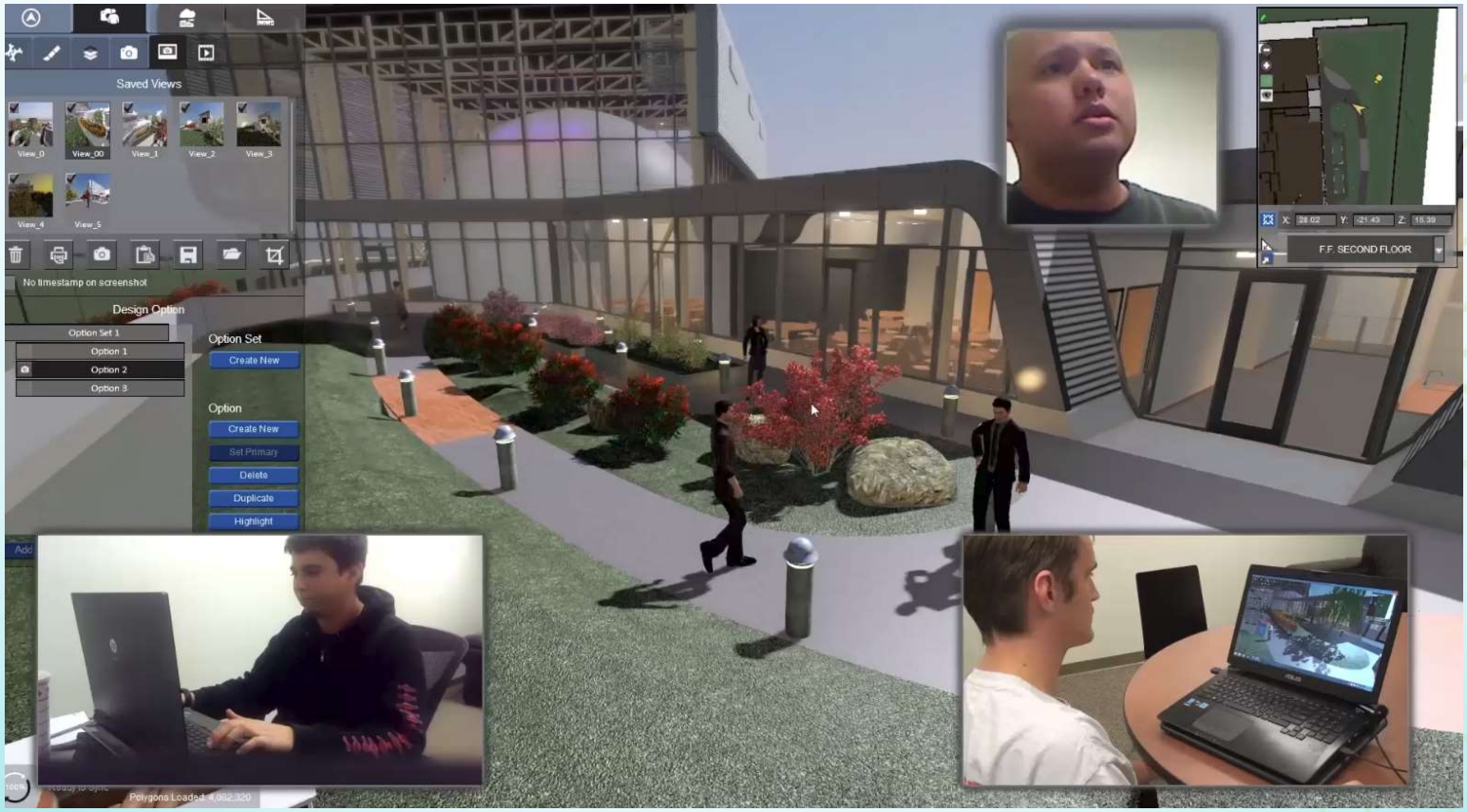




- Change of Model / Information can be recorded with time and author
- Model / Information can be reviewed directly online
- No limit in time and location

https://www.youtube.com/watch?v=U20tciM4gBk

40. Further Development of CDE



Online Multi Discipline platform

- Plugin software to simulate the virtual environment
- Different discipline can involve and revise the design at the same time

https://www.youtube.com/watch?v=DUwBQjjeVsQ

41. Certify of BIM

How to ensure the BIM delivery in Hong Kong?

BIM Team Structure

The Consultant/Contractor* shall propose and establish a BIM team that are appropriate for the scale and complexity of the Assignment/Contract*, highlighting key roles and responsibilities of each position, within [14] calendar days after commencement of Assignment/Contract*. The team shall be led by a BIM team leader who holds a key position in the Consultant/Contractor's* project team structure. The BIM team shall include sufficient and technically competent resources in order to complete all BIM tasks and deliverables specified in the Assignment/Contract*. Notwithstanding, the BIM team shall at least comprise [3] staff well trained in relevant disciplines. The BIM team leader shall either have corporate membership of an appropriate professional institution or shall have [5] years relevant post-qualification experience plus university degree or equivalent in an appropriate engineering discipline. The BIM team leader shall have a minimum of [3] years of practical experience in management of BIM projects or a professional member of the Hong Kong Institute of Building Information Modelling (HKIBIM) or equivalent. The disciplinary BIM coordinators shall have [3] years related construction project experience. The coordinators shall have a minimum of [1] year practical experience in BIM projects or an associate member of the HKIBIM or equivalent.

BIM Sub-Consultant/Sub-Contractor*

If the Consultant/Contractor* does not have the necessary expertise, the Consultant/Contractor* shall engage a sub-consultant/sub-contractor* with suitable expertise for the performance of BIM related tasks. If the Consultant/Contractor* intends to or is required to sub-contracts the BIM works to a BIM sub-consultant/sub-contractor*, the Consultant/Contractor* shall obtain approval from the Director/Engineer* before formal engagement and shall indicate this clearly in the project team structure. The positions of the staff members from the BIM sub-consultant/sub-contractor* shall also be indicated clearly in the BIM team organisation structure.

- HKIBIM with certify qualification in different discipline
- To ensure the user is knowledgeable in BIM operation
- Proper training to be provided for Design Author

THANK YOU