CERTIFICATE COURSE IN BIM MODELLING

Architecture Track

Certificate Course in BIM Modelling (Architecture Track)

Topic Overview

	Day 1	Day 2	Day 3	Day 4
AM	BIM Fundamentals & Revit Interface	BIM e-Submission Guidelines & Template Overview	(Assignment – 3D part finish)	(Assignment – 2D Documentation, Family)
	Starting a BIM project: Project template, Insert files, Project base point, Grids & Levels, Create views	Basic 3D modeling : staircase, railing, roof, ceiling		
PM	Site & Mass Modelling	(Assignment – 3D part)	Family editor interface & simple family creation	
	Basic 3D modeling : Wall, floor, ramp, doors & windows		Basic 2D elements: rooms, area, annotation, dimension, tags, schedule, sheets, titleblock, exporting files.	

DAY 1

BIM INTRODUCTION

- “A change anywhere is a change everywhere”

- Autodesk

Building Information Modeling - BIM

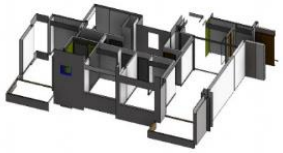
- What is BIM
- What are the benefits

What is BIM ?

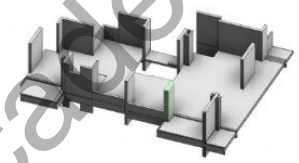
Building Information Modeling

Extracted Information from Model

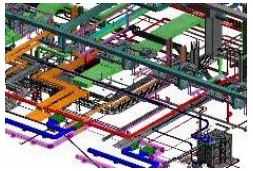
e.g. Construction Simulation, Cost Estimates, Progress Payment Reports, Safety, Quality, and Site Planning



Architectural Model



Structural Model



MEP Model

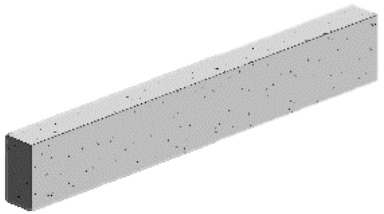
Geometric + Non Geometric Information

Better

Information

Management

Proper Modelling
(Beam terminations and correct alignments)



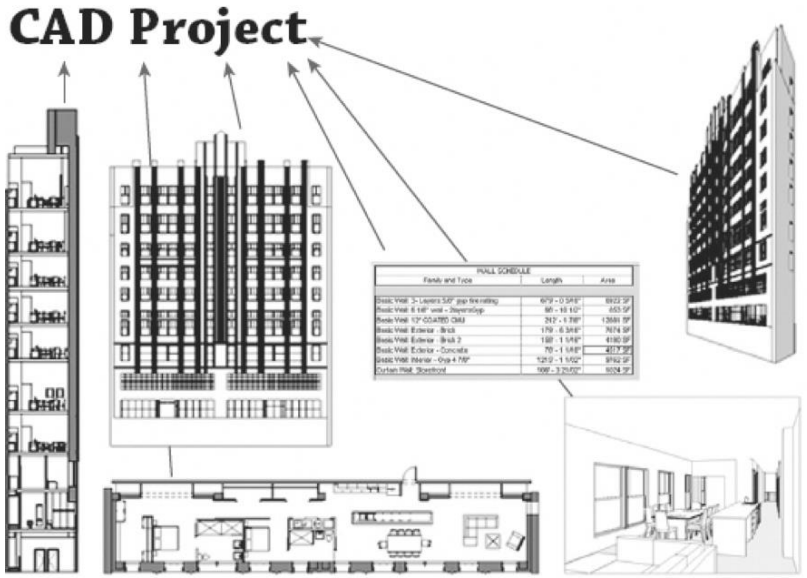
Geometric Information
- 400x800x6700
- 2.152 m³

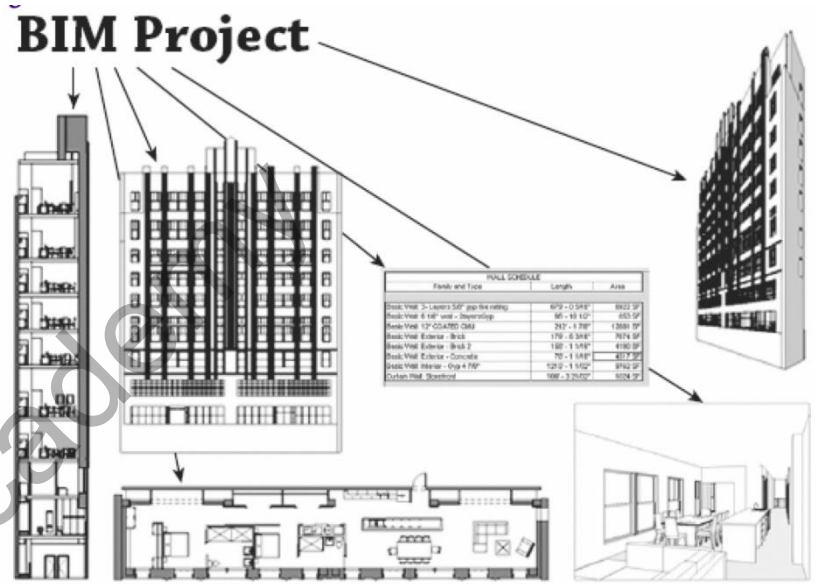
Non-Geometric Information
- Concrete Grade 40
- Precast Beam

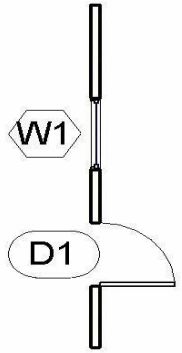
What is BIM ?

- 2D – Equivalent to conventional drafting, only performed on a computer. Unintelligent
- 3D – A model that includes 3-D shape information only
- 4D (BIM) – A 3-D BIM that has objects and assemblies that have schedule and time constraint data added to them. (4D = 3D + Schedule (time))
- 5D BIM - A 4-D BIM that has object and assemblies that have a cost dimension added to them. (5-D = 4-D + Cost)

CAD v.s. BIM ?

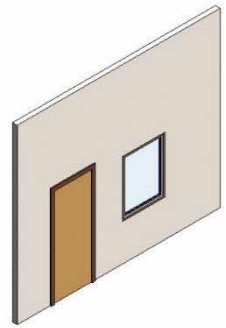






Vector Platform

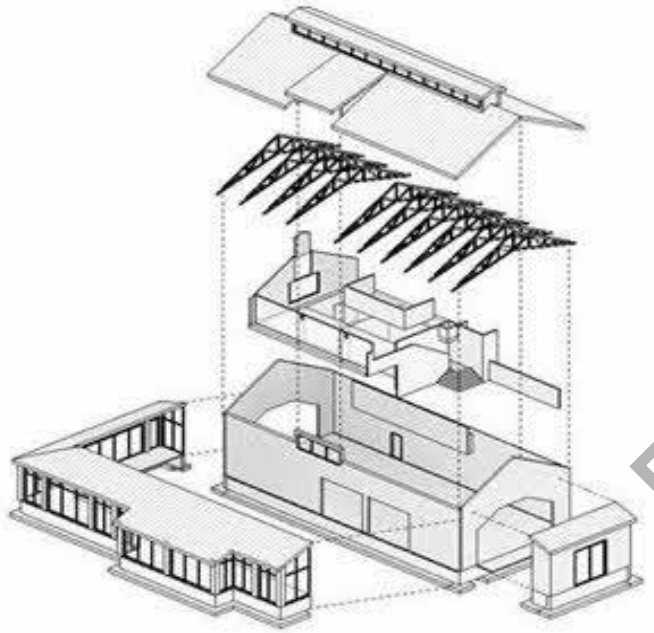
Parametric Platform

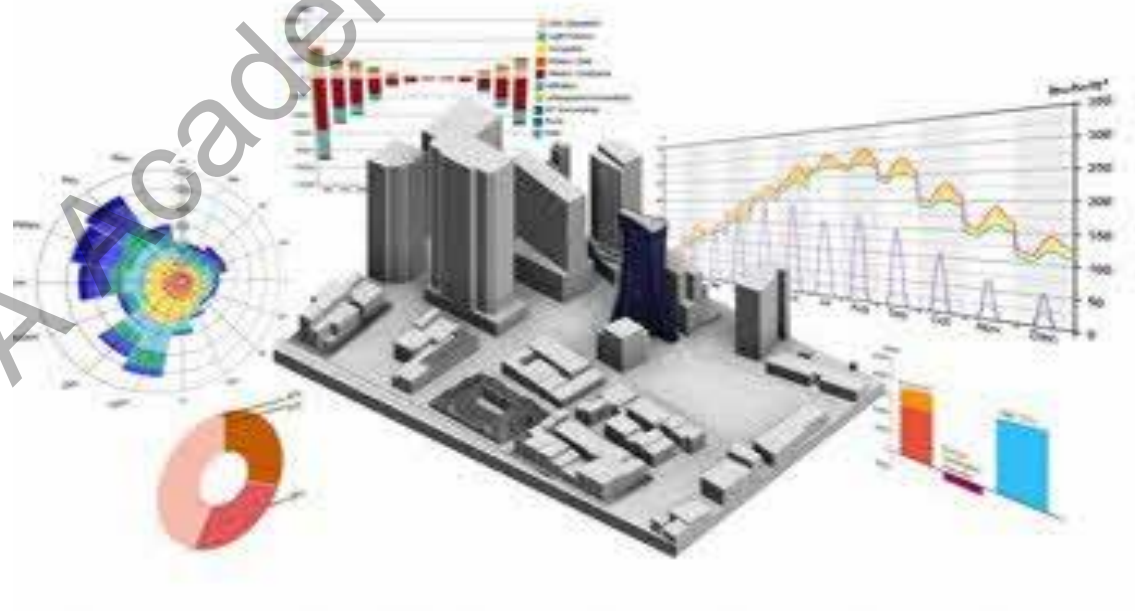


BIM Model = Parametric Model

BIM Model = Parametric Model

BIM Model = Geometry + Parameter





BIM & VDC & IDD ≠ SOFTWARE

** List is non-exhaustive*

TYPES	BIM APPLICATION	USES
AUTHORING	AUTODESK REVIT	3D Modeling, 2D Documentation
	GRAPHISOFT ARCHICAD	
	BENTLEY OPENBUILDINGS	
	TEKLA STRUCTURES	DETAILED STRUCTURAL MODELING
SEQUENCING (4D) AND PRESENTATION	FUZOR VDC	4D SIMULATION & VIRTUAL MOCK-UPOS
	SYNCHRO	4D PLANNING
	LUMION	VISUALISATION, SUPPORT 4D ANIMATION FOR PRESENTATIONS
	REVIZTO	4D COORDINATION AND VR-BASED PRESENTATION
	AUTODESK NAVISWORKS	4D SIMULATION, CLASH DETECTION
QUANTITY TAKE OFF (5D)	COSTX	5D TOOL
	GLODON BIM SUITE	

BIM & VDC & IDD ≠ SOFTWARE

** List is non-exhaustive*

TYPES	BIM APPLICATION	USES
COORDINATION & COLLABORATION	AUTODESK CONSTRUCTION CLOUD (ACC)	CENTRALISED DOUMENT MANAGEMENT/ DATA SHARING MODEL COORDINATION AND CLASH DETECTION FIELD / CROSS-PROJECT COLLABORATION TEAM MANAGEMENT
	AUTODESK NAVISWORKS	**4D** SIMULATION, CLASH DETECTION
	SOLIBRI MODEL CHECKER	MODEL CHECKING, CLASH RESOLUTION
	BIMCOLLAB	CENTRALISED ISSUE MANAGEMENT, CLASH DETECTION, MODEL COORDINATION
	REVIZTO	REAL-TIME COORDINATION, CLASH DETECTION, ISSUE TRACKING, VR-BASED REVIEWS
	BENTLEY PROJECTWISE	(INFRASTRUCTURE) COLLABORATION, DOCUMENT MANAGEMENT
	TRIMBLE CONNECT	MODEL VIEWING, ISSUE TRACKING, COLLABORATION

