

# Integrated Digital Delivery – Diversified BIM Building a Multi-dimensional User-hub

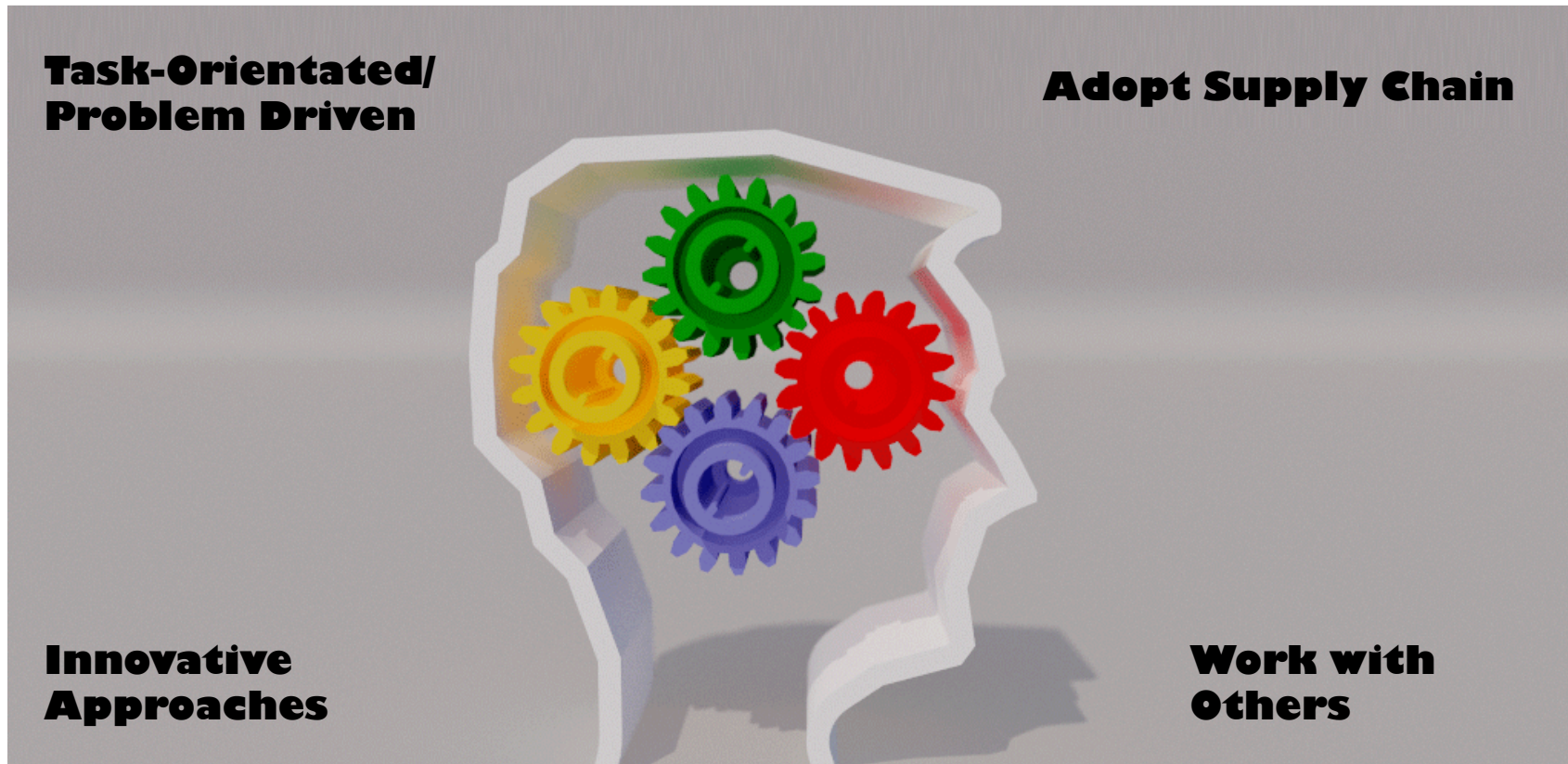


**BUILDING A NEW DIMENSION**

Source: Autodesk BIM360 and Gammon projects - 30 May 2019

# Industry-wide Strategy

- Co-creative
- Create better solutions



# BIM & Engineering

**Task-Orientated/  
Problem Driven**

**Adopt Supply Chain**

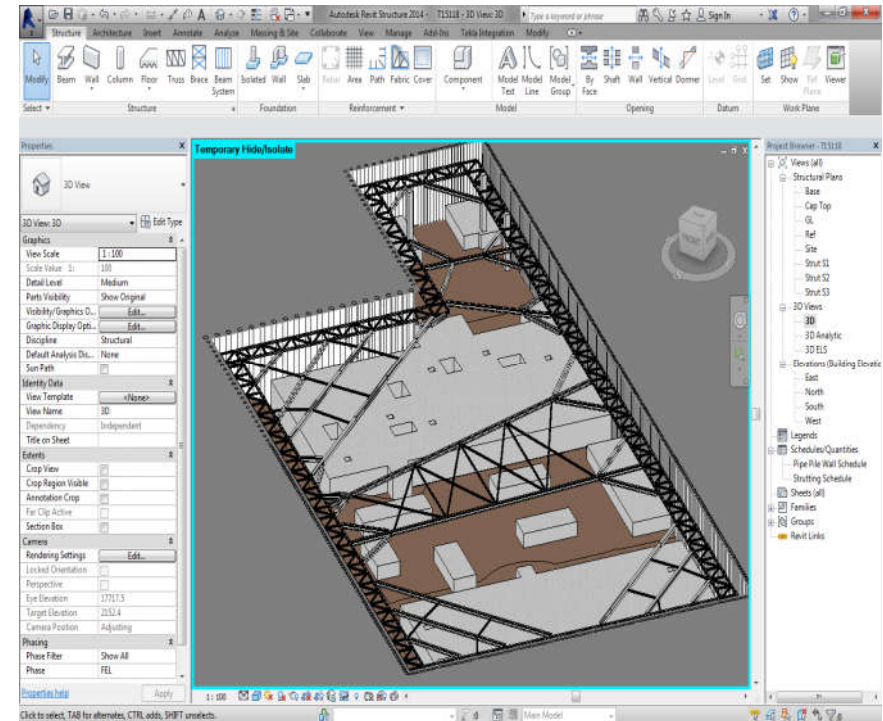
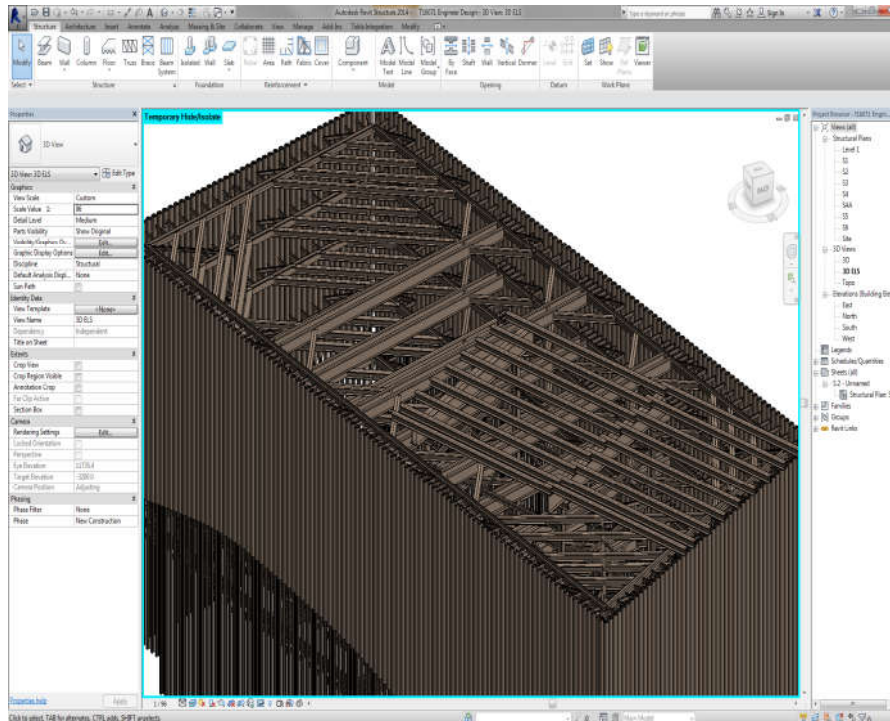


**Innovative  
Approaches**

**Work with  
Others**

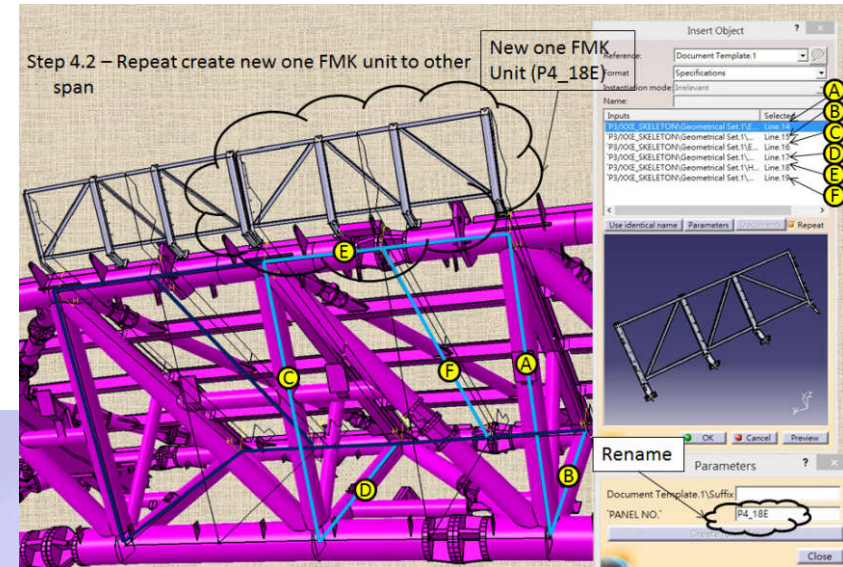
# BIM in Design

- Stable design workflow for
  - ELS design
  - Piling and Pile Cap design
- Constantly collect design information and set up BIM model in semi-automatic way



# BIM in Design

- Site Formation
- Topological Verifications
- Falsework Design



# BIM & Planning

**Task-Orientated/  
Problem Driven**

**Adopt Supply Chain**



**Innovative  
Approaches**

**Work with  
Others**

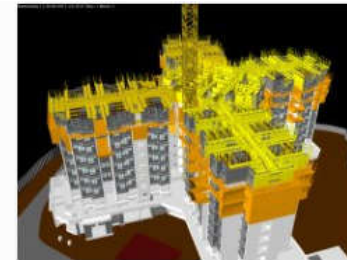
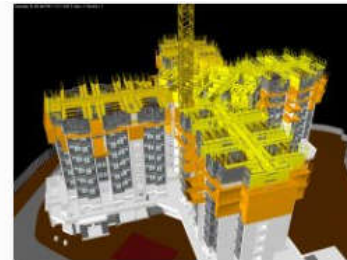
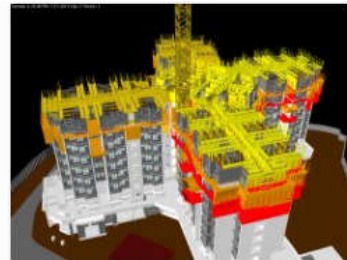
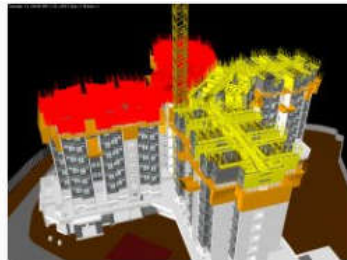
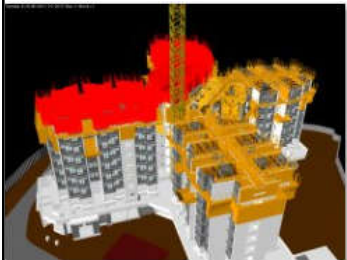
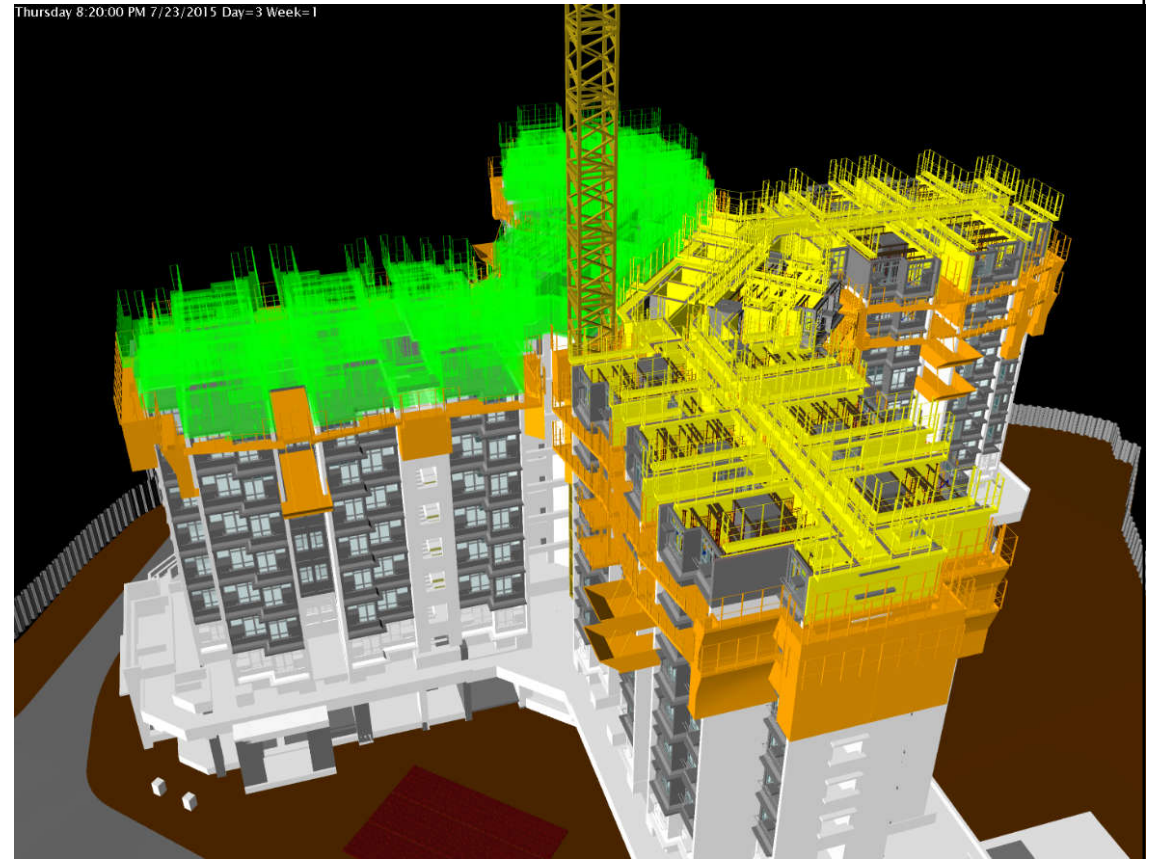
# Precast Highrise Construction

1樓 (短期計劃表)

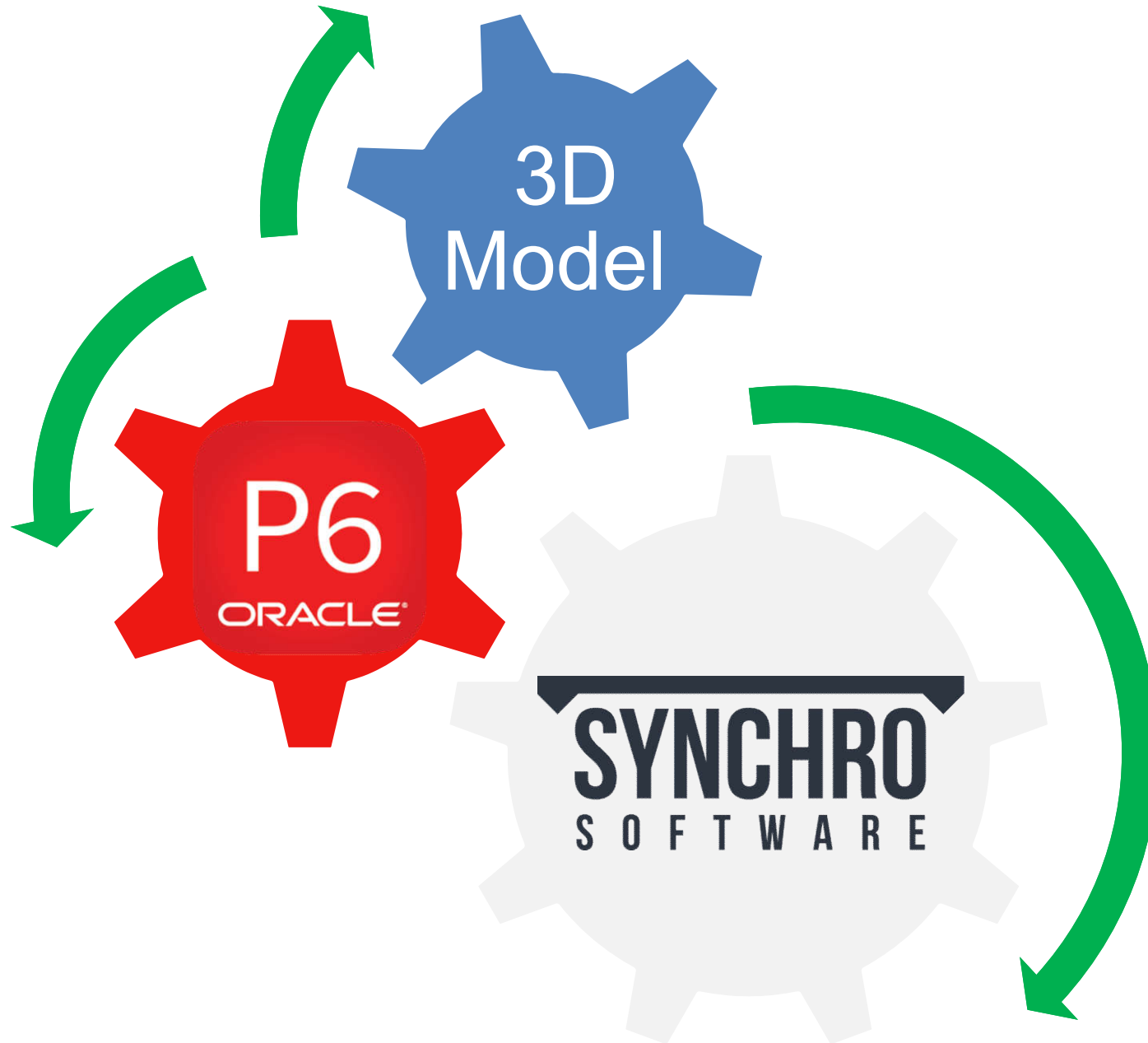
2015

2015 June

Day	時間	Wing	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5
1	0700-0815	AB	上坪身裝																																		
1	0815-1400	AB	上機沙、VPB、樓梯																																		
1	0800-1500	AB	VPB 北台柱身灌漿位封邊收口																																		
1	0700-1730	AB	升坪身裝																																		
1	12:00	AB	掛(梁)中令+斷亦交場																																		
1	15:30	AB	掛(梁)大亦隔四單位交場																																		
1	17:30	AB	掛(梁)大亦全文																																		
1	0900-1500	AB	打燈																																		
1	12:30	AB	掛(梁)坪身隔牆																																		
1	15:00	AB	掛(梁)坪身隔牆																																		
1	17:00	AB	掛(梁)坪身隔牆																																		
1	1300-1900	AB	裝飲機																																		
1	1300-1900	CD	預板(裝機落街(AB亦)																																		
2	0700-1100	AB	裝樓梯																																		
2	0700-1100	CD	預板/底面預板																																		
2	0700-1300	CD	VPB 裝機落街																																		
2	1000-1900	CD	訂定機生全																																		
2	1100-1600	CD	升層+安裝預板																																		
2	1100-1300	CD	裝機面預板																																		
2	1200-1800	CD	上層制機面																																		
2	1200-1700	CD	預板(機機)裝機坪 Drywall 裝機 Lift Door																																		
2	18:00	CD	掛(梁)中令+斷亦交場																																		
2	1600-1630	CD	上乳定版中令機面裝																																		
3	0700-1500	AB	預板預石尖																																		
3	0700-1500	CD	升層預石尖																																		
3	0800-1500	CD	裝機燈架																																		
3	1000-1530	CD	安裝Ranben位機																																		
3	1300-1530	CD	掛(梁)機機面燈架、機、試水																																		
3	1530-1900	CD	預板預石尖																																		
3A	0800-1900	CD	預板預石尖																																		
4	0700-0815	CD	上坪身裝																																		
4	0815-1400	CD	上機沙、VPB、樓梯																																		
4	0800-1500	CD	VPB 北台柱身灌漿位封邊收口																																		
4	0700-1730	CD	升坪身裝																																		
4	12:00	CD	掛(梁)中令+斷亦交場																																		
4	15:30	CD	掛(梁)大亦隔四單位交場																																		
4	17:30	CD	掛(梁)大亦全文																																		
4	0900-1500	CD	打燈																																		
4	12:30	CD	掛(梁)坪身隔牆																																		

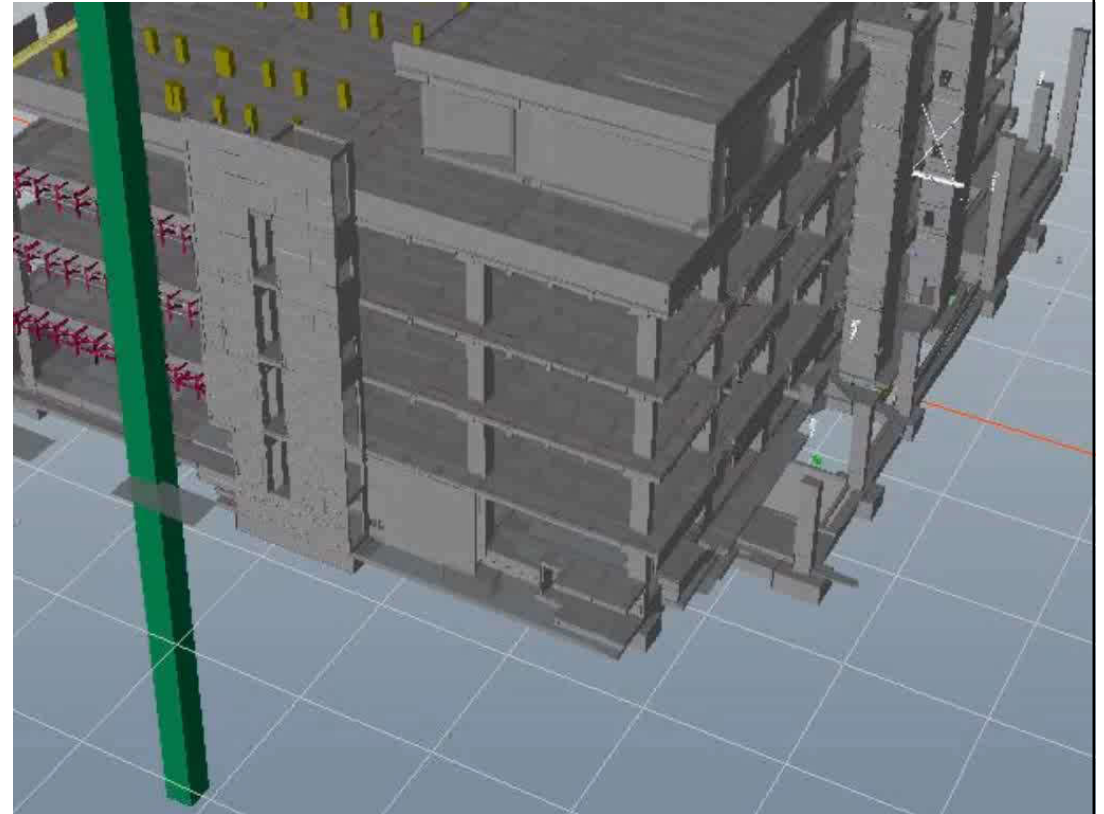
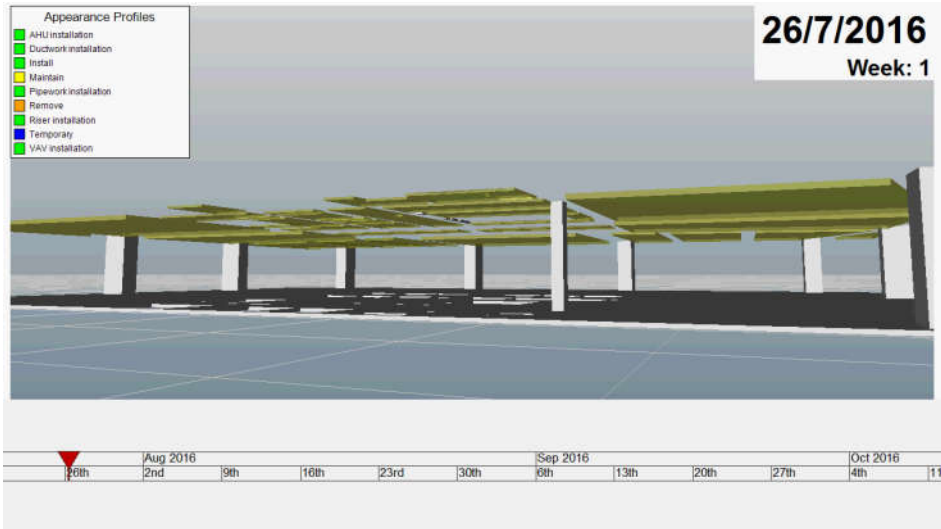


# 4D BIM Time





# 4D BIM – E&M Planning



# BIM & Surveying

**Task-Orientated/  
Problem Driven**

**Adopt Supply Chain**

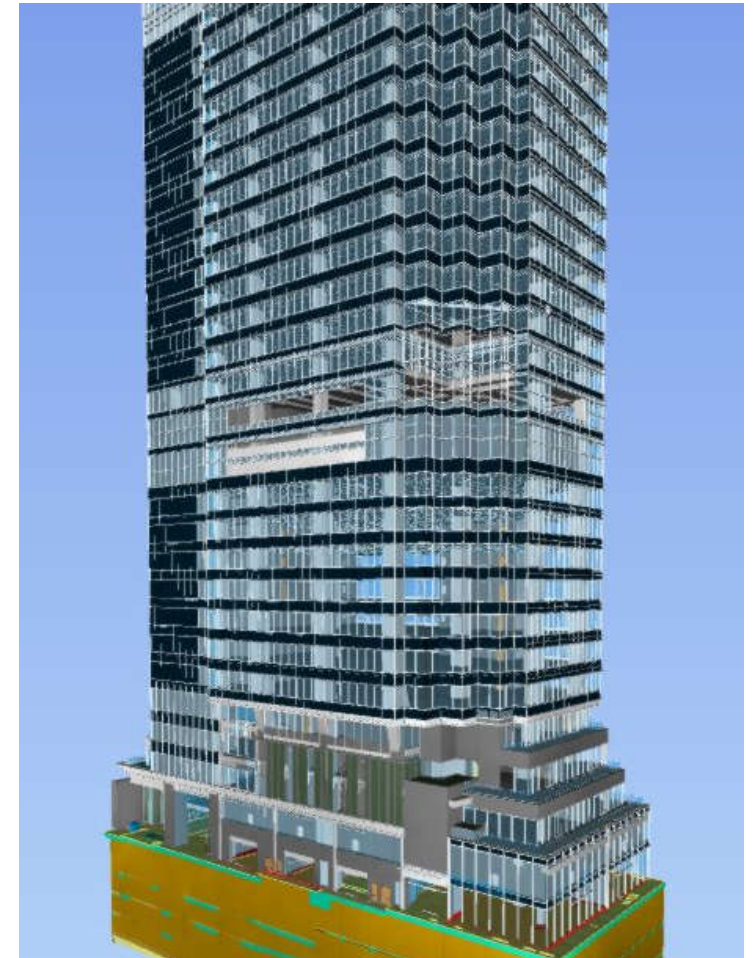
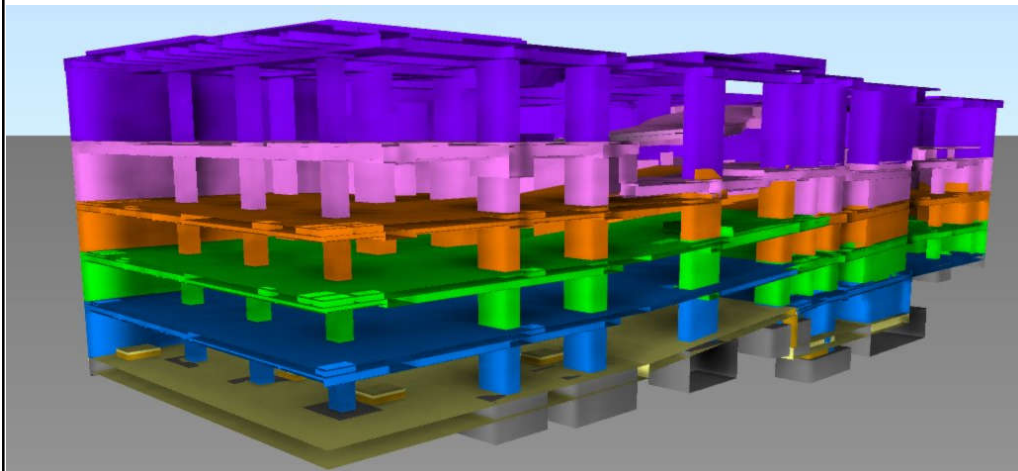


**Innovative  
Approaches**

**Work with  
Others**

# Trial Project – Office development

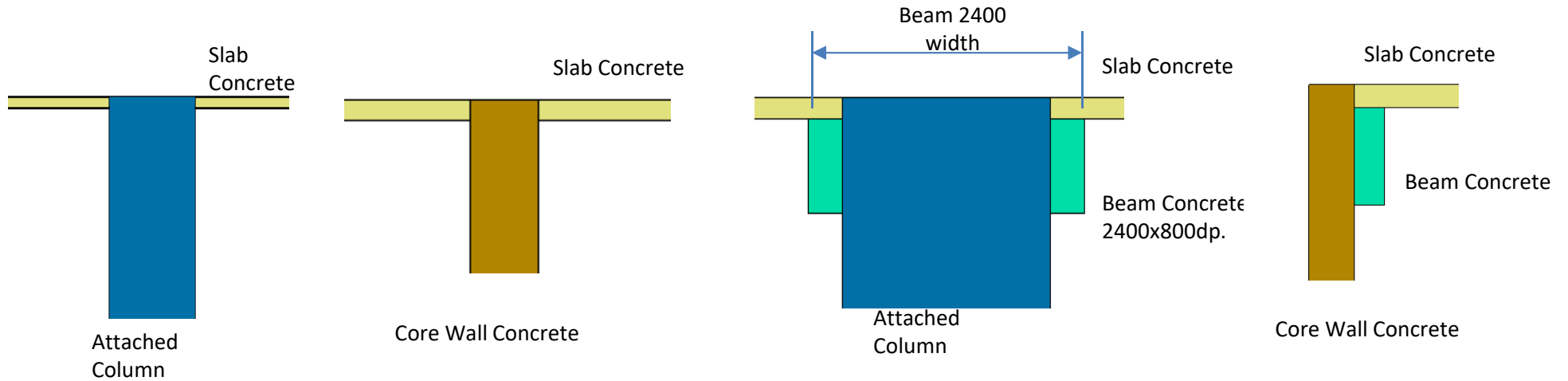
- ☑ BIM Model Ready.
- ☑ Modification of BIM Model to align with Simpler SMM Rules (GSMM).
- ☑ Start the 1<sup>st</sup> level information BIM taking off.



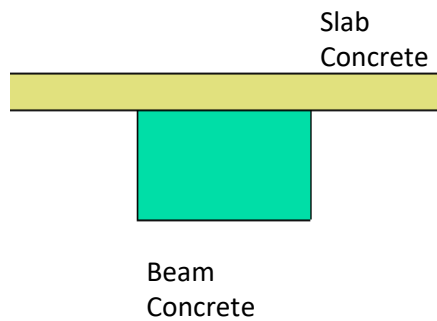
# Sample BIM Concrete Measure Simple Rules - Level 1

Superstructure BIM modeling role : Column & Core Wall > Slab > Beam

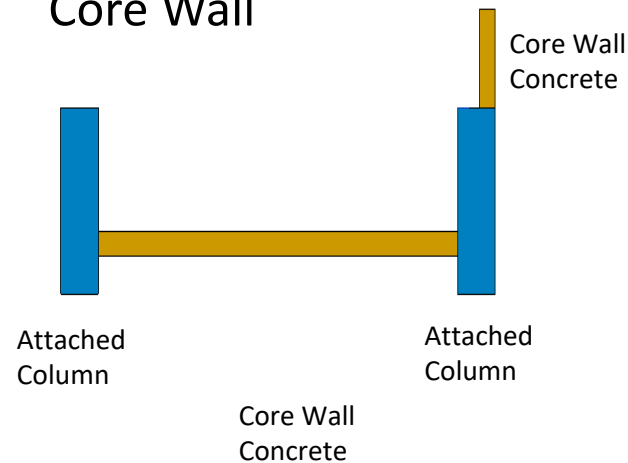
## Rule 1 – Column/ Core Wall Across Slab/ Beam



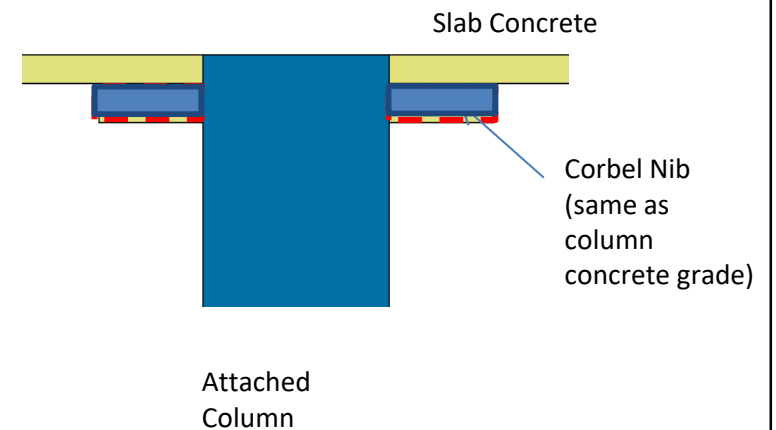
## Rule 2 – Slab Across Beam



## Rule 3 – Column Across Core Wall

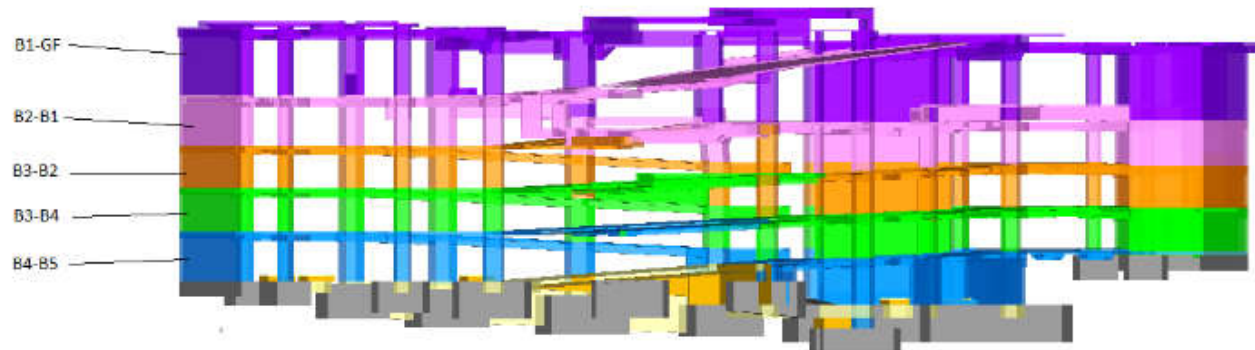


## Rule 4 – Corbel Follow Column



# BIM Measure Results – BasementLevel (Below Ground Level)

Row Labels	Length	Width	Thickness	Height	Perimeter	Area	Volume	Weight	Count	PrimaryQuant
B1-GF										
C20	0	0	2.24	0	343.2024804	743.763591	267.124846	0	7	
C45	1343.213554	162.08	3.025	68.44178057	1155.317166	2698.927956	1458.349157	0	199	
C60	172.5398449	39.75	0	21.05	0	141.1433812	575.9000665	0	27	
B2-B1										
C20	0	1	0.3	0	0	0	0	0	1	
C45	1478.163155	188.54	7.825	100.5272323	1574.541057	3180.0322	1639.797755	0	311	
C60	98.25819674	30.35	0	10.5	0	75.8476547	342.4142072	0	25	
B3-B2										
C20	0	0	0.07	0	7.498287815	3.21188691	0.224832084	0	2	
C45	1006.060373	137.24	4.155	76.19566631	1029.809135	2375.550432	1020.493071	0	195	
C60	110.2318656	37.45	0.25	11.61	11.89103793	86.99505762	379.4798851	0	28	
B4-B3										
C20	0	1	0.76	0	40.76586631	20.91574669	2.115806861	0	5	
C45	1080.58009	150.9	5.75	96.34378943	1072.552288	2601.066599	1181.997928	0	221	
C60	106.2758729	37.45	0.25	9.25	11.89103793	84.10521077	353.4482672	0	28	
B5-B4										
C20	0	1	4.355	0	57.57228908	38.87211129	105.0639591	0	5	
C45	941.9269308	120.03	4.975	121.9051889	1181.337414	3360.488719	1362.530059	0	188	
C60	103.907204	32.65	0	11.28	0	77.90506878	388.7645118	0	23	



# Use of Navisworks to Obtain the Quantity

- Use the Navisworks to check the module and obtain the quantity in 3D view

The screenshot displays the Autodesk Navisworks Manage 2014 interface. The main window shows a 3D model of a building structure with various panels highlighted in different colors (yellow, orange, blue, pink, red). The Selection Tree on the left lists various elements, including Ceilings, Doors, Floors, Furniture, Generic Models, Lighting Fixtures, Plumbing Fixtures, Railings, Stairs, Structural Columns, and Walls. The Properties panel on the right shows details for a selected 'Basic Wall' element, including Volume (3.60 m³) and Area (24.02 m²). The Selection Inspector at the bottom right shows a table with 1 item selected: Basic Wall with a volume of 3.60 m³.

Property	Value
Base Extension Distance	0.00 m
Base Offset	0.05 m
Zone	Arch
Top Offset	0.00 m
Unconnected Height	4.75 m
Location Line	2
Base is Attached	0
QTO_Level Refer	3F
Structural Usage	0
Volume	3.60 m³
Base Constraint	Level "3F", #28...
Phase Created	Phase "New Co...
Room Bounding	1
Top is Attached	0
Enable Analytical Model	0
Area	24.02 m²
Length	5.67 m

Item Name	Element Volume
Basic Wall	3.60 m³

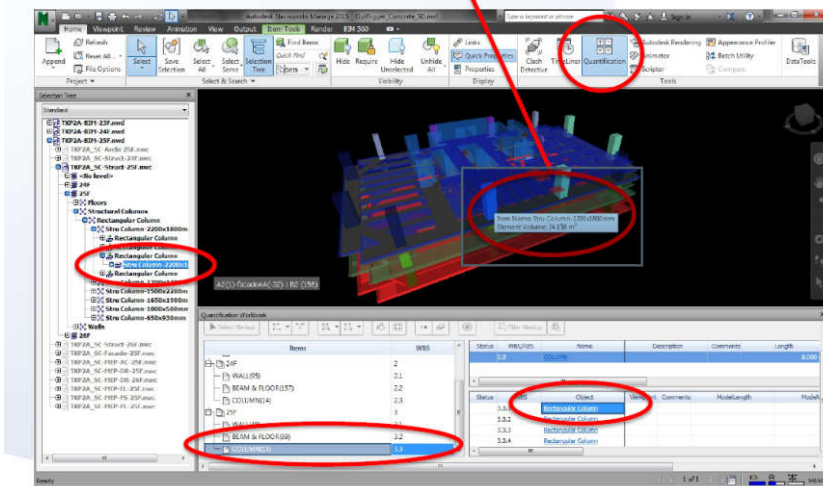
# Applications

- Ordering of Concrete
- Wastage Control (Consumption Projection)
- Operational Planning (Concrete Pour Qty)
- Check BQ Errors



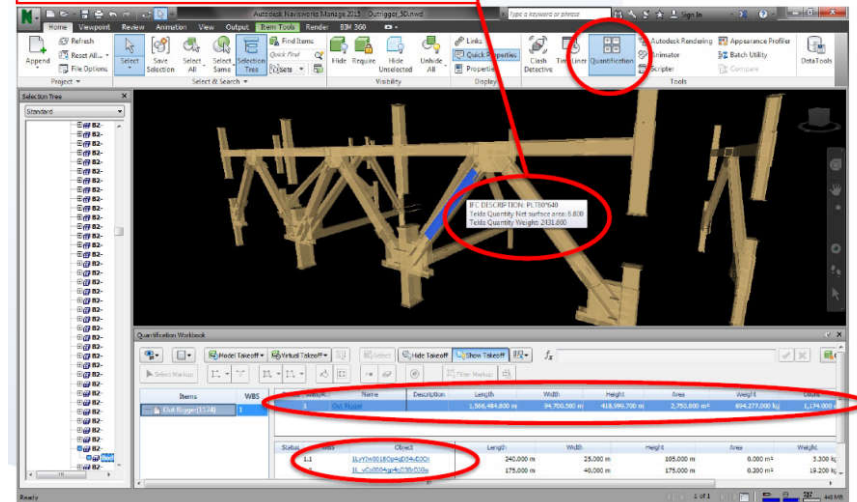
# BIM for Quantification

Quantity of Column=2200x1800=24.156m<sup>3</sup>



Building 5thD Pilot – RC

Weight of the Steel =2431.6 kg



Building 5thD Pilot – Structural Steel



Building 5thD Pilot – M&E Fittings and Equipments

Type	Size	Count	Diameter	Length
VAV BOX	1460X400	59	200 mm	580.08 mm
AHU(04-01)	2250X2580	1		
AHU(04-02)	2250X2580	1		

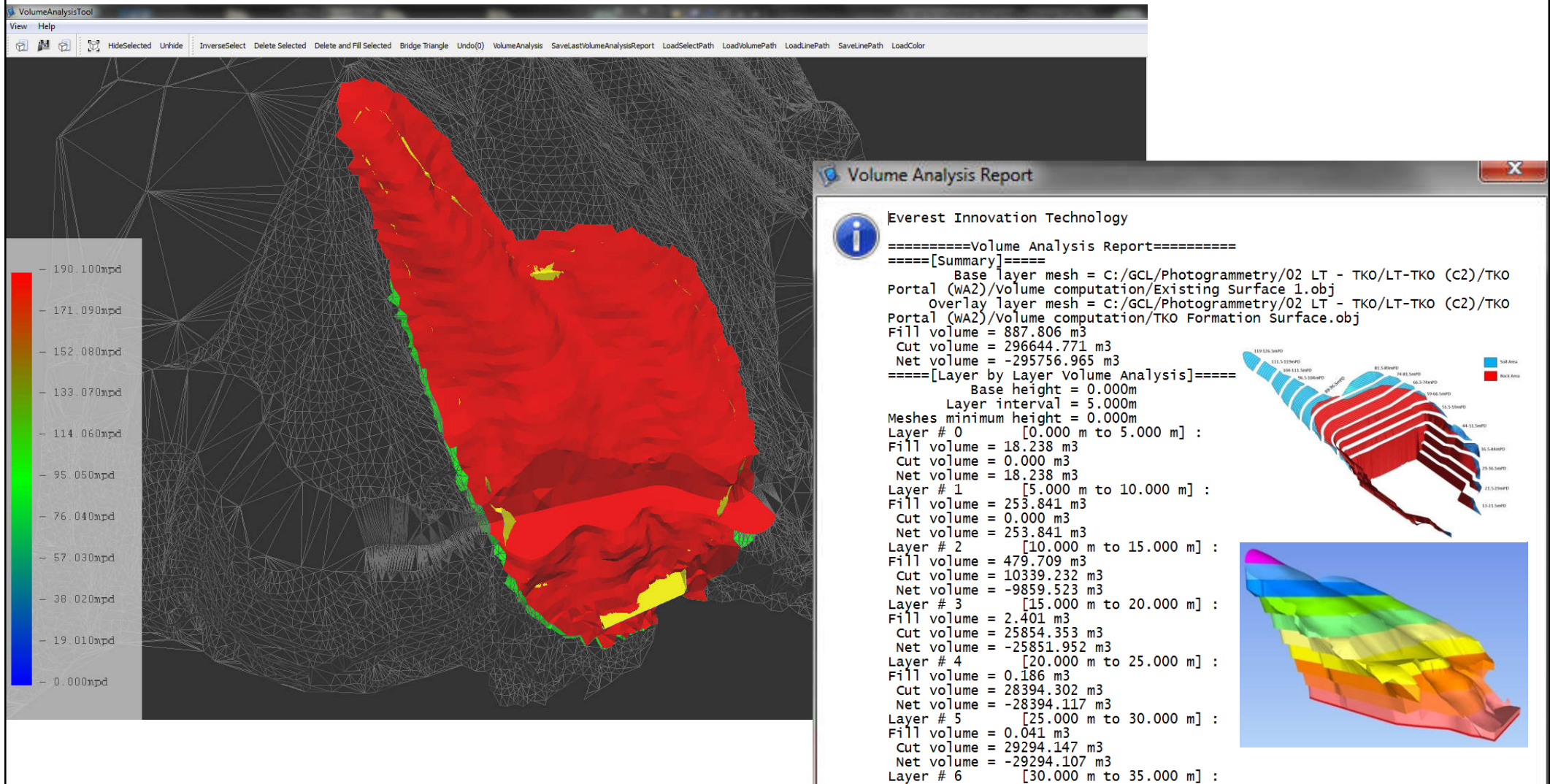
Type	Size	Type Name	Count
115X1200 SAG	1200X115	SAG	79
400X200 SAG	400X200	SAG	8
450X300-EAG	450X300	EAG	1

Type	Size	Count	Duct Type	Width	Height	Depth	Area
1100x350 Silencer	1100 mmx350 mm-1100 mmx350 mm	1	SAD	345 mm	200 mm	0.6 mm	0.9
1250x400 Silencer	1250 mmx400 mm-1250 mmx400 mm	1	SAD	345 mm	200 mm	0.6 mm	2.92
F.D	150 mmx150 mm-150 mmx150 mm	1	SAD	345 mm	200 mm	0.6 mm	0.89
F.D	450 mmx300 mm-450 mmx300 mm	2	SAD	345 mm	200 mm	0.6 mm	0.95



# Volumetric Computation Cut & Fill Quantity Automation

- 1) Compare 2 models for volumetric computation
- 2) Custom setup depth interval (e.g. 5m) for layer to layer computation



# BIM & Operation

**Task-Orientated/  
Problem Driven**

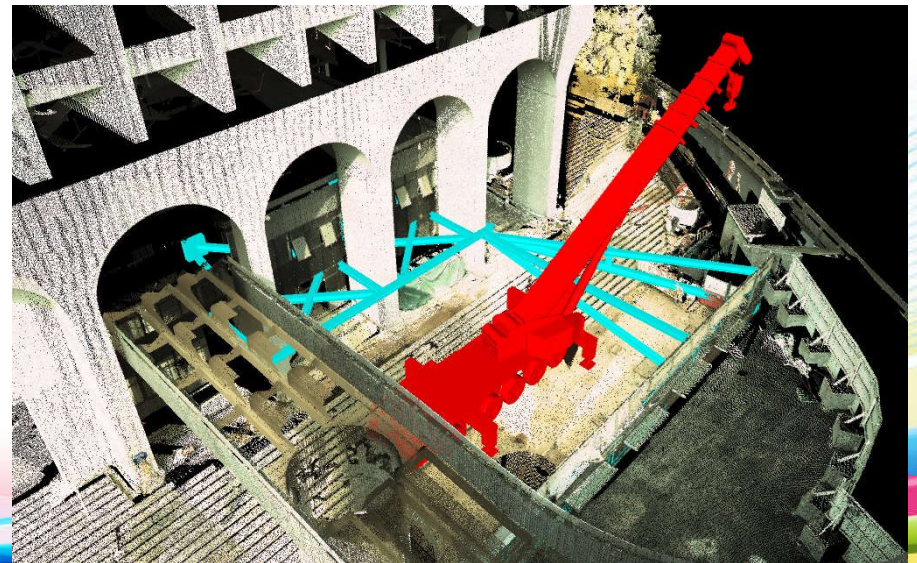
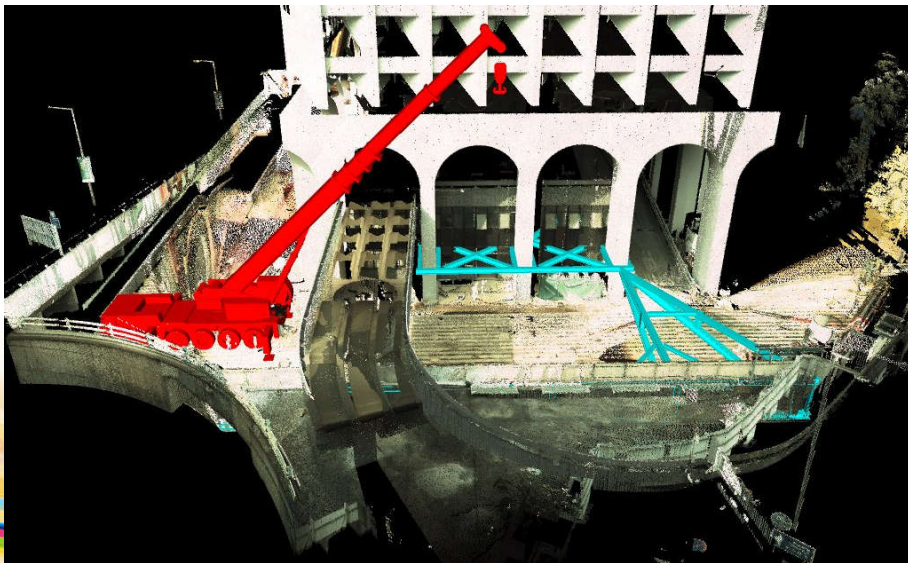
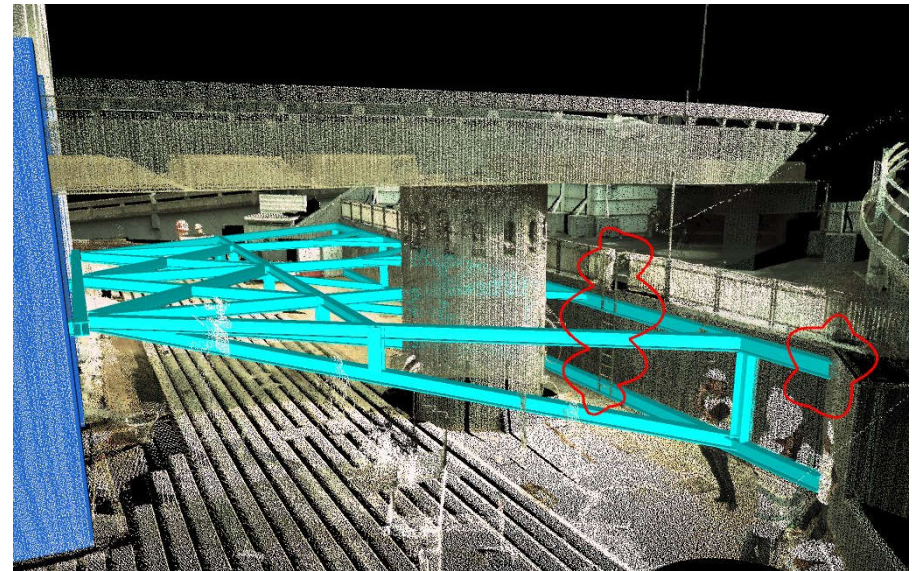
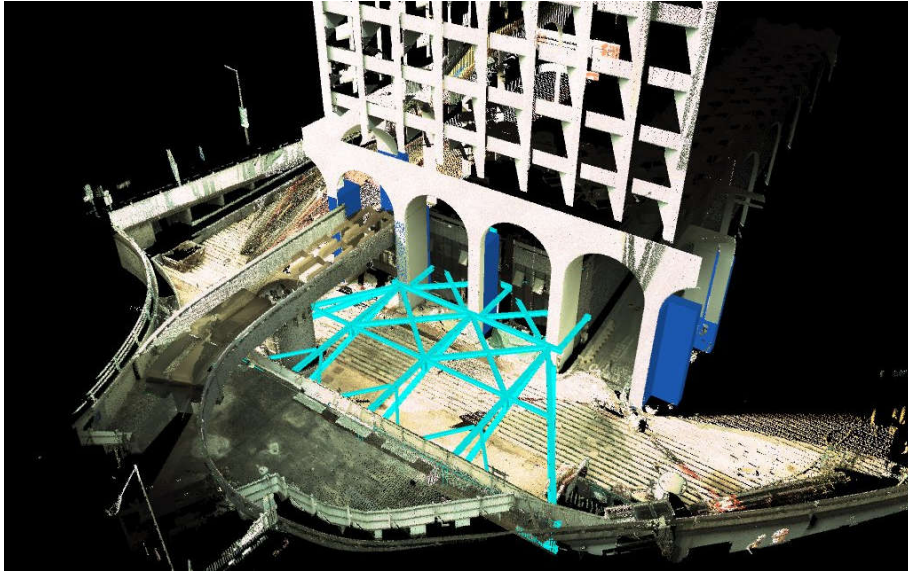
**Adopt Supply Chain**



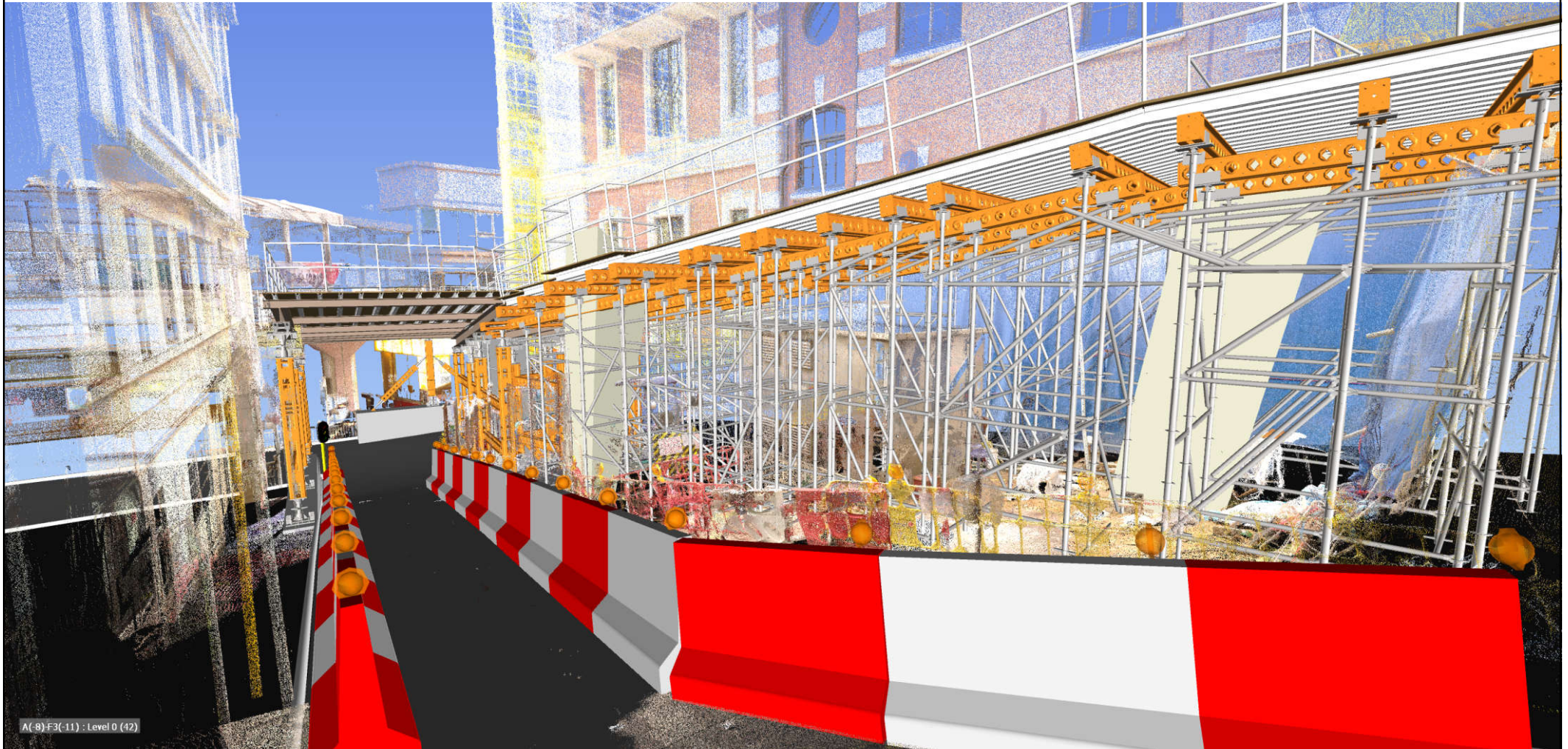
**Innovative  
Approaches**

**Work with  
Others**

# Site Planning for Alteration Works

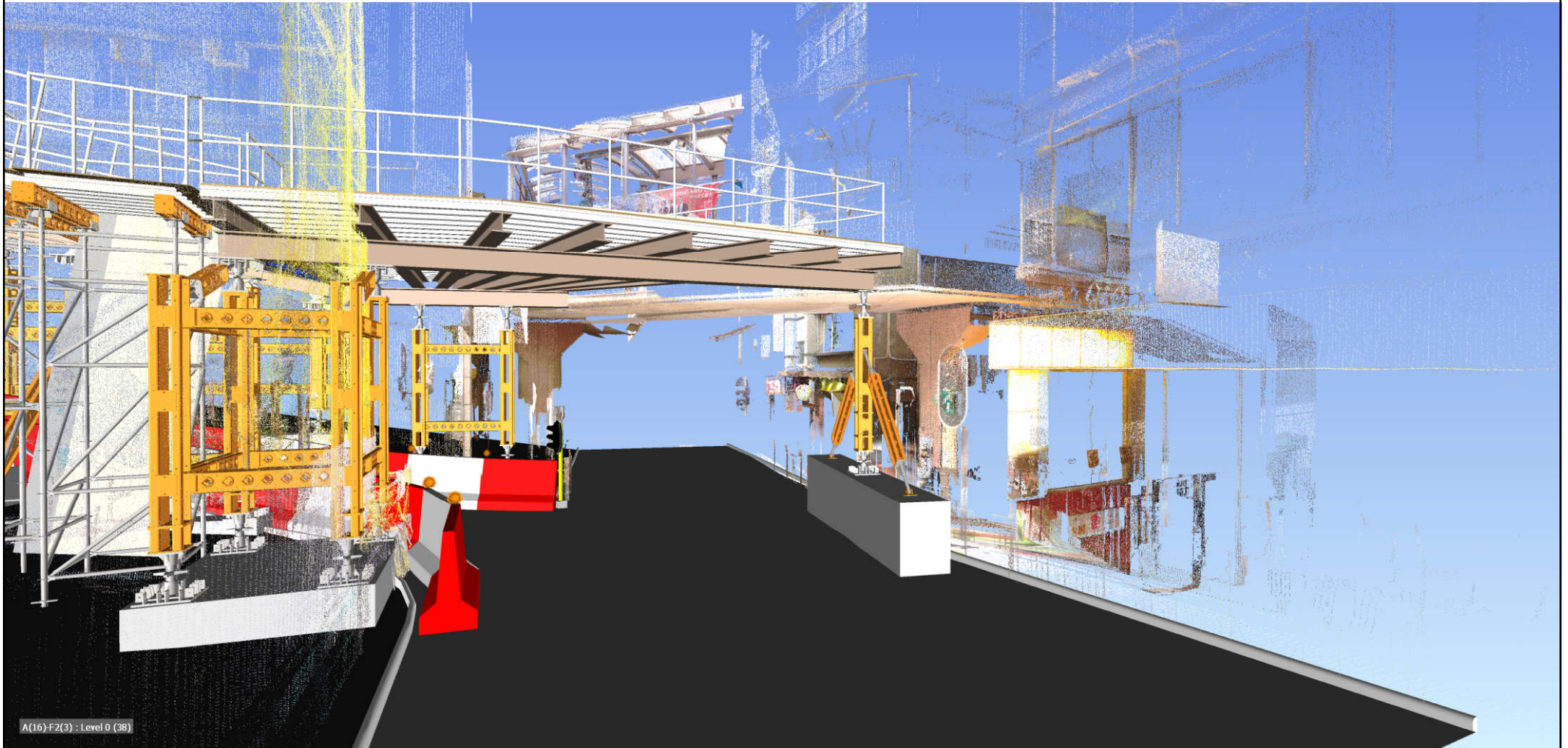


# Site Planning for Footbridges



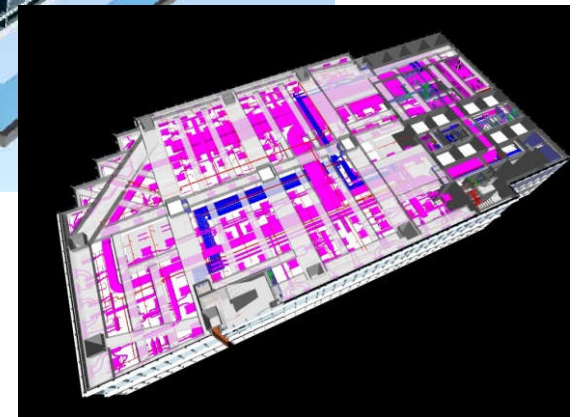
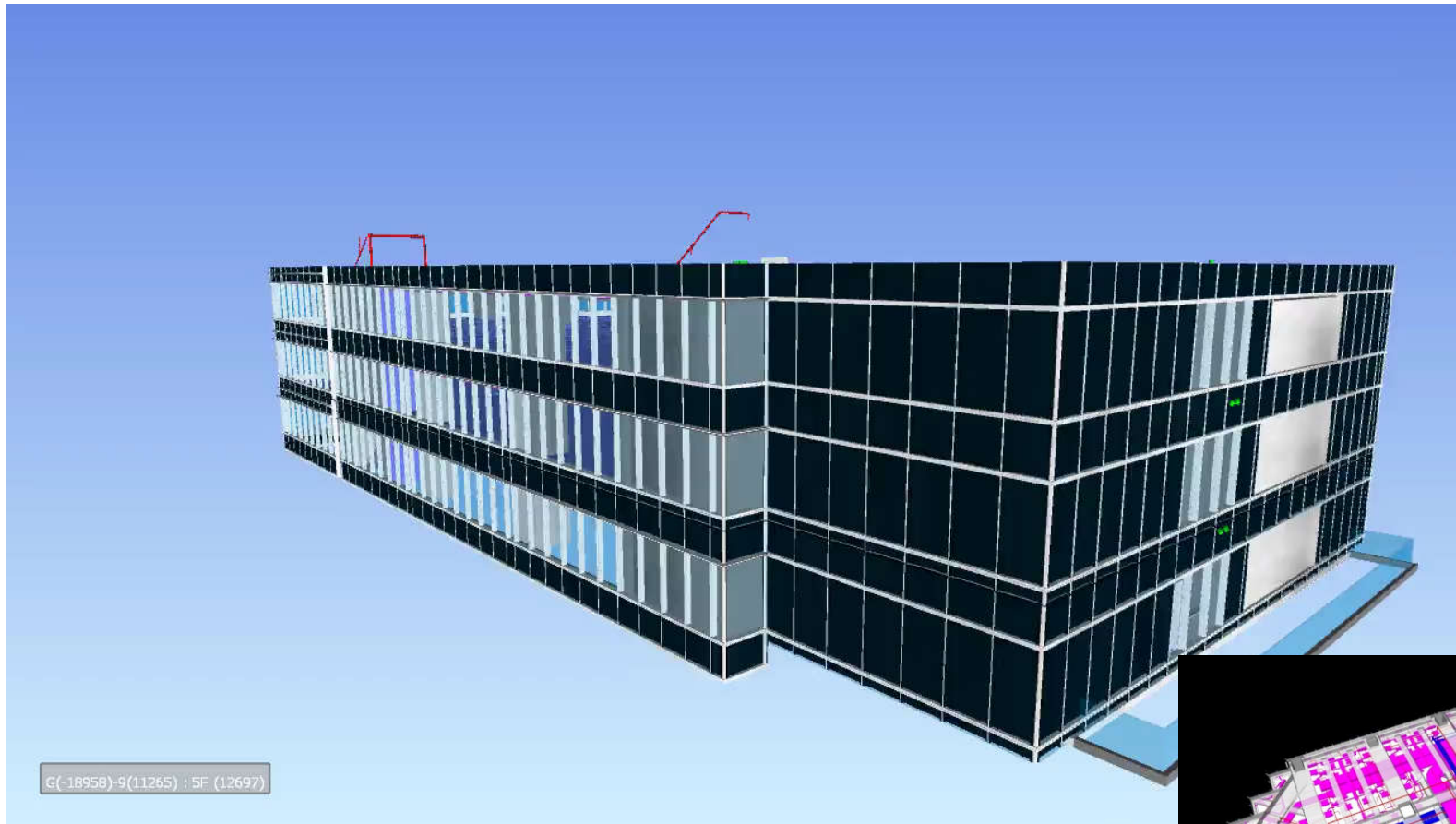
A(8)F3(-11) : Level 0 (42)

# Site Planning for Footbridges

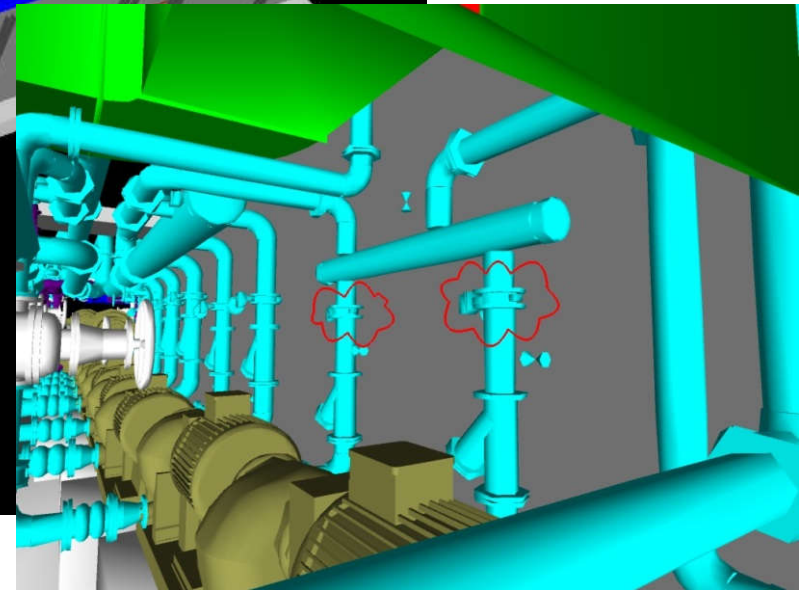
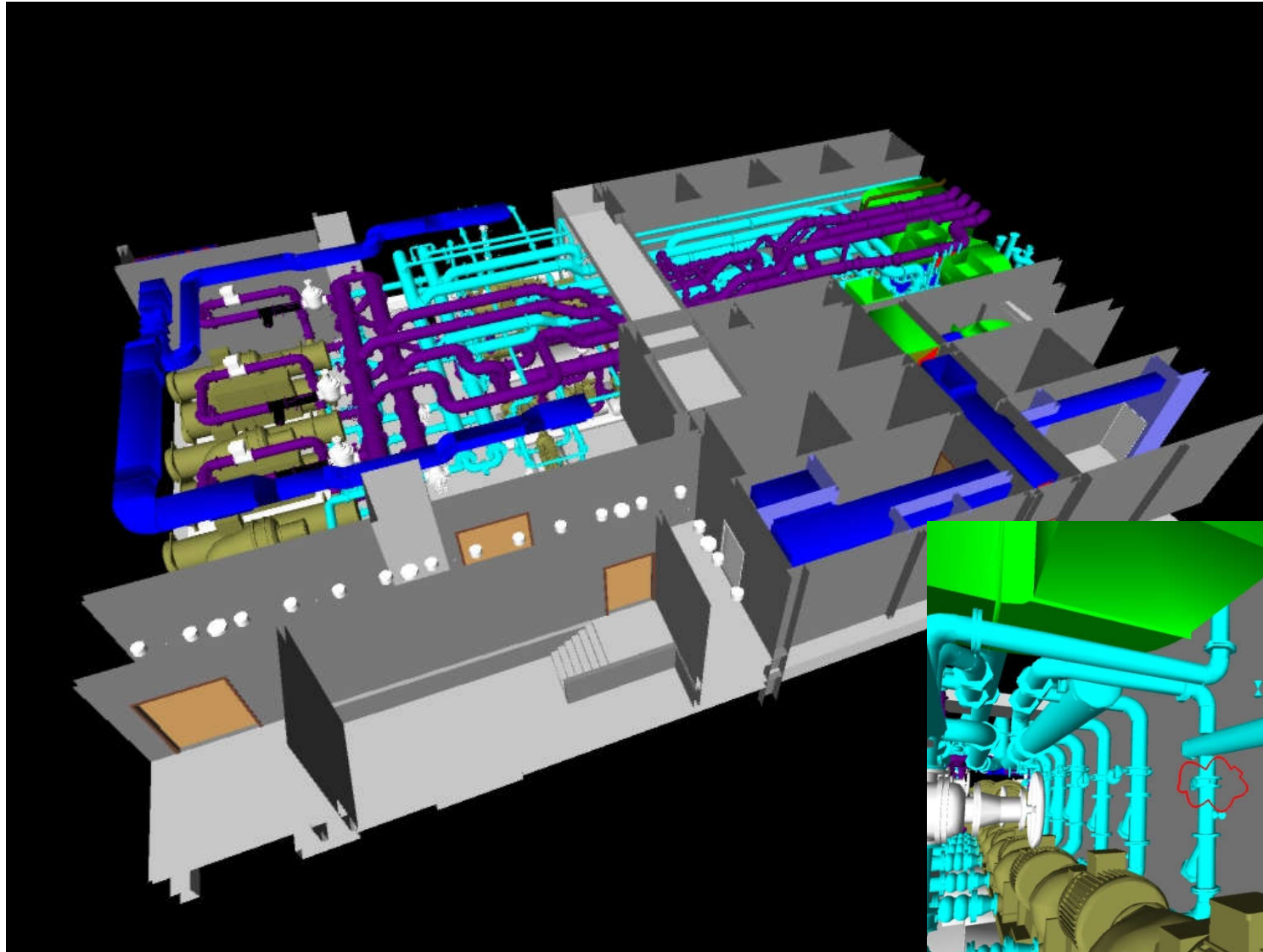


A(16)-F2(3) : Level 0 (38)

# BIM Development –Optimizing Headroom



# BIM Development – Built for Maintenance



# BIM & Production

**Task-Orientated/  
Problem Driven**

**Adopt Supply Chain**



**Innovative  
Approaches**

**Work with  
Others**



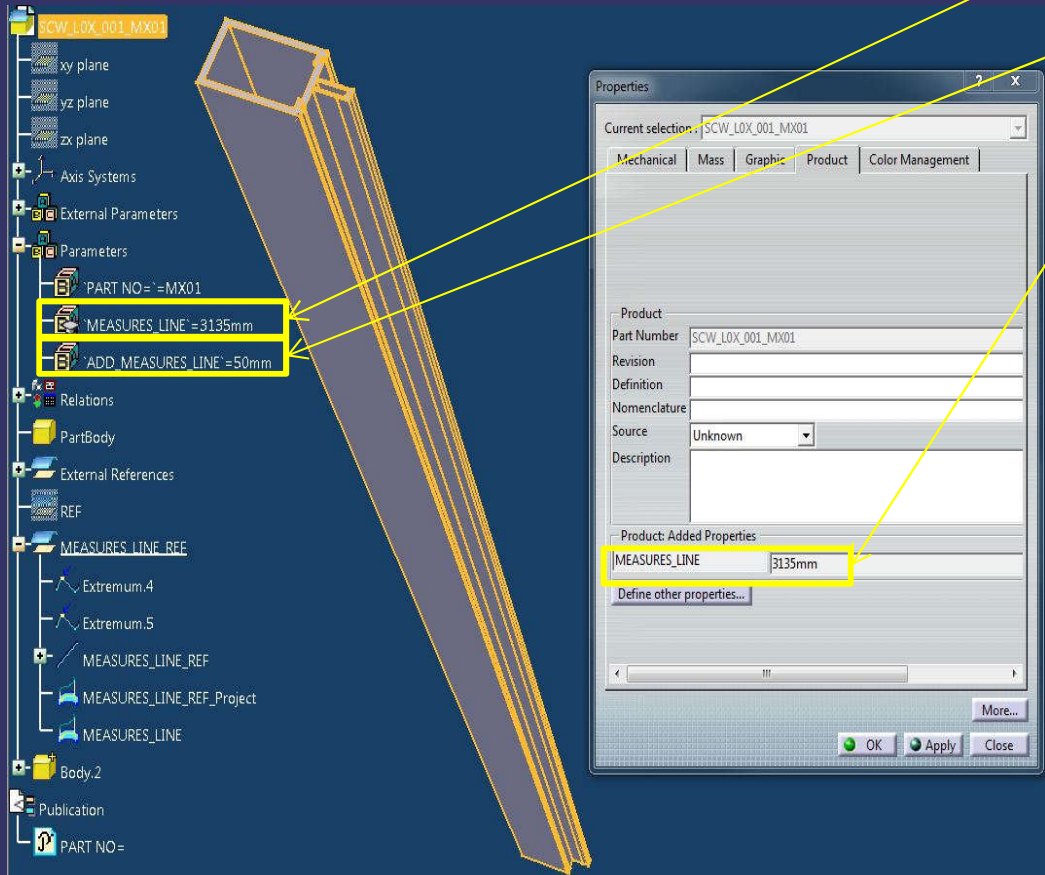
# 3D for Curtainwall Production

Extrusion Model measure length = 3035mm

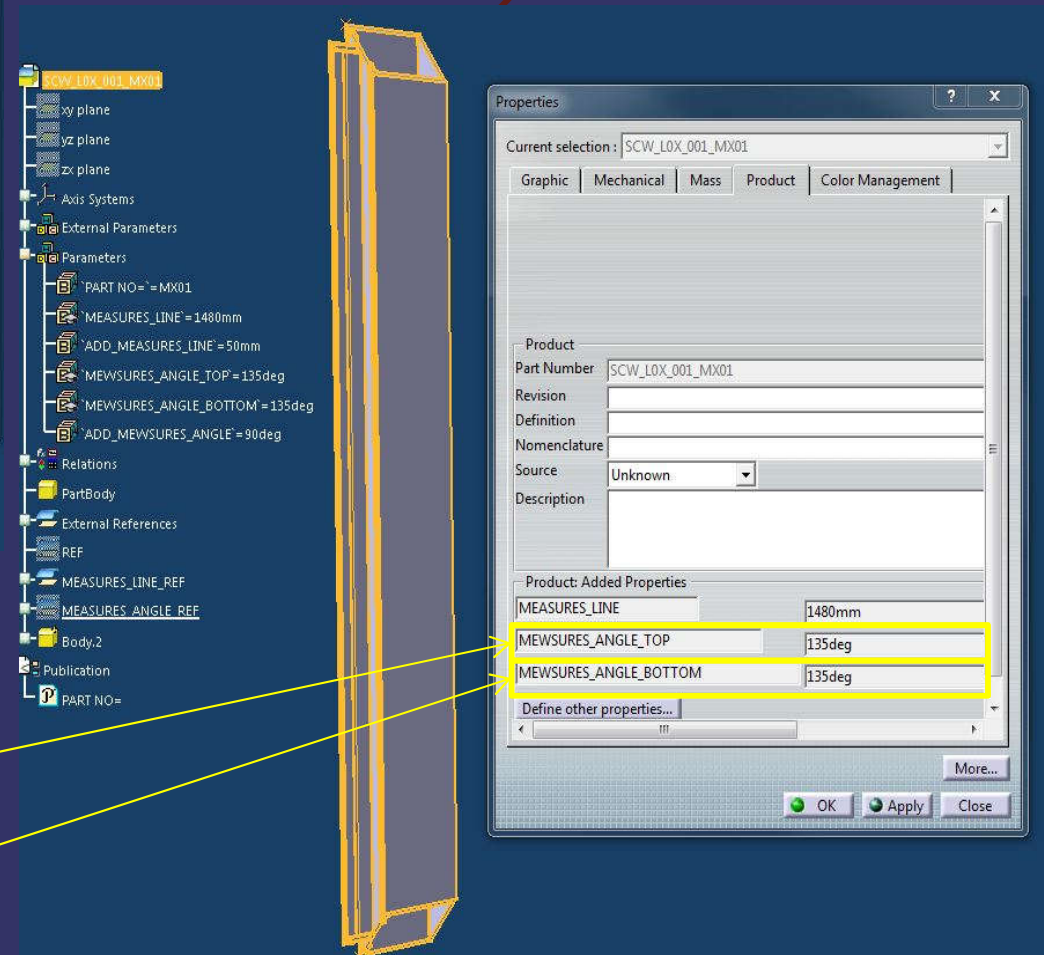
Extend length for fabricate fixing space = 100mm

Total length = 3135mm

Angle Cutting Case



Horizontal Cutting Case



Extrusion Model measure cutting angle (Top) = 135deg

Extrusion Model measure cutting angle (Bottom) = 135deg

# 3D for Curtainwall Production

Check Clash

Definition  
Type: Contact + Clash 0mm Selection: 1 No selection  
Between all components Selection: 2 No selection

Results  
Number of interferences: 1279 (Clash:12, Contact:1267, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	Type	Value	Status
126	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-4.76	Relevant
127	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
128	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
129	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
138	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
139	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
140	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
141	HU401_011.1 [HU4...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
309	GW_L01_001_HU41...	...GW_L01_006_HU401...	Clash	-8.09	Relevant
446	GW_L01_006_HU40...	...GW_L01_001_HU418...	Clash	-8.09	Relevant
499	GW_L01_001_HU41...	...GW_L01_007_HU401...	Clash	-8.09	Relevant
734	GW_L01_001_HU41...	...GW_L01_012_HU401...	Clash	-8.09	Relevant

Check Clash

Definition  
Type: Contact + Clash 0mm Selection: 1 No selection  
Between all components Selection: 2 No selection

Results  
Number of interferences: 1279 (Clash:12, Contact:1267, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	S...	Type	Value	Status
126	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-4.76	Relevant
127	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
128	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
129	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
138	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
139	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
140	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
141	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
309	GW_L01_001_HU41...	GW_L01_006_H...		Clash	-8.09	Relevant
446	GW_L01_006_HU40...	GW_L01_001_H...		Clash	-8.09	Relevant
499	GW_L01_001_HU41...	GW_L01_007_H...		Clash	-8.09	Relevant
734	GW_L01_001_HU41...	GW_L01_012_H...		Clash	-8.09	Relevant

Check Clash

Definition  
Type: Contact + Clash 0mm Selection: 1 No selection  
Between all components Selection: 2 No selection

Results  
Number of interferences: 642 (Clash:38, Contact:604, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	Type	Value	Status	Comment
13	FRAMING_L1.1...	RC WALL_LG.1...	Clash	-873.01	Relevant	
14	RC WALL_L1.1	SLAB_LG.1 [SL...	Clash	-1298.02	Relevant	
16	RC WALL_L1.1	RC WALL_LG.1	Clash	-1223.02	Relevant	
17	RC WALL_L1.1	FRAMING_LG...	Clash	-1383.01	Relevant	
18	RC WALL_L1.1	SLAB_L2.1 [SL...	Clash	-148.02	Relevant	
20	RC WALL_L1.1	FRAMING_L2.1	Clash	-773.01	Relevant	
21	RC WALL_L1.1	RC WALL_L2.1	Clash	-48.01	Relevant	
25	SLAB_LG.1 [SL...	RC WALL_LG.1	Clash	-1058.01	Relevant	
26	SLAB_LG.1 [SL...	FRAMING_LG...	Clash	-17.73	Relevant	
30	COLUMN_LG.1...	FRAMING_L2.1	Clash	-773.01	Relevant	
32	RC WALL_LG.1	FRAMING_LG...	Clash	-105.18	Relevant	
34	RC WALL_LG.1	FRAMING_L2.1	Clash	-773.01	Relevant	
44	RC WALL_L2.1	FRAMING_L3.1	Clash	-428	Relevant	
47	SLAB_L3.1 [SL...	RC WALL_L3.1	Clash	-148.02	Relevant	
53	RC WALL_L3.1	FRAMING_L5...	Clash	-468.01	Relevant	
58	SLAB_L5_L3.1	SCW_L07_001...	Clash	-15.81	Relevant	
64	COLUMN_L5_L...	SCW_L07_001...	Clash	-15.81	Relevant	
65	FRAMING_L5...	RC WALL_L5_L...	Clash	-5076.83	Relevant	
67	RC WALL_L5_L...	FRAMING_L16...	Clash		Not inspe...	
77	FRAMING_L16...	RC WALL_L16...	Clash		Not inspe...	
79	RC WALL_L16...	FRAMING_L25...	Clash		Not inspe...	
89	FRAMING_L25...	RC WALL_L25...	Clash		Not inspe...	
90	RC WALL_L25...	SLAB_L29.1 [SL...	Clash		Not inspe...	
91	RC WALL_L25...	FRAMING_L29...	Clash		Not inspe...	
92	RC WALL_L25...	RC WALL_29F...	Clash		Not inspe...	

Check Clash

Definition  
Type: Contact + Clash 0mm Selection: 1 No selection  
Between all components Selection: 2 No selection

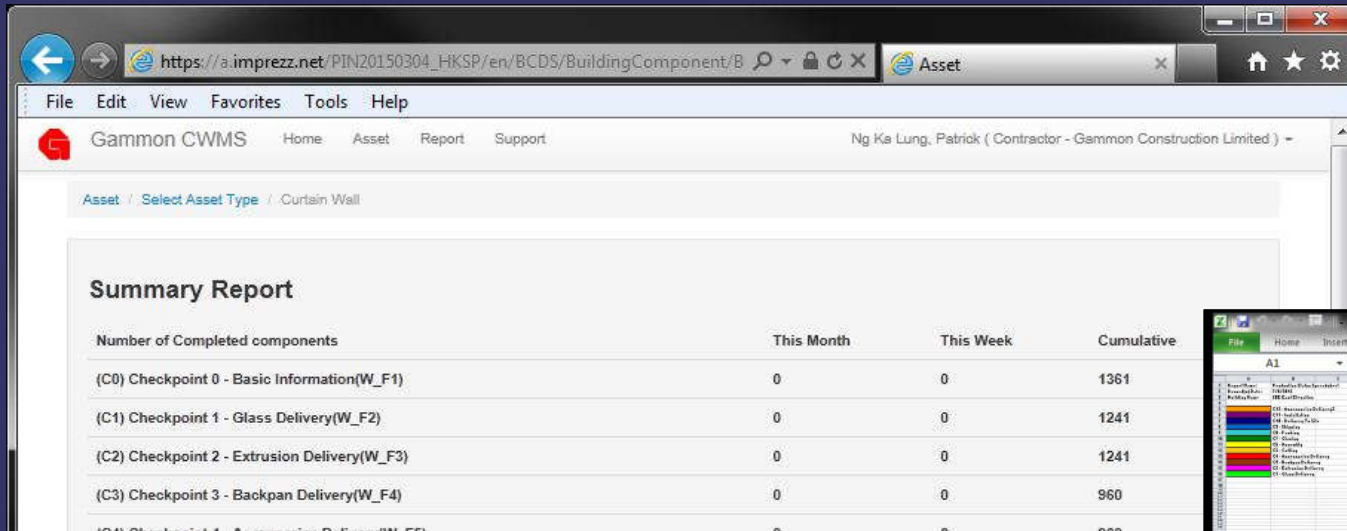
Results  
Number of interferences: 1279 (Clash:12, Contact:1267, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	S...	Type	Value	Status
126	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-4.76	Relevant
127	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
128	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
129	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
138	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
139	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
140	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
141	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
309	GW_L01_001_HU41...	GW_L01_006_H...		Clash	-8.09	Relevant
446	GW_L01_006_HU40...	GW_L01_001_H...		Clash	-8.09	Relevant
499	GW_L01_001_HU41...	GW_L01_007_H...		Clash	-8.09	Relevant
734	GW_L01_001_HU41...	GW_L01_012_H...		Clash	-8.09	Relevant

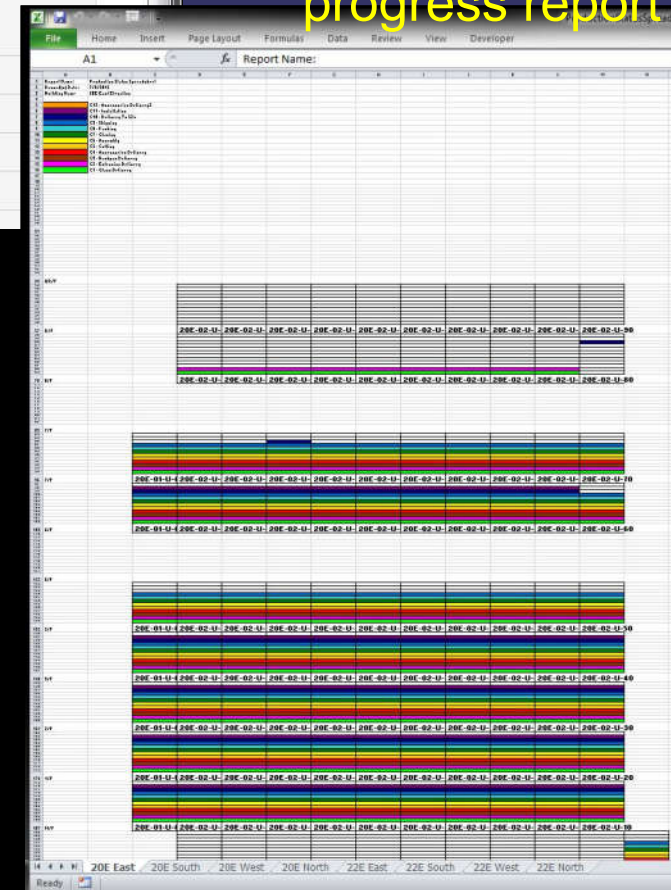
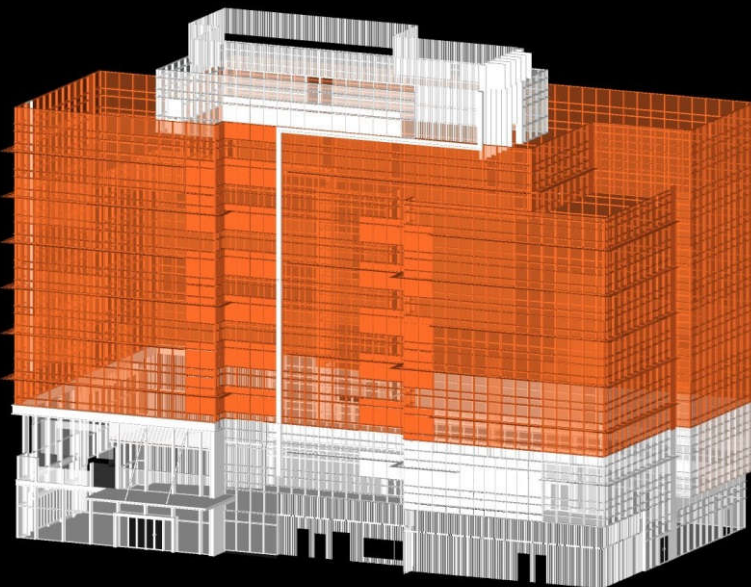
# RFID – BIM Work Delivery Tracking

Collated RFID status  
via online portal  
integrated with BIM  
for executive  
progress report

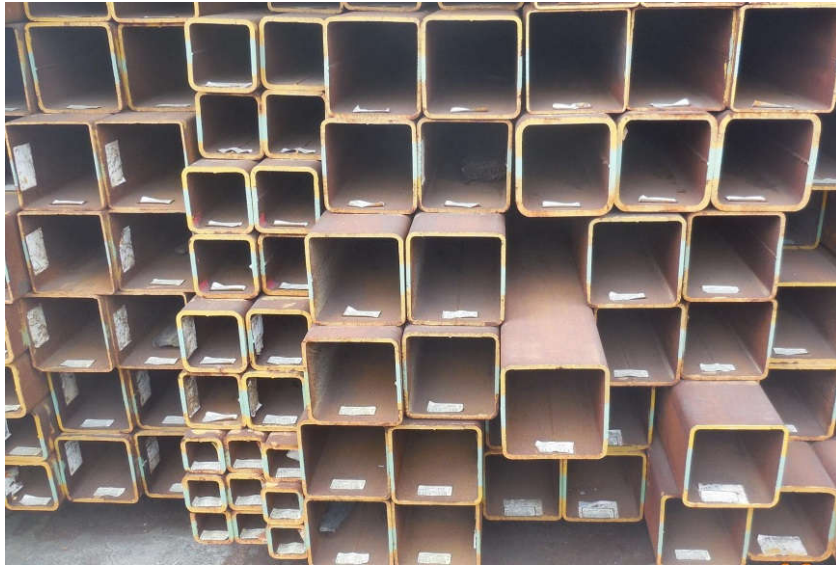


The screenshot shows a web browser window with the URL [https://a.imprezz.net/PIN20150304\\_HKSP/en/BCDS/BuildingComponent/B](https://a.imprezz.net/PIN20150304_HKSP/en/BCDS/BuildingComponent/B). The page title is "Asset" and the user is logged in as "Ng Ka Lung, Patrick ( Contractor - Gammon Construction Limited )". The main content area displays a "Summary Report" for "Curtain Wall".

Number of Completed components	This Month	This Week	Cumulative
(C0) Checkpoint 0 - Basic Information(W_F1)	0	0	1361
(C1) Checkpoint 1 - Glass Delivery(W_F2)	0	0	1241
(C2) Checkpoint 2 - Extrusion Delivery(W_F3)	0	0	1241
(C3) Checkpoint 3 - Backpan Delivery(W_F4)	0	0	960
(C4) Checkpoint 4 - Accessories Delivery(W_F5)	0	0	0

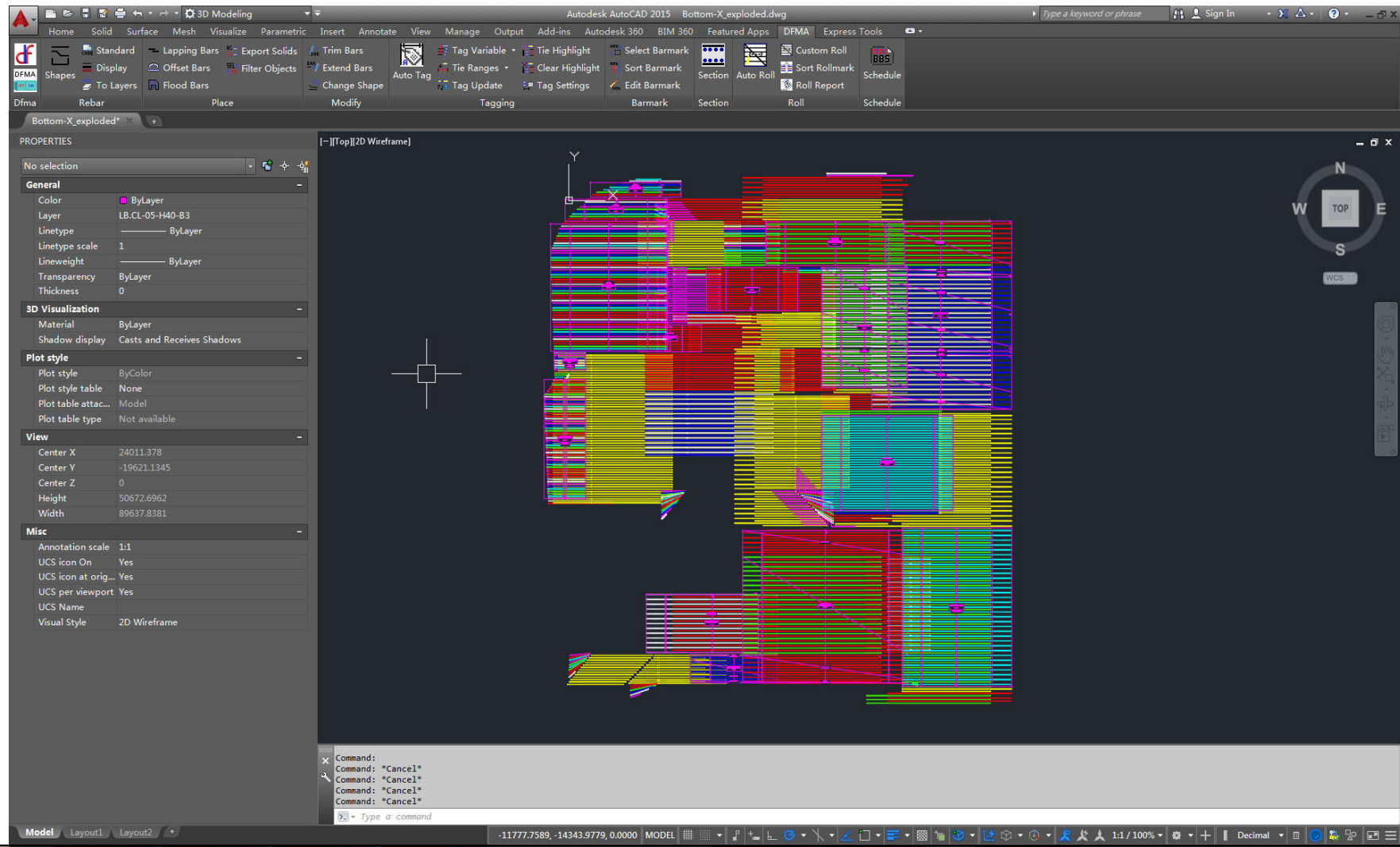


# 8D in Steel Fabrication Tracking



# Pile Cap Reinforcement

- Pilot – layer B3 for example



# Bar Bending Schedule

- Configuration

The screenshot shows the 'DFMA - Schedule' configuration window with the following sections:

- SCHEDULE PARAMETERS:** Job No (3628), Drawing No, Client Name, Site Ref 1, Site Ref 2, Prepared Date (10-五月-16), Prepared By, Checked By, Revised Date (10-五月-16), Memb Multi, Memb Count x, Standard (BS8666-2005), Bar Length (Actual), Length Round (25 mm).
- IN SCHEDULE:**  Include Rolls,  Show Call No,  Show Item No,  Show Cast No,  Show Memo,  Show Runoff.
- IN MEMBER NAME:** Table with columns SCH and WGT. Rows: Call No, Layer Prefix, Work Type, Fixing Type, Layer Suffix, Bar Set.
- SORTING:** Member Barmark, ItemNo, CallNo.
- REVISION:** Rev P01, Status P. Legend: P - Preliminary, T - Tender, C - Construction.
- SCHEDULE LAYOUT:** default
- SHAPE DISPLAY:** default
- HIGHLIGHT BAR WEIGHT:** 25 Kg limit.
- SCHEDULE REPORTS:** default, Data Export (CSV, CSF, SDI, XML), Schedule Report (default\_schedule, default\_cover), Scrap Report (default\_scrap), Drawing Schedule (CREATE IN DWG, UPDATE IN DWG, AUTO CREATE / UPDATE IN DWG).
- SCHEDULE REVISION:**  Show Revised Lines,  Show Deleted Lines,  Mark Revision in Entity,  Manual Defined,  Auto Compare, Browse Xml File.
- SCHEDULE GENERATION:**  Generate Schedule By Call No,  Show Reference Summary,  Show Weight Summary, Schedule Reference (Add Block, Add Xref),  Scan Frozen Layer,  Scan Off Layer.
- STATUS BAR:** Drawing Schedule generated successfully. Buttons: GENERATE SCHEDULE, CLOSE.

# Bar Bending Schedule

- BBS Table Generation

[-][Top][2D Wireframe]

## Dfma Bending Schedule

Site Ref: \_\_\_\_\_

Drawing No: \_\_\_\_\_

Job/Contract No: \_\_\_\_\_

Sheet No: \_\_\_\_\_

Prepared By: _____	Checked By: _____	Rev: P01
Prepared Date: 10-May-16	Revised Date: 10-May-16	Status: P

Item No	Member	Bar mark	Type and size	No. of mbrs	No. of bars in each	Total No.	Length of each bar mm	Shape code	A* mm	B* mm	C* mm	D* mm	E/R* mm	F* mm	G* mm	H* mm	I* mm	J* mm	Pin Bend DIA mm	Rev	Weight (kg)
X9	LB-AP-B1	929	H40	1	1	1	6600	11	1840	4850									280		[65.11]
X9	LB-AP-B1	930	H40	1	8	8	5050	11	1840	3300									280		[398.56]
X9	LB-AP-B1	931	H40	1	10	10	7250	11	1840	5510									280		[715.20]
X13	LB-AP-B1.a	36	H40	1	1	1	1975	00	1970												19.48
X3	LB-AP-B1.a	308	H40	1	1	1	7175	11	2310	4955									280		[70.78]
X3	LB-AP-B1.a	309	H40	1	1	1	5500	11	2310	3280									280		[54.26]
X3	LB-AP-B1.a	310	H40	1	1	1	6550	11	2310	4350									280		[64.61]
X3	LB-AP-B1.a	311	H40	1	1	1	7625	11	2310	5420									280		[75.22]
X3	LB-AP-B1.a	312	H40	1	1	1	10225	11	2310	8015									280		[100.87]
X3	LB-AP-B1.a	313	H40	1	1	1	4425	11	2310	2210									280		[43.65]
X3	LB-AP-B1.a	314	H40	1	1	1	8225	11	2310	6025									280		[81.14]
X3	LB-AP-B1.a	315	H40	1	1	1	9300	11	2310	7095									280		[91.74]
X3	LB-AP-B1.a	316	H40	1	1	1	8225	11	2310	6015									280		[81.14]
X13	LB-AP-B1.a	485	H40	1	2	2	4175	00	4170												[82.36]
X10	LB-AP-B1.a	536	H40	1	1	1	6900	00	6900												[68.07]
X13	LB-AP-B1.a	683	H40	1	1	1	5950	00	5940												[58.69]
X10	LB-AP-B1.a	780	H40	1	1	1	4225	00	4220												[41.68]
X7	LB-AP-B1.a	810	H40	1	19	19	7525	00	7520												[1410.37]

WCS

# Re-bar Fabrication



- Real Fabrication

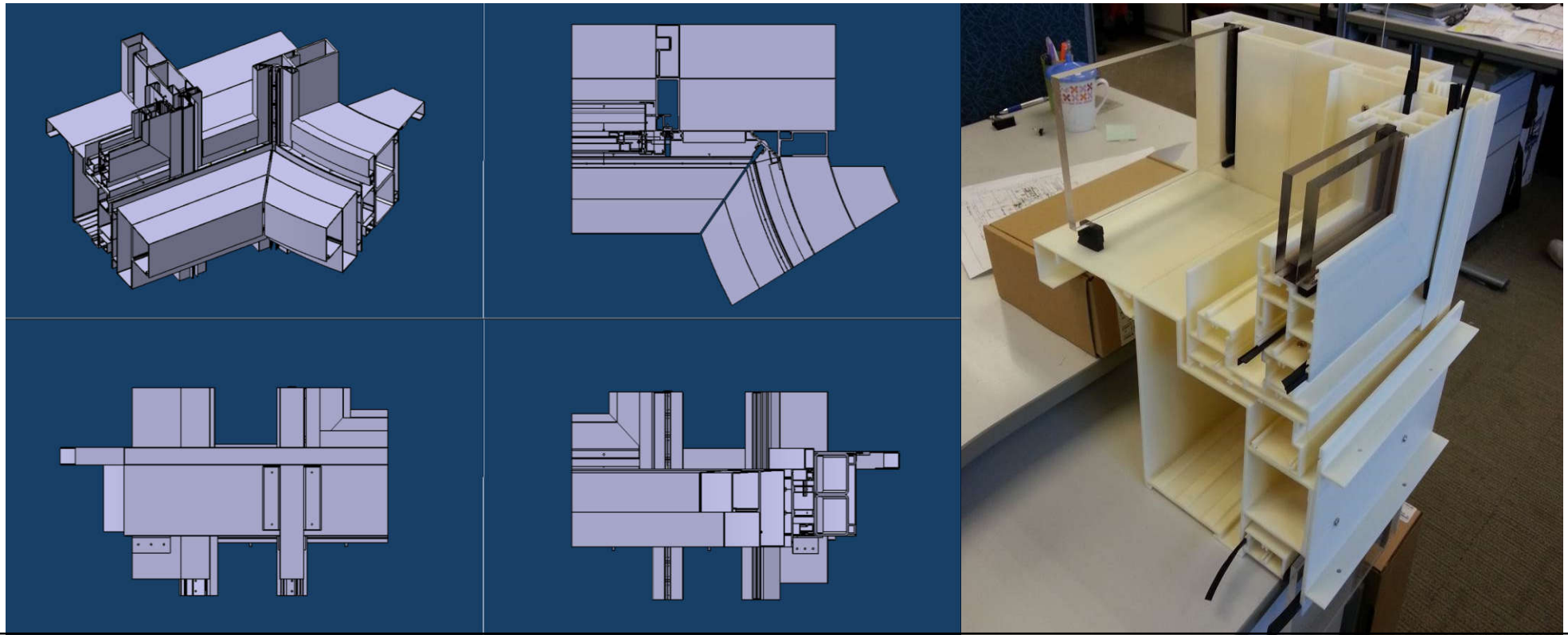


- Desktop Prototyping



# DfMA for Facade Units

- Design Aesthetic Evaluation
- Joinery Investigation & Assembly Trial
- Detail Design Study & Improvement
- Enhance client communication
- Speed up approval process



# Design Coordination in Panel Assembly & RC

Check Clash

Definition  
 Type: Contact + Clash 0mm Selection: 1 No selection  
 Between all components Selection: 2 No selection

Results  
 Number of interferences: 1279 (Clash:12, Contact:1267, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	Type	Value	Status
126	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-4.76	Relevant
127	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
128	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
129	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
138	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
139	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
140	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
141	HU401_011.1 [HU40...	...GW_L01_001_HU418...	Clash	-5.25	Relevant
309	GW_L01_001_HU41...	...GW_L01_006_HU401...	Clash	-8.09	Relevant
446	GW_L01_006_HU40...	...GW_L01_001_HU418...	Clash	-8.09	Relevant
499	GW_L01_001_HU41...	...GW_L01_007_HU401...	Clash	-8.09	Relevant
734	GW_L01_001_HU41...	...GW_L01_012_HU401...	Clash	-8.09	Relevant

Check Clash

Definition  
 Type: Contact + Clash 0mm Selection: 1 No selection  
 Between all components Selection: 2 No selection

Results  
 Number of interferences: 1279 (Clash:12, Contact:1267, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	S...	Type	Value	Status
126	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-4.76	Relevant
127	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
128	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
129	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
138	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
139	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
140	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
141	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
309	GW_L01_001_HU41...	GW_L01_006_H...		Clash	-8.09	Relevant
446	GW_L01_006_HU40...	GW_L01_001_H...		Clash	-8.09	Relevant
499	GW_L01_001_HU41...	GW_L01_007_H...		Clash	-8.09	Relevant
734	GW_L01_001_HU41...	GW_L01_012_H...		Clash	-8.09	Relevant

Check Clash

Definition  
 Type: Contact + Clash 0mm Selection: 1 No selection  
 Between all components Selection: 2 No selection

Results  
 Number of interferences: 642 (Clash:38, Contact:604, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	Type	Value	Status	Comment
13	FRAMING_L1.1...	RC WALL_LG.1...	Clash	-873.01	Relevant	
14	RC WALL_L1.1...	SLAB_LG.1 [SL...	Clash	-1298.02	Relevant	
16	RC WALL_L1.1...	RC WALL_LG.1...	Clash	-1223.02	Relevant	
17	RC WALL_L1.1...	FRAMING_LG...	Clash	-1383.01	Relevant	
18	RC WALL_L1.1...	SLAB_L2.1 [SL...	Clash	-148.02	Relevant	
20	RC WALL_L1.1...	FRAMING_L2.1...	Clash	-773.01	Relevant	
21	RC WALL_L1.1...	RC WALL_L2.1...	Clash	-48.01	Relevant	
25	SLAB_LG.1 [SL...	RC WALL_LG.1...	Clash	-1058.01	Relevant	
26	SLAB_LG.1 [SL...	FRAMING_LG...	Clash	-17.73	Relevant	
30	COLUMN_LG.1...	FRAMING_L2.1...	Clash	-773.01	Relevant	
32	RC WALL_LG.1...	FRAMING_LG...	Clash	-105.18	Relevant	
34	RC WALL_LG.1...	FRAMING_L2.1...	Clash	-773.01	Relevant	
44	RC WALL_L2.1...	FRAMING_L3.1...	Clash	-428	Relevant	
47	SLAB_L3.1 [SL...	RC WALL_L3.1...	Clash	-148.02	Relevant	
53	RC WALL_L3.1...	FRAMING_L5...	Clash	-468.01	Relevant	
58	SLAB_L5_L3.1...	SCW_L07_001...	Clash	-15.81	Relevant	
64	COLUMN_L5_L...	SCW_L07_001...	Clash	-15.81	Relevant	
65	FRAMING_L5...	RC WALL_L5_L...	Clash	-5076.83	Relevant	
67	RC WALL_L5_L...	FRAMING_L16...	Clash		Not inspe...	
77	FRAMING_L16...	RC WALL_L16...	Clash		Not inspe...	
79	RC WALL_L16...	FRAMING_L25...	Clash		Not inspe...	
89	FRAMING_L25...	RC WALL_L25...	Clash		Not inspe...	
90	RC WALL_L25...	SLAB_L29.1 [SL...	Clash		Not inspe...	
91	RC WALL_L25...	FRAMING_L29...	Clash		Not inspe...	
92	RC WALL_L25...	RC WALL_29F...	Clash		Not inspe...	

Check Clash

Definition  
 Type: Contact + Clash 0mm Selection: 1 No selection  
 Between all components Selection: 2 No selection

Results  
 Number of interferences: 1279 (Clash:12, Contact:1267, Clearance:0)

Filter list: Clash No filter on value All statuses

No.	Product 1	Product 2	S...	Type	Value	Status
126	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-4.76	Relevant
127	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
128	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
129	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
138	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
139	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
140	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
141	HU401_011.1 [HU40...	GW_L01_001_H...		Clash	-5.25	Relevant
309	GW_L01_001_HU41...	GW_L01_006_H...		Clash	-8.09	Relevant
446	GW_L01_006_HU40...	GW_L01_001_H...		Clash	-8.09	Relevant
499	GW_L01_001_HU41...	GW_L01_007_H...		Clash	-8.09	Relevant
734	GW_L01_001_HU41...	GW_L01_012_H...		Clash	-8.09	Relevant