BIM & VDC & IDD ≠ SOFTWARE

** List is non-exhaustive*

TYPES	BIM APPLICATION	USES
DESIGN: ANALYSIS TOOLS	AUTODESK FORMA	SITE, WIND, SOLAR ANALYSIS
	AUTODESK ROBOT STRUCTURAL ANALYSIS	STRUCTURAL LOAD, SEIMIC ANAYSIS
	AUTODESK INSIGHT	ENERGY, DAYLIGHT, HVAC ANALYSIS
	IES VE	ENERGY, SUSTAINABILITY ANALYSIS
CONSTRUCTION: FIELD AND CONSTRUCTION TOOLS	AUTODESK CONSTRUCTION CLOUD (ACC)	CENTRALISED DOUMENT MANAGEMENT/ DATA SHARING MODEL COORDINATION AND CLASH DETECTION FIELD / CROSS-PROJECT COLLABORATION TEAM MANAGEMENT MODEL VIEWING ON-SITE QUALITY / SAFETY
	TRIMBLE SITEVISION	MODEL VIEWING ON-SITE QUALITY / SAFETY
	PLANGRID	DOCUMENT /TEAM MANAGEMENT MODEL VIEWING ON-SITE
	NOVATE / FINALCAD	QAQC - DEFECTS MANAGEMENT
	LN-100	SURVEY - ROBOTIC SURVEY EQUIPMENT

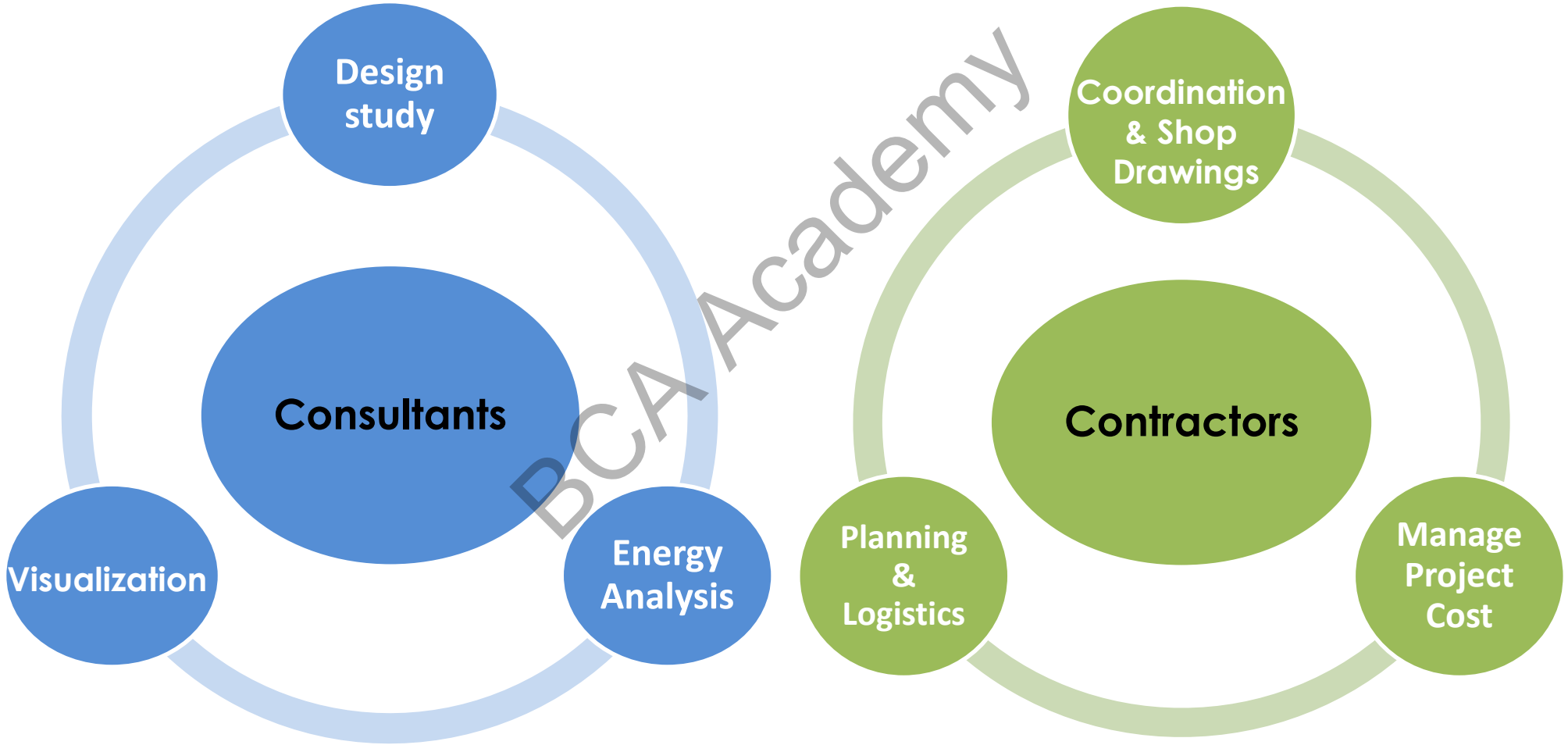
BIM & VDC & IDD ≠ SOFTWARE

** List is non-exhaustive*

TYPES	BIM APPLICATION	USES
OPERATION: FM SOLUTIONS & DIGITAL TWIN TOOL	ARCHIBUS	ASSET & SPACE MANAGEMENT, TRACKING (6D)
	FM:SYSTEMS	WORKSPACE & OCCUPANCY PLANNING, TRACKING (6D)
	BENTLEY iTWIN	ASSET MANAGEMENT, DIGITAL TWIN CREATION, TRACKING (6D)
	ECODOMUS	ASSET/SPACE PLANNING, TRACKING (6D), IoT INTEGRATION

Benefit's of BIM

WHAT CAN BIM DO FOR YOU ?



Benefit's of BIM

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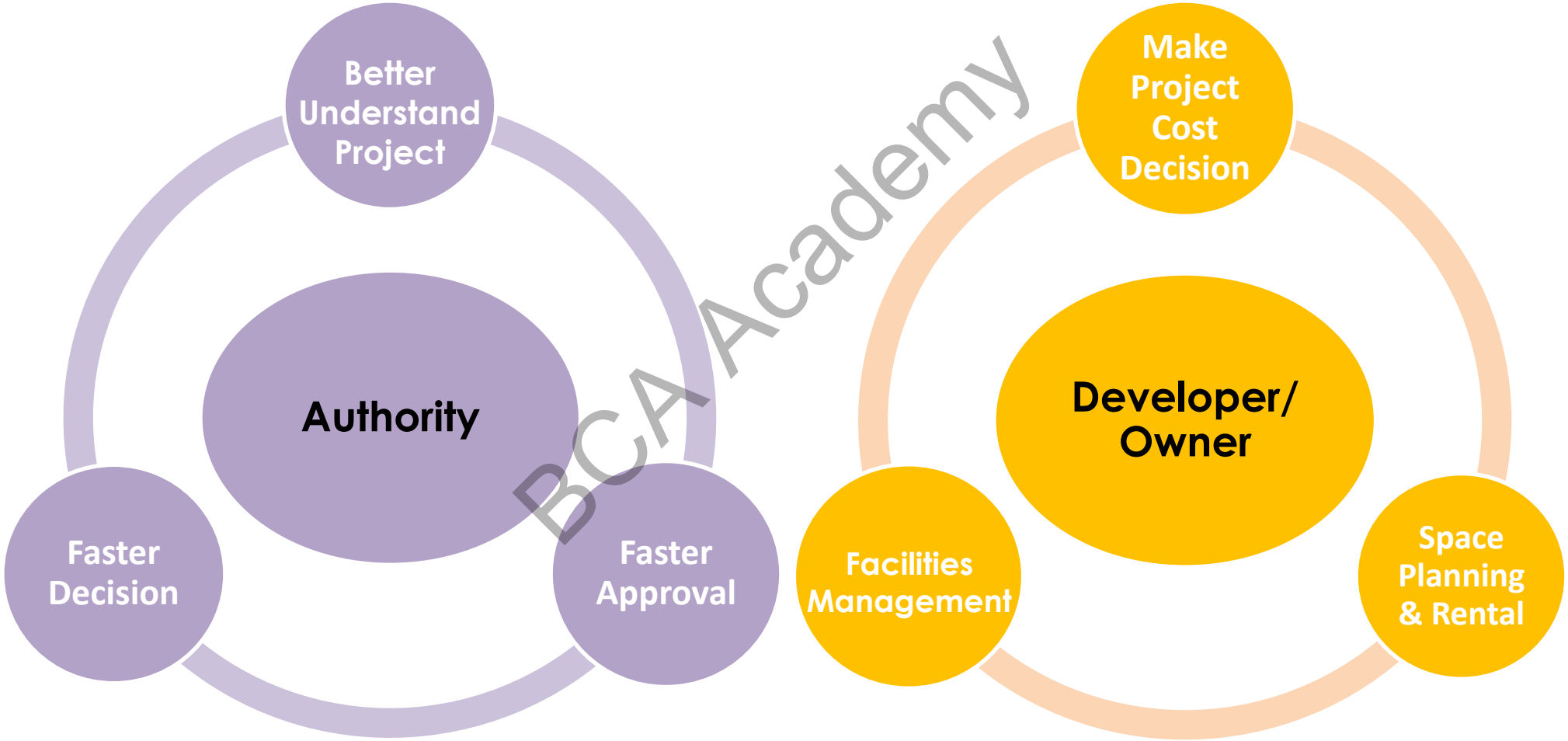


LEVEL OF DEVELOPMENT (LOD)

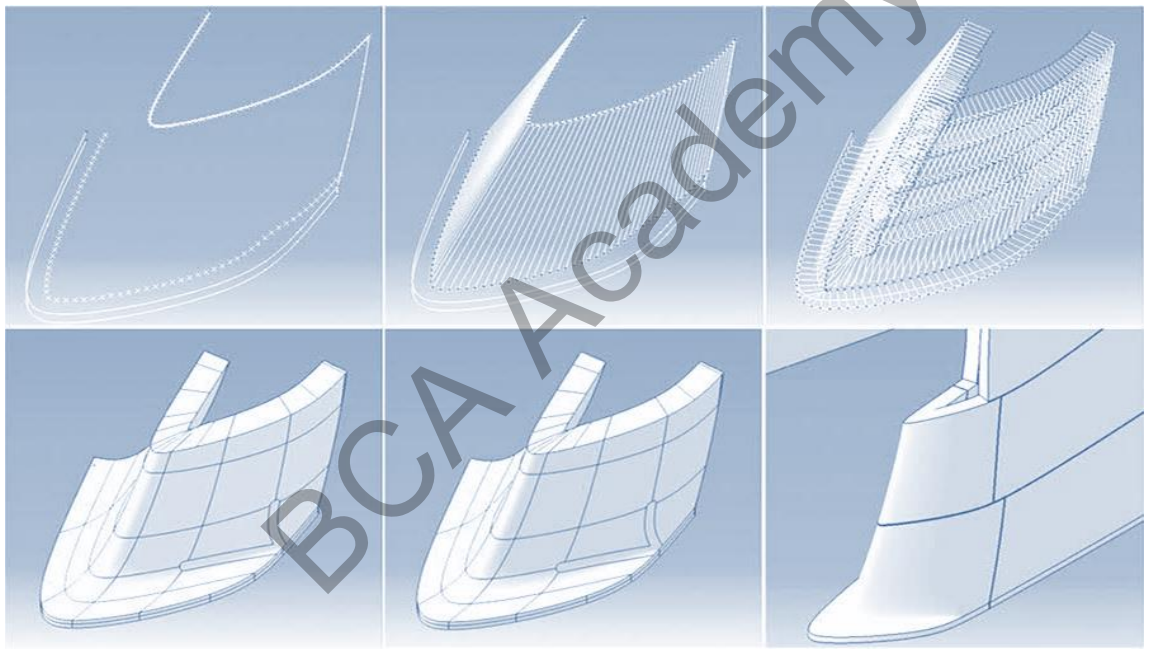


Image from www.aecbytes.com

Prototype Revit Model

- Architectural
- Structural
- Mechanical
- Electrical
- Plumbing
- Automotive
- Drawing Updating

WHAT IS LOD?

- AIA 2008-E202 BIM Standardization & Guidelines

- To define the BIM process and project delivery.
- To define a clear expectation of BIM model.

HOW TO DEFINE LOD?

LOD 100- Conceptual Design

LOD 200- Schematic Design

LOD 300- Construction & Coordination

LOD 400- Fabrication & Assembly

LOD 500- 'As-BIM' Model

LOD 100 - Concept Design

The building 3D model is developed to represent the information on basic level. Thereby, only conceptual model creation is possible in this stage. Parameters like area, height, volume, location and orientation are defined.

Image from thebimmanager.blogspot.sg

LOD 200 - Schematic Design

General model where elements are modeled with approximate quantities, size, shape, location and orientation. We can also attach non- geometric information to the model elements

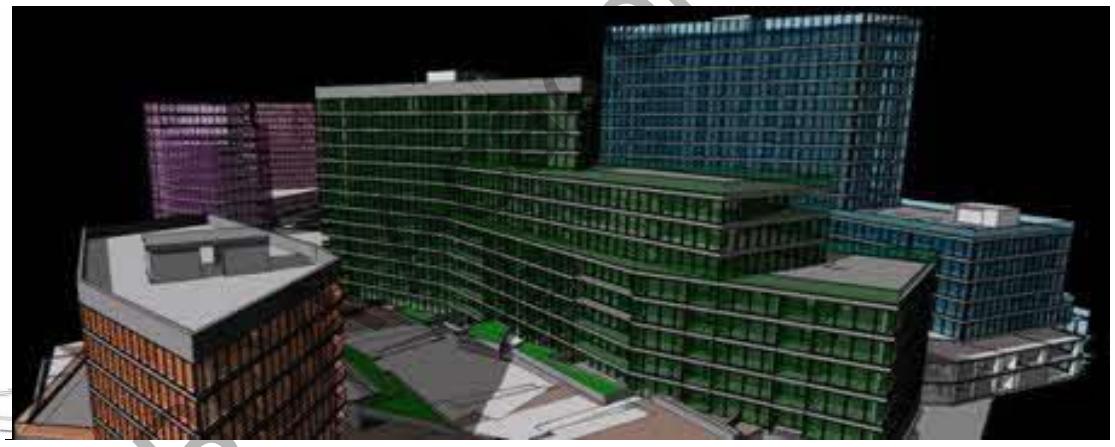


Image from thebimmanager.blogspot.sg

LOD 300 - Detailed Design

Accurate modeling and shop drawings where elements are defined with specific assemblies, precise quantity, size, shape, location and orientation. Here too we can attach non- geometric information to the model elements

Image from thebimmanager.blogspot.sg

LOD 350 - Construction Documentation

It includes model detail and element that represent how building elements interface with various systems and other building elements with graphics and written definitions

Image from thebimmanager.blogspot.sg

▪ LOD 400 - Fabrication & Assembly

Model elements are modeled as specific assemblies, with complete fabrication, assembly, and detailing information in addition to precise quantity, size, shape, location and orientation. Non- geometric information to the model elements can also be attached

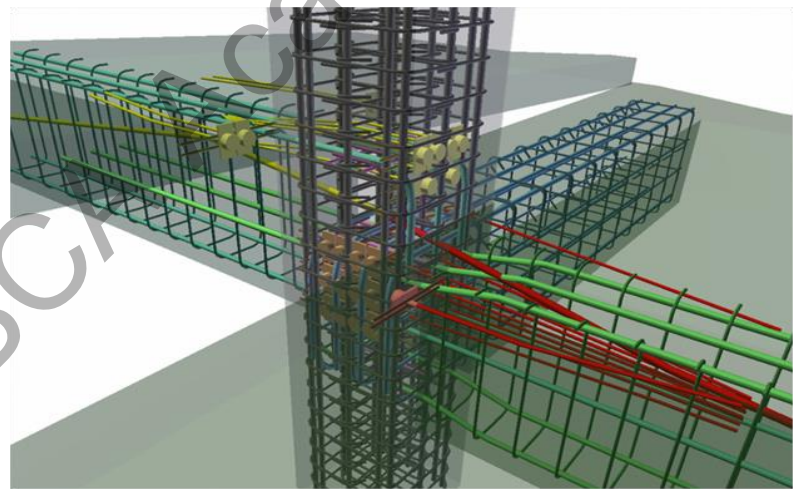
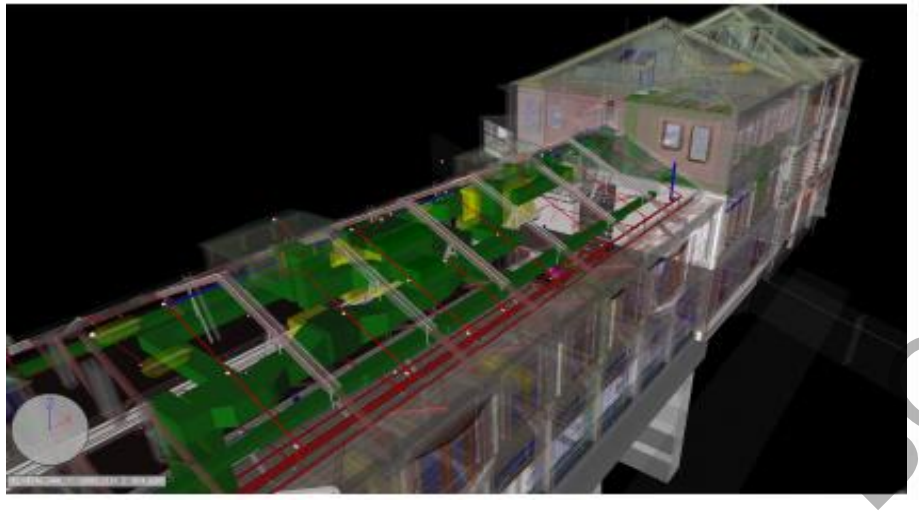


Image from filetraffic.eu

LOD 500 - As-Built

Elements are modeled as constructed assemblies for Maintenance and operations. In addition to actual and accurate in size, shape, location, quantity, and orientation, non-geometric information is attached to modeled elements



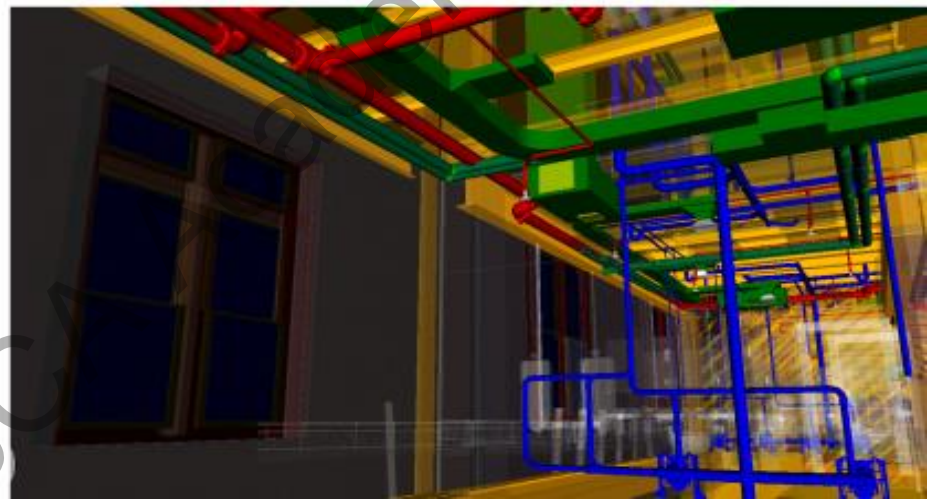


Image from www.agiworks.com

WHAT CAN BIM DO FOR PROJECT ?

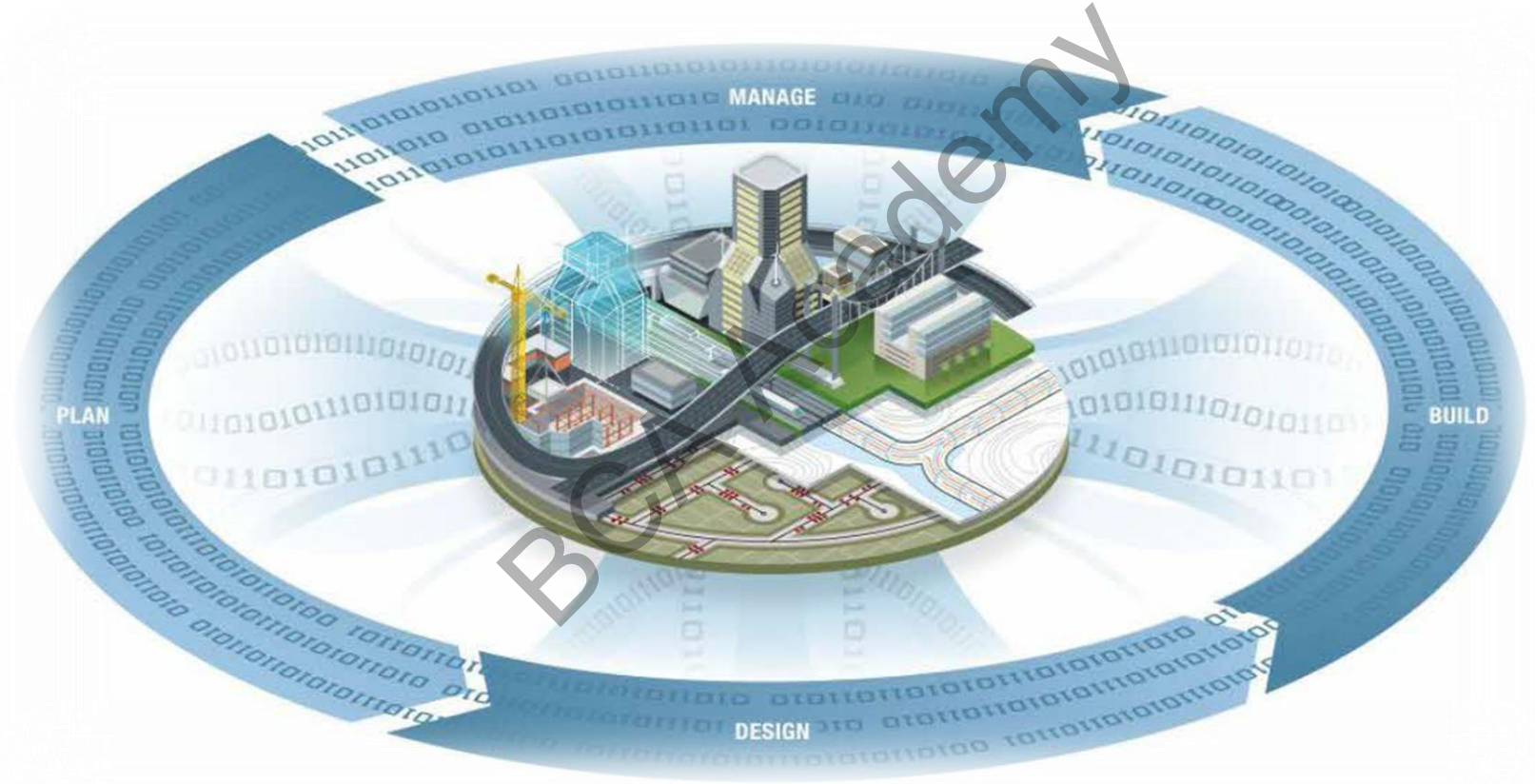


Image from www.consortech.com

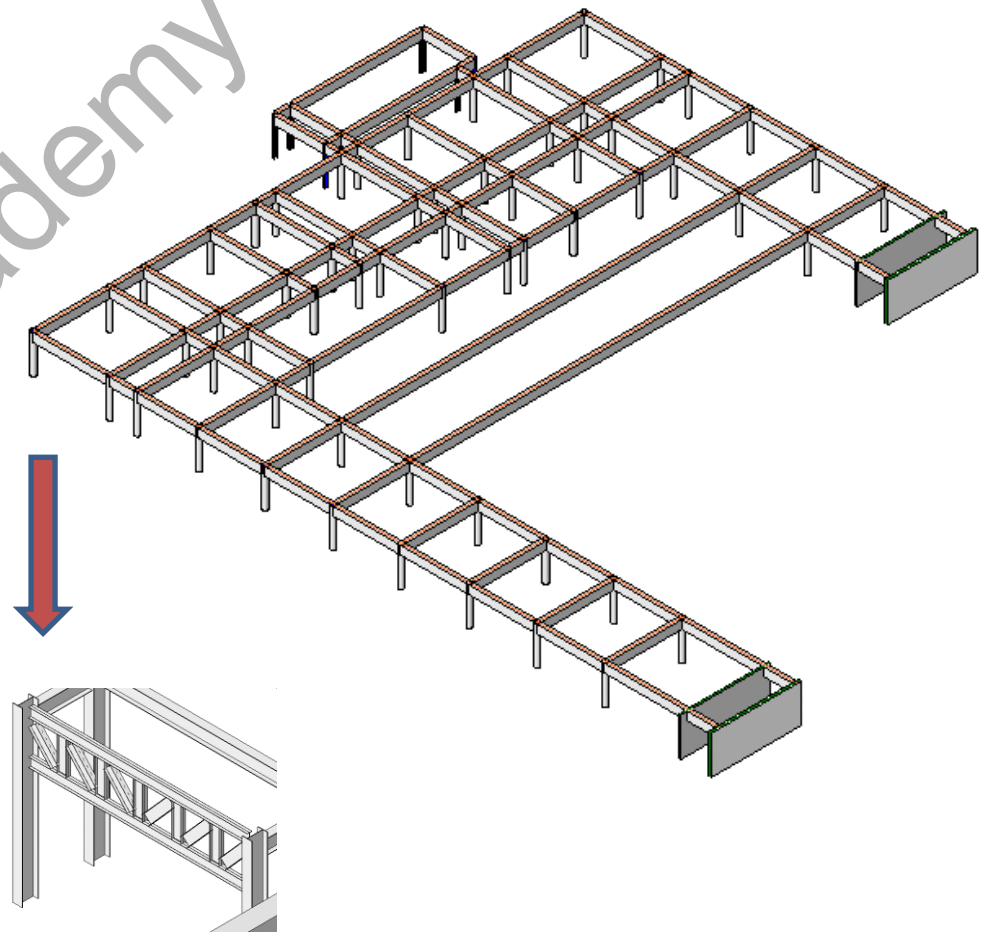
WHAT CAN BIM DO FOR PROJECT ?

Planning & Design Stage…

- ✓ **Visualisation & Study**
- ✓ **Design Analysis**
- ✓ **Design Coordination**
- ✓ **Design Collaboration**
- ✓ **Documentation**

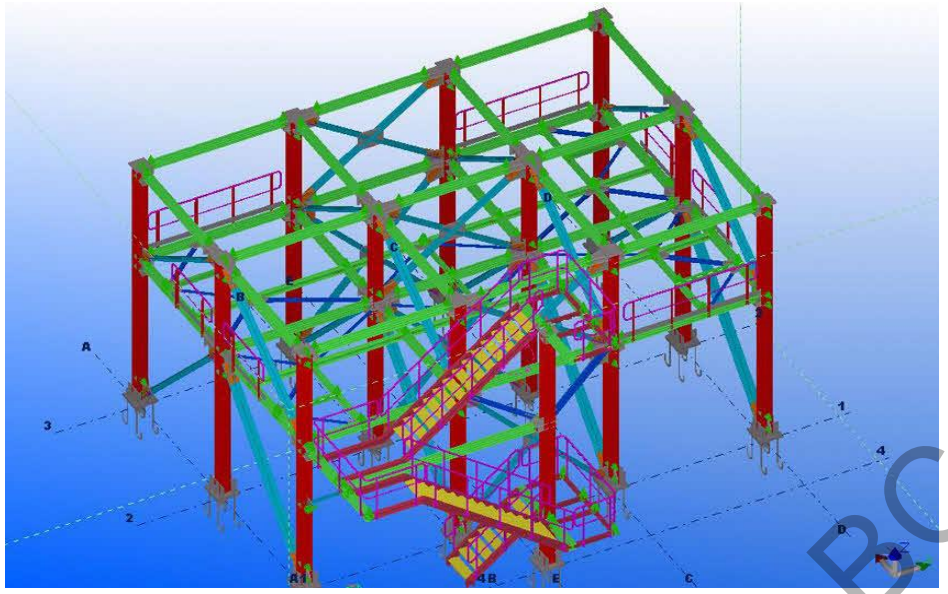
✓ Visualisation & Study

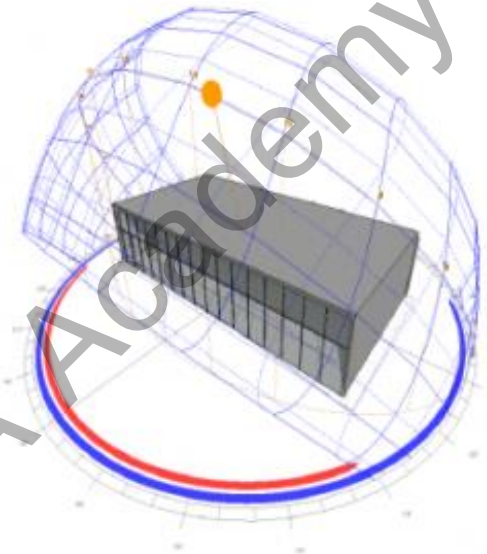
- Allow to review, to understand and to evaluate the design.
- Enable virtual presentation of the proposed built form.

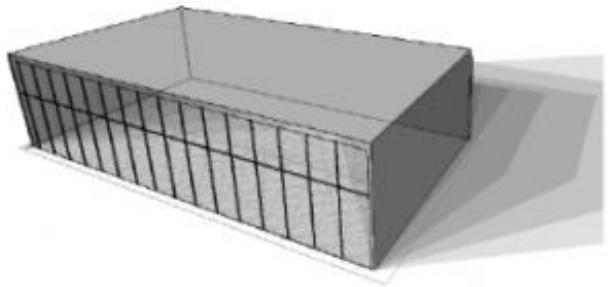


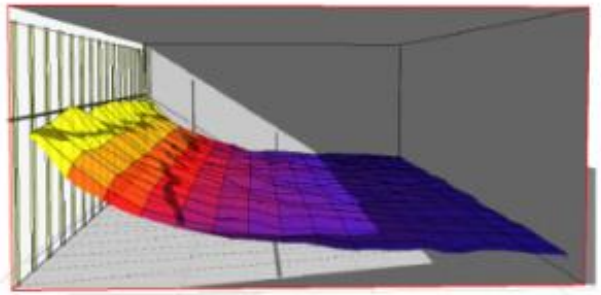
✓ Design Analysis

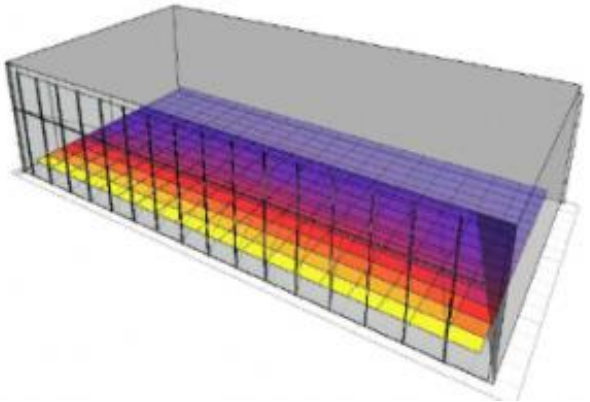
- Allow the study of the building performance during design.
- Designing a sustainable building become more possible.





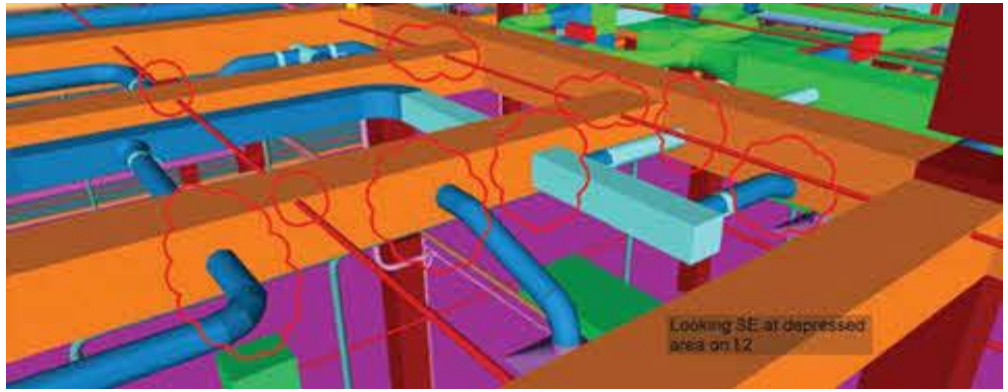


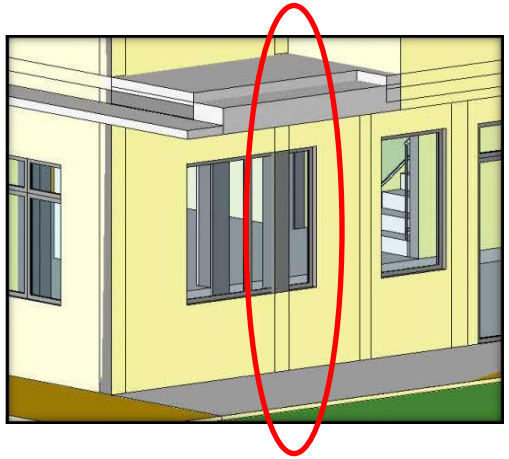


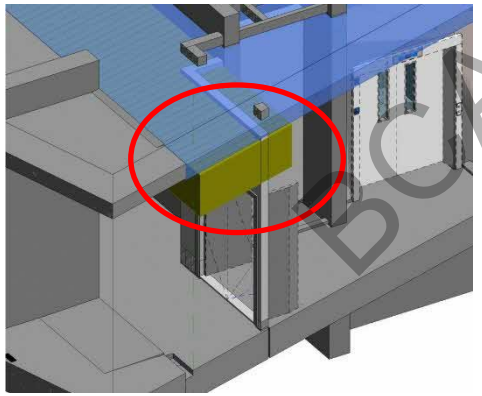


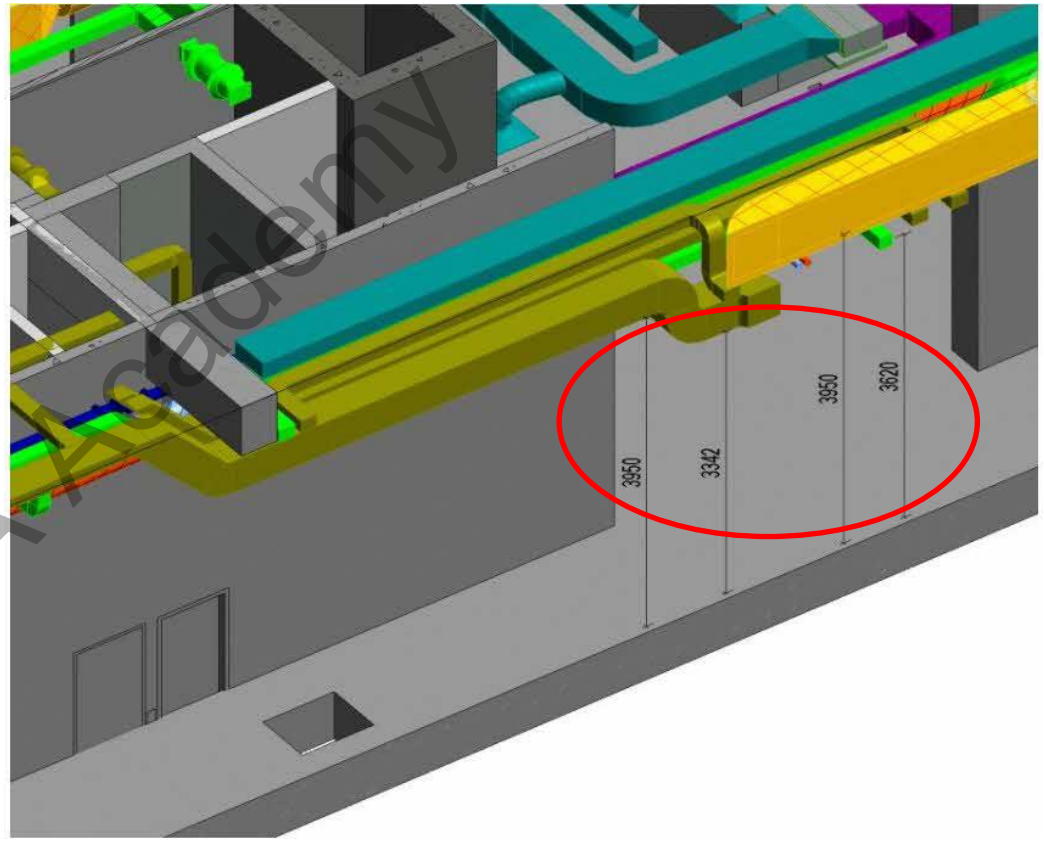
✓ Design Coordination

- Ability to detect and resolve construction clashes prior to construction.









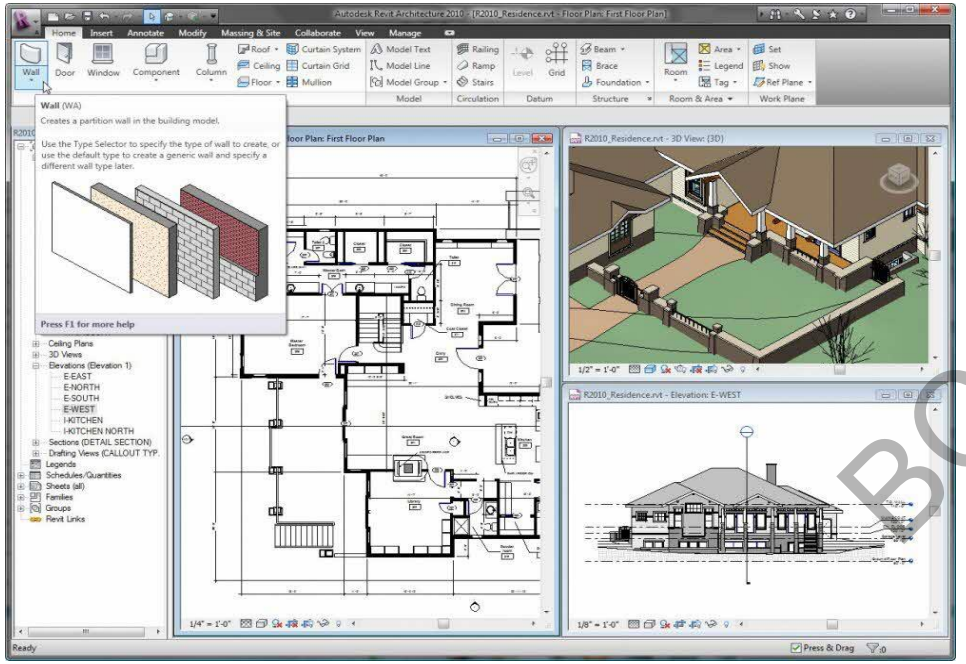
✓ Design Collaboration

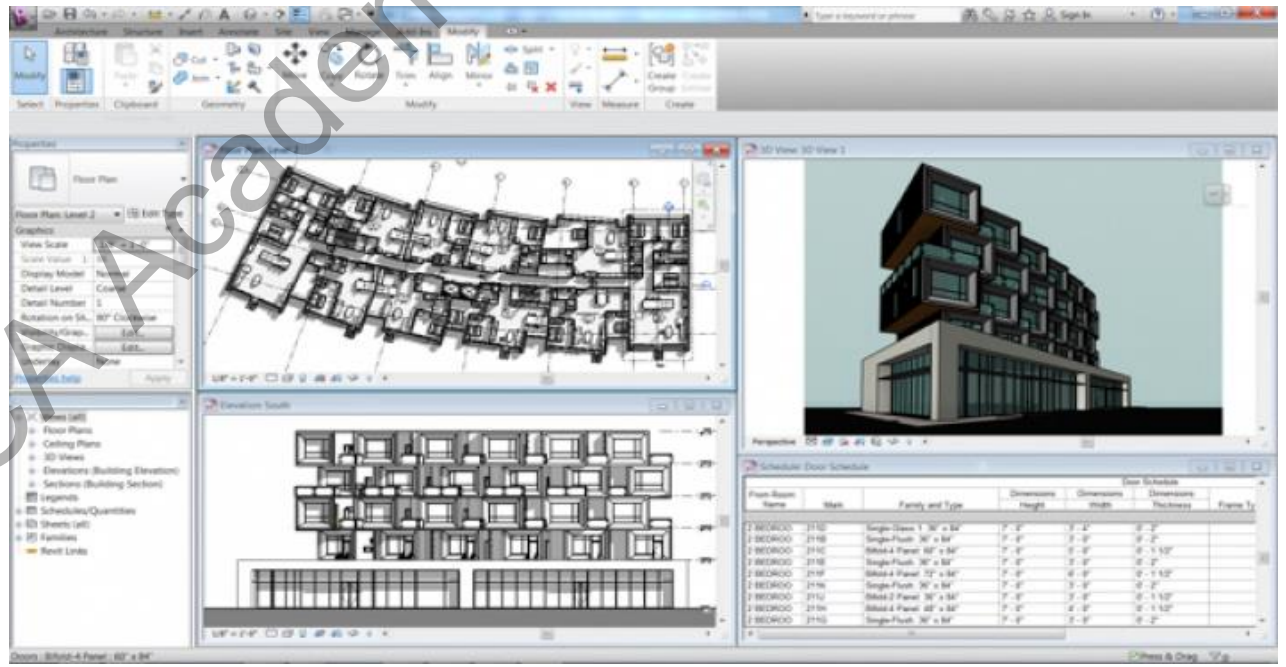
- Share model information between different disciplines to resolve potential conflicts upfront.

- Avoid costly abortive works and delays at construction stage.

✓ Documentation

- Generate 2D drawings directly from BIM model.
- Managing Design & Detail drawings.
- Generate Schedule.





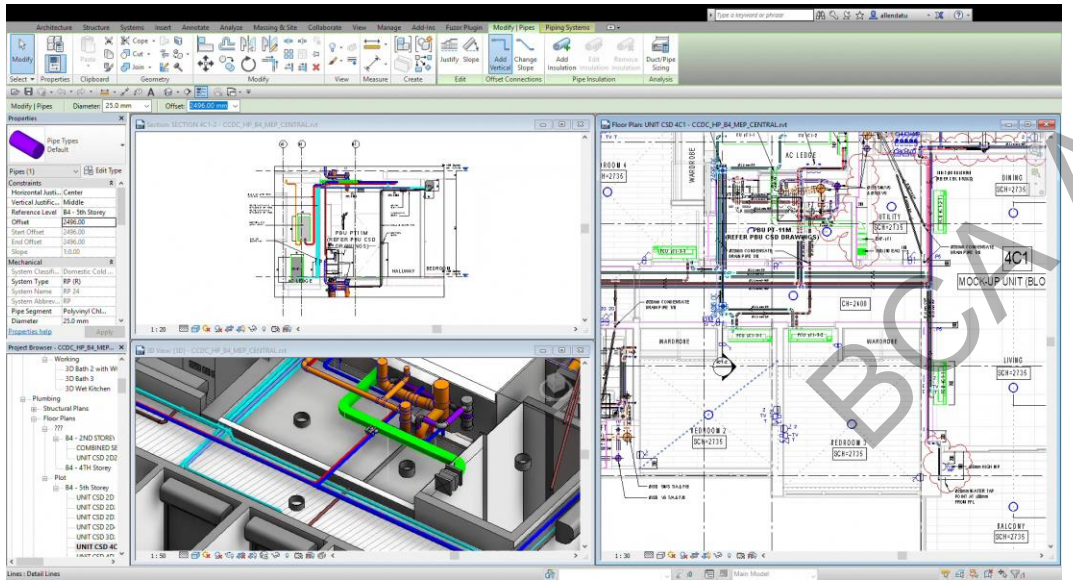
WHAT CAN BIM DO FOR PROJECT ?

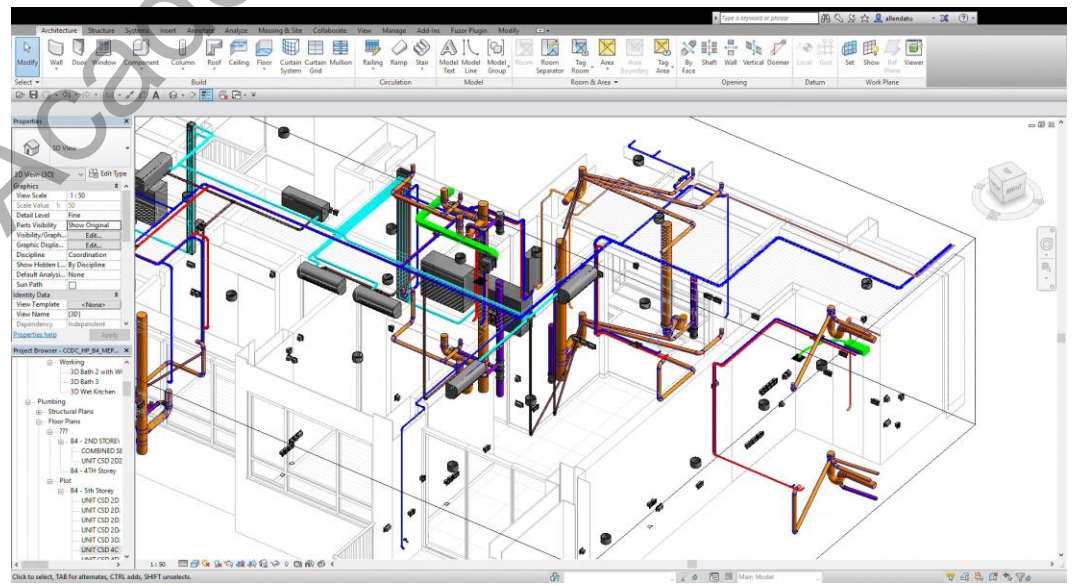
Construction Stage…

- ✓ Project Coordination
- ✓ Project Collaboration (Virtual Mock-up)
- ✓ Construction Sequencing
- ✓ Documentation
- ✓ Quantity Take Off (QTO)
- ✓ Integrated Digital Delivery (IDD)
- ✓ BIM to Field

✓ Project Coordination

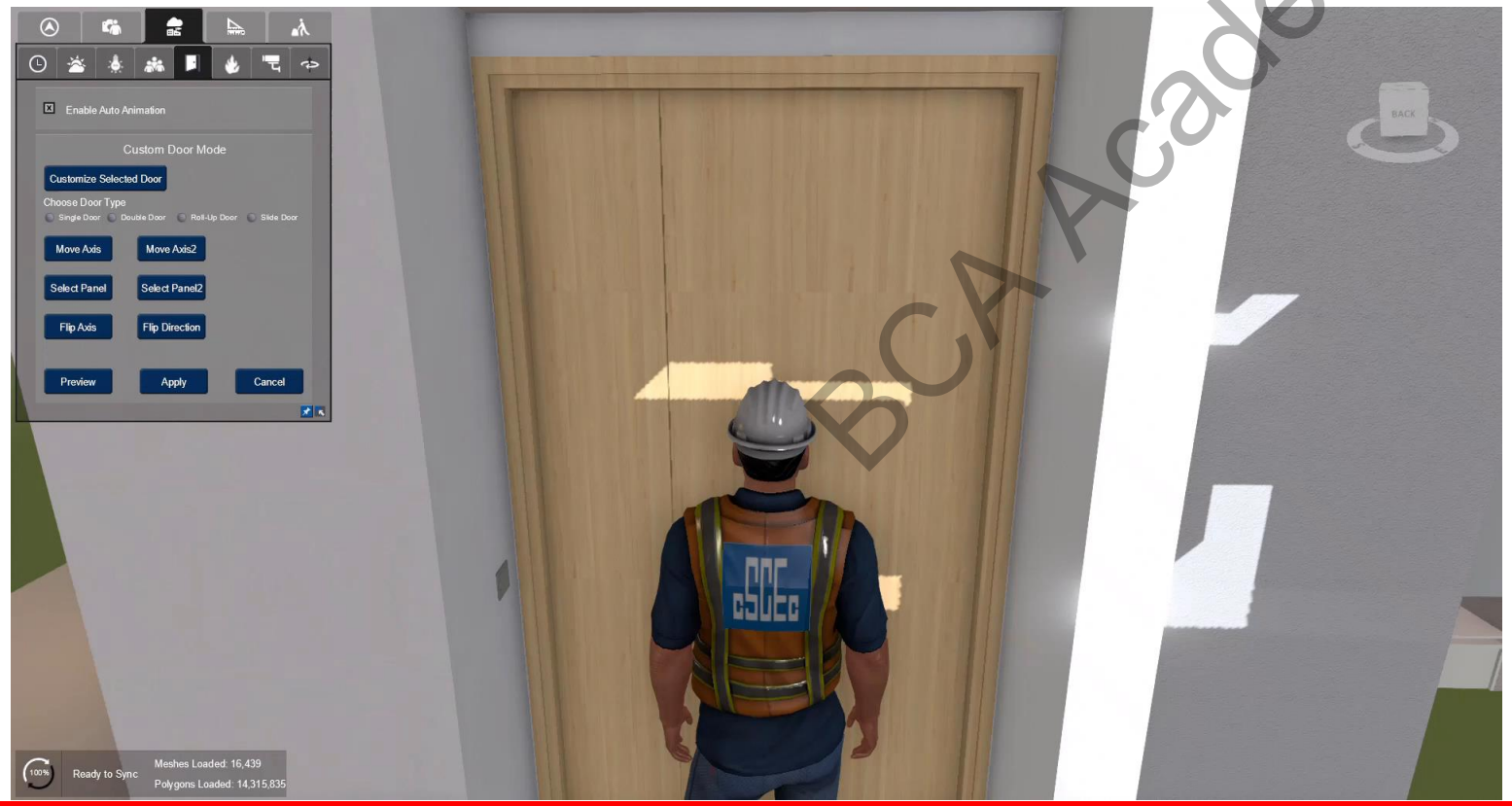
- Manage with BIM Authoring tools
- Coordinate construction information between trades.
- Clashes to be detected during modeling stage.

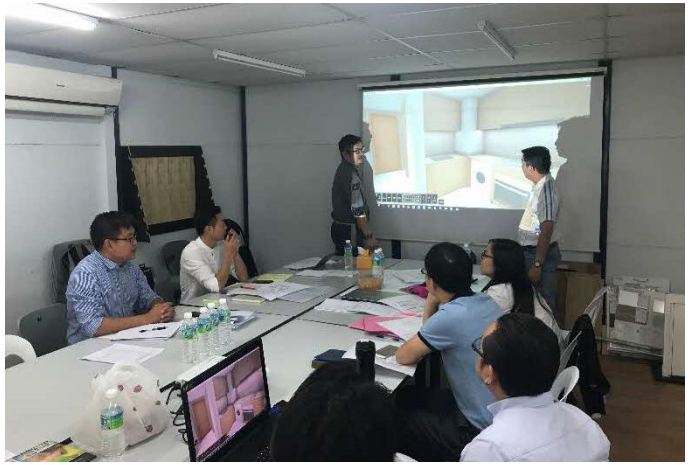


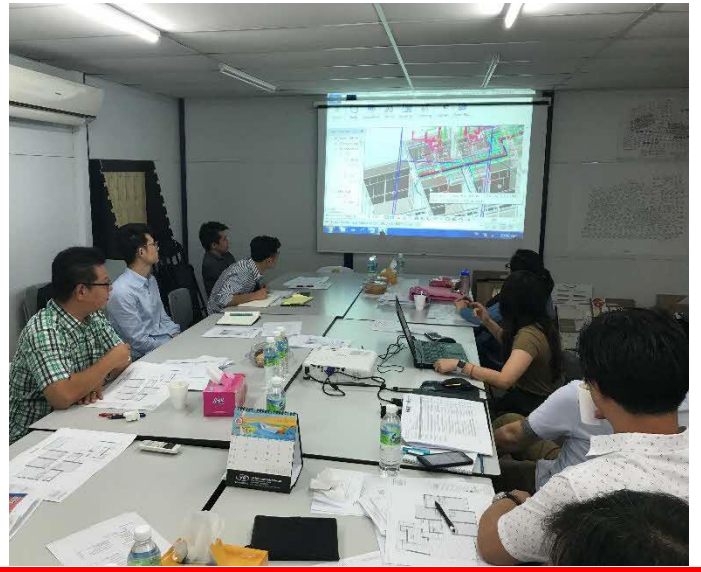


✓ Project Collaboration (Virtual Mock-up)

- Using BIM Presentation software like Fuzor to showcase model.
- Inter-disciplinary Model Collaboration Assessment.
- Resolve clash on the spot, to reduce RFI.
- Change format of technical meeting.

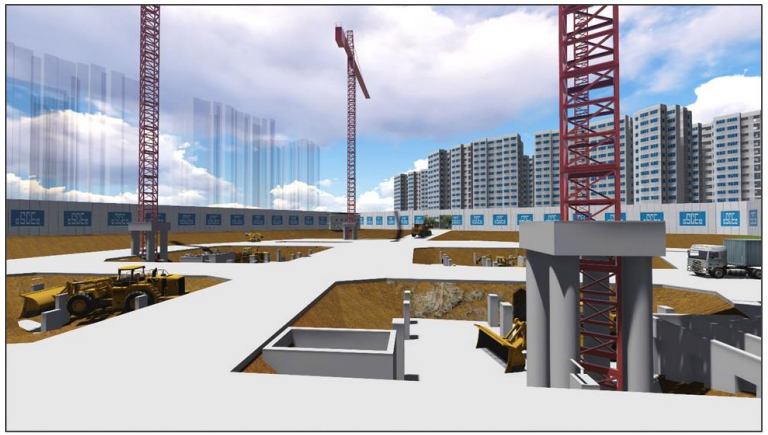






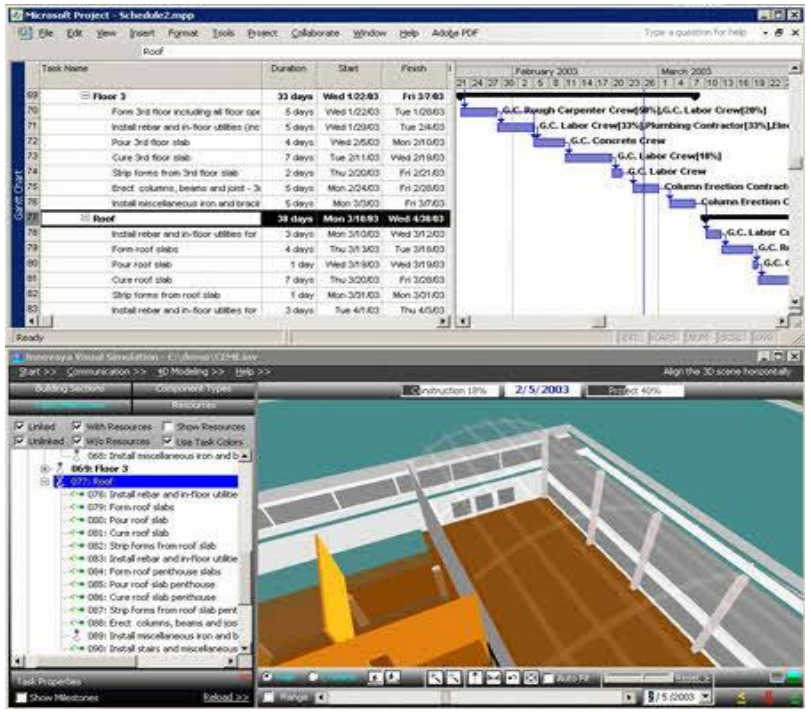
✓ Construction Sequencing

- Integrating construction programme into BIM model.
- Simulating & Visualization of Construction Stages.
- Comparison of different construction sequence.
- Safety & Quality pre-study.



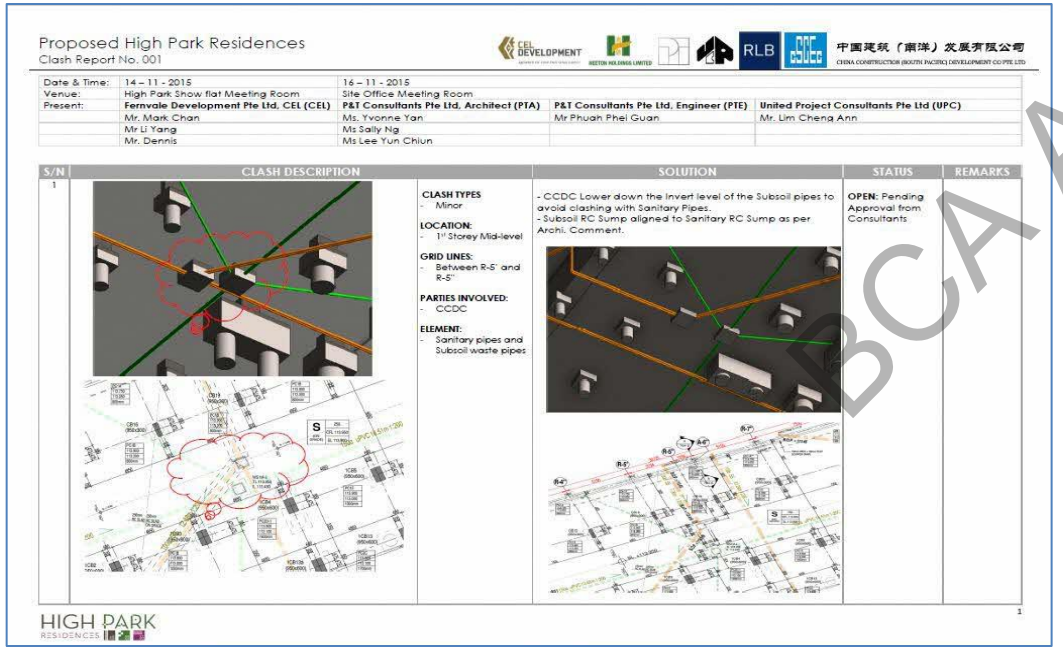
VIRTUAL CONSTRUCTION

ACTUAL CONSTRUCTION



✓ Documentation

- Coordination Report & Clash Report to be generated for monitoring.
- Coordinated Shop Drawings directly issued from BIM Model. (Reduce approval period)
- Generate Schedule.

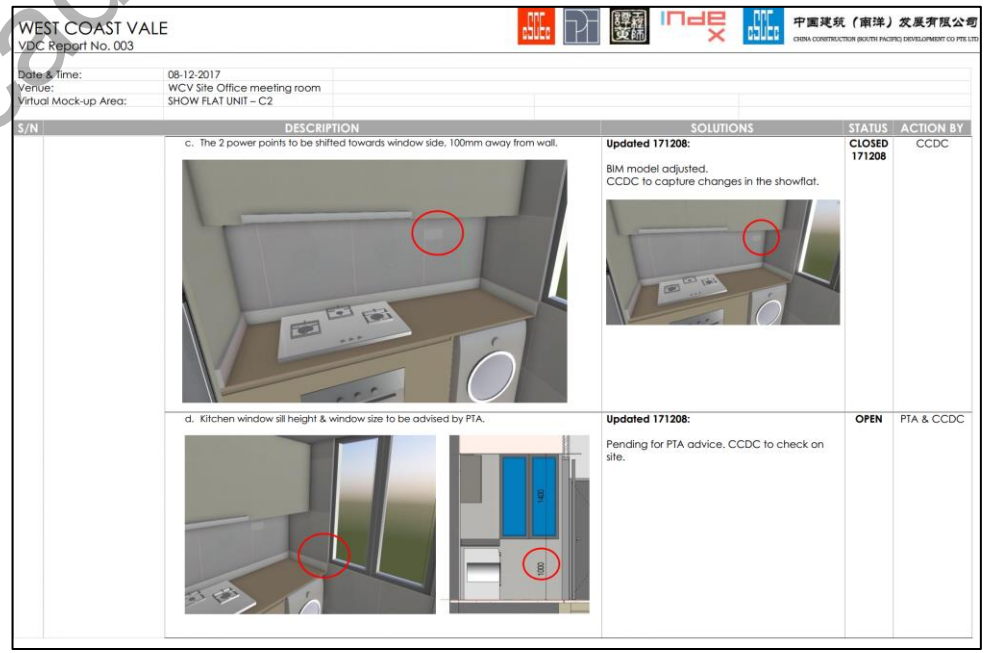


Proposed High Park Residences
Clash Report No. 001

Date & Time:	14 – 11 - 2015	16 – 11 - 2015		
Venue:	High Park Show flat Meeting Room	Site Office Meeting Room		
Present:	Fernvale Development Pte Ltd, CEL (CEL)	P&T Consultants Pte Ltd, Architect (PTA)	P&T Consultants Pte Ltd, Engineer (PTE)	United Project Consultants Pte Ltd (UPC)
	Mr. Mark Chan	Ms. Yvonne Yan	Mr Phuah Phei Guan	Mr. Lim Cheng Ann
	Mr Li Yang	Ms Sally Ng		
	Mr. Dennis	Ms Lee Yun Chiun		

S/N	CLASH DESCRIPTION		SOLUTION	STATUS	REMARKS
1		**CLASH TYPES** - Minor **LOCATION:** - 1st Storey Mid-level **GRID LINES:** - Between R-5' and R-5" **PARTIES INVOLVED:** - CCDC **ELEMENT:** - Sanitary pipes and Subsoil waste pipes	- CCDC Lower down the Invert level of the Subsoil pipes to avoid clashing with Sanitary Pipes. - Subsoil RC Sump aligned to Sanitary RC Sump as per Archi. Comment. 	**OPEN:** Pending Approval from Consultants	

HIGH PARK RESIDENCES



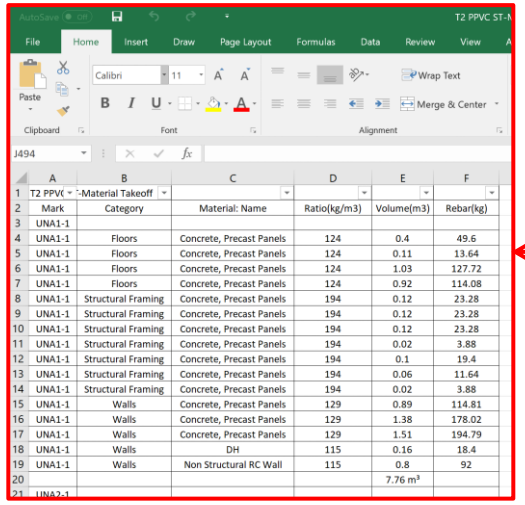
WEST COAST VALE
VDC Report No. 003

Date & Time:	08-12-2017
Venue:	WCV Site Office meeting room
Virtual Mock-up Area:	SHOW FLAT UNIT – C2

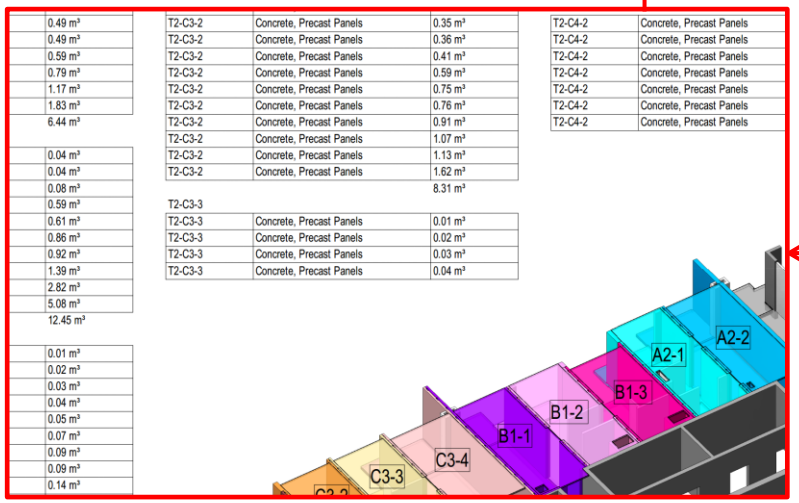
S/N	DESCRIPTION	SOLUTIONS	STATUS	ACTION BY
	c. The 2 power points to be shifted towards window side, 100mm away from wall. 	**Updated 171208:** BIM model adjusted. CCDC to capture changes in the showflat. 	**CLOSED 171208**	CCDC
	d. Kitchen window sill height & window size to be advised by PTA. 	**Updated 171208:** Pending for PTA advice. CCDC to check on site.	**OPEN**	PTA & CCDC

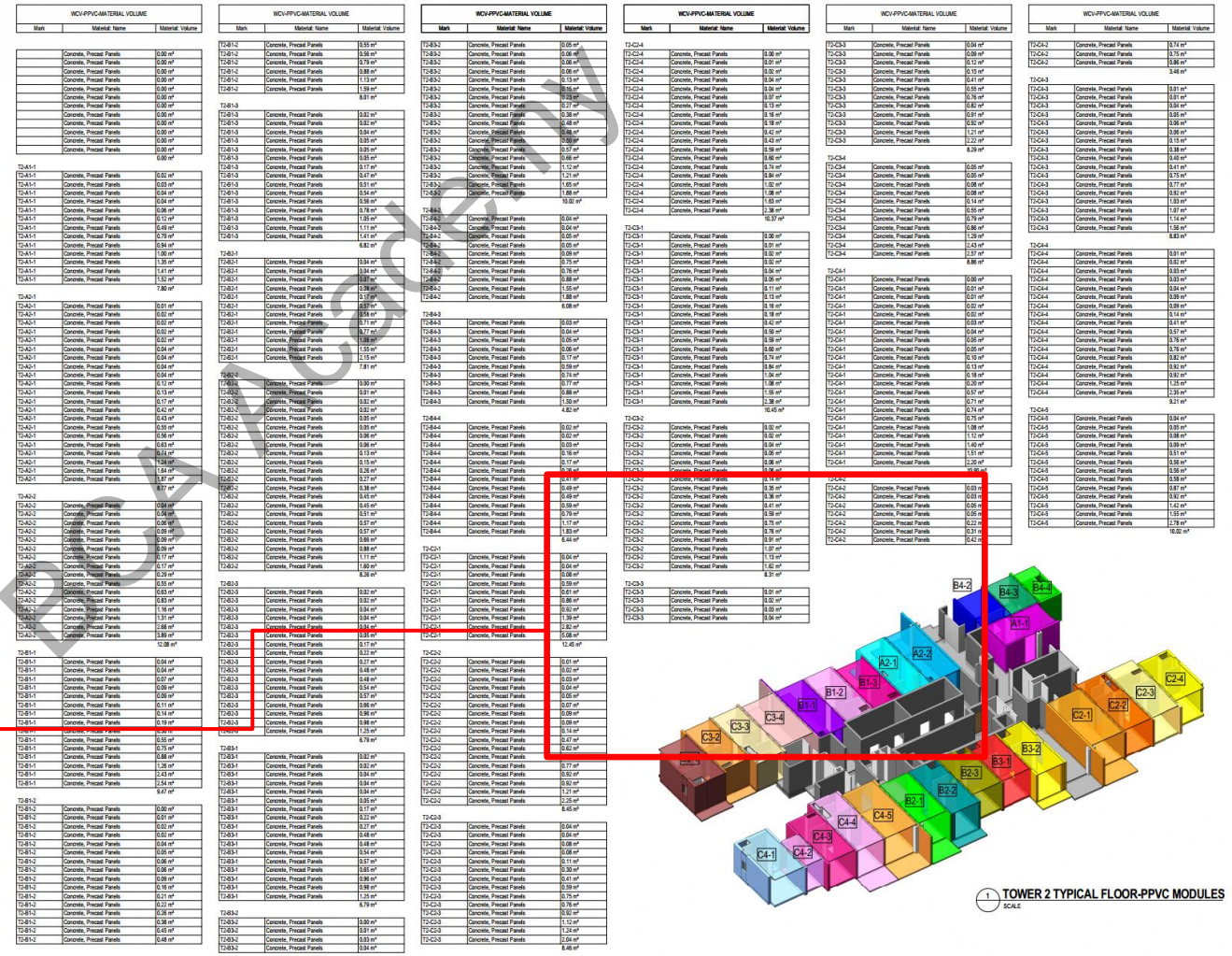
✓ Quantity Take Off (QTO)

- Make material costing faster, easier, and more accurate.
- Maintain a dynamic document of record.



T2 PPVC	Material Takeoff				
Mark	Category	Material: Name	Ratio(kg/m3)	Volume(m3)	Rebar(kg)
UNA1-1					
UNA1-1	Floors	Concrete, Precast Panels	124	0.4	49.6
UNA1-1	Floors	Concrete, Precast Panels	124	0.11	13.64
UNA1-1	Floors	Concrete, Precast Panels	124	1.03	127.72
UNA1-1	Floors	Concrete, Precast Panels	124	0.92	114.08
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.12	23.28
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.12	23.28
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.12	23.28
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.02	3.88
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.1	19.4
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.06	11.64
UNA1-1	Structural Framing	Concrete, Precast Panels	194	0.02	3.88
UNA1-1	Walls	Concrete, Precast Panels	129	0.89	114.81
UNA1-1	Walls	Concrete, Precast Panels	129	1.38	178.02
UNA1-1	Walls	Concrete, Precast Panels	129	1.51	194.79
UNA1-1	Walls	DH	115	0.16	18.4
UNA1-1	Walls	Non Structural RC Wall	115	0.8	92
				7.76 m³	

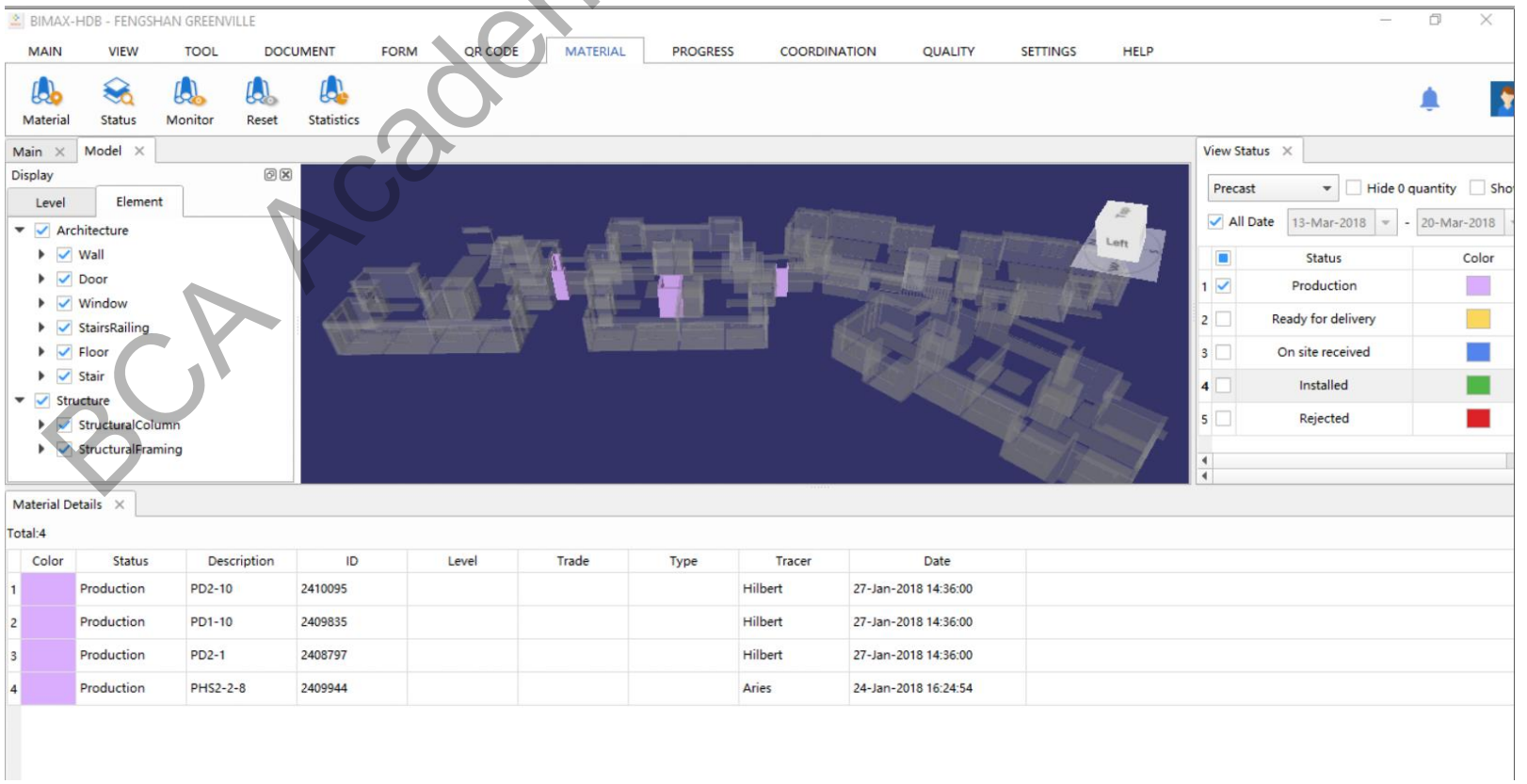




TOWER 2 TYPICAL FLOOR-PPVC MODULES

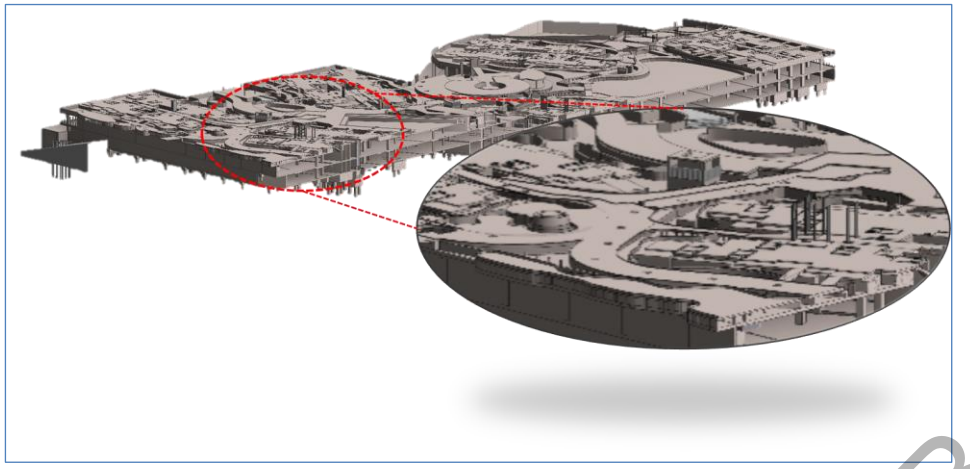
✓ Integrated Digital Delivery (IDD)

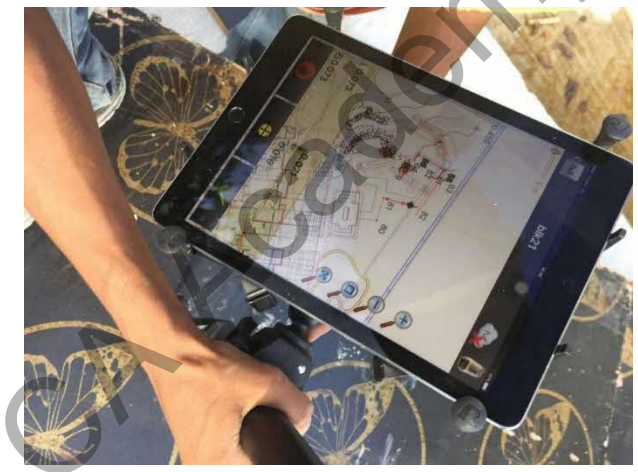
- Material Tracking / Logistic Management
- Delivery Coordination / Defect Management

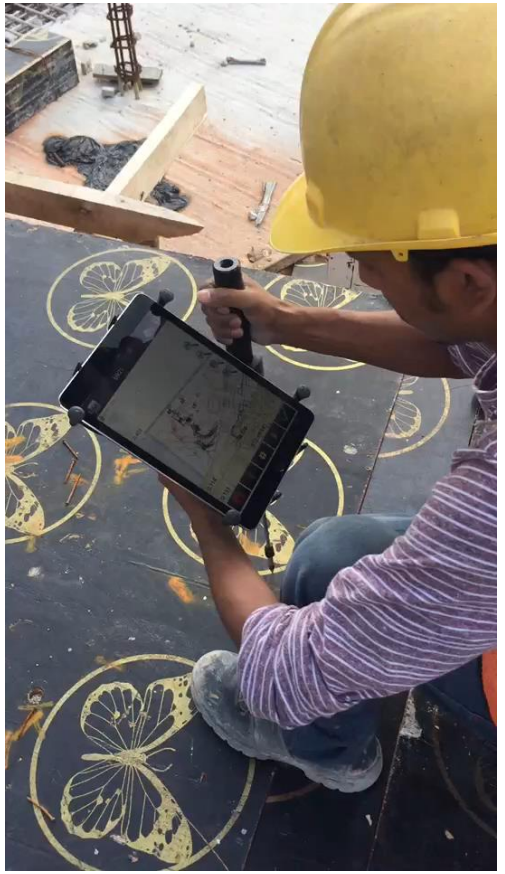


✓ BIM to Field

- Robotic Surveying, change process.
- Improve efficient (to be layout by one person).
- Improve accuracy.







WHAT CAN BIM DO FOR PROJECT ?

Facility Management Stage…

- ✓ As-built Visualization
- ✓ Space Management
- ✓ Database of FM information

✓ Visualization

- Animated walkthroughs within the as-built model.
- Effectively communicate critical building issues.

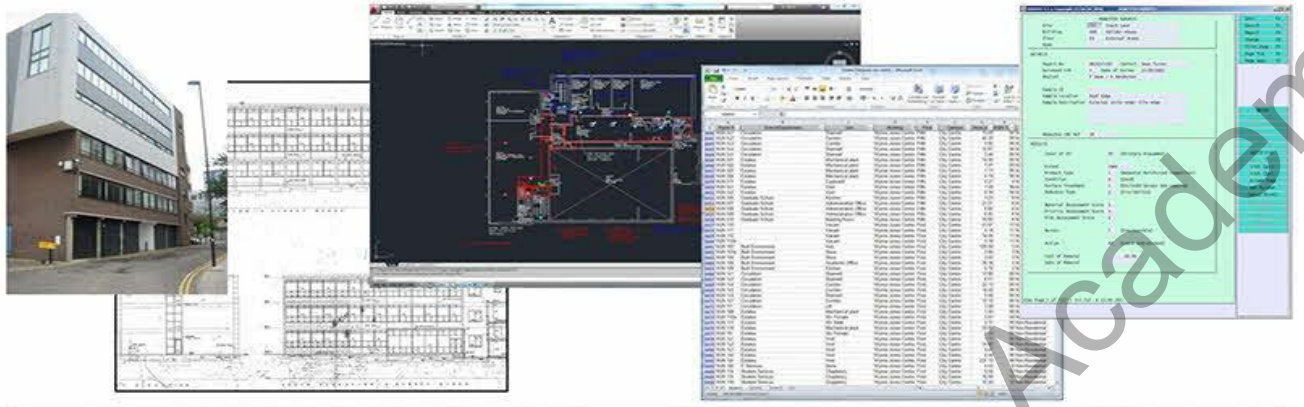
✓ Space Management

- Incorporate 3D spaces and objects for accommodate custom space management requirements.

✓ Database of FM Information

- Incorporate organizational data to support FM needs.

Efficiency gains, Drawing and Data Maintenance



Integrated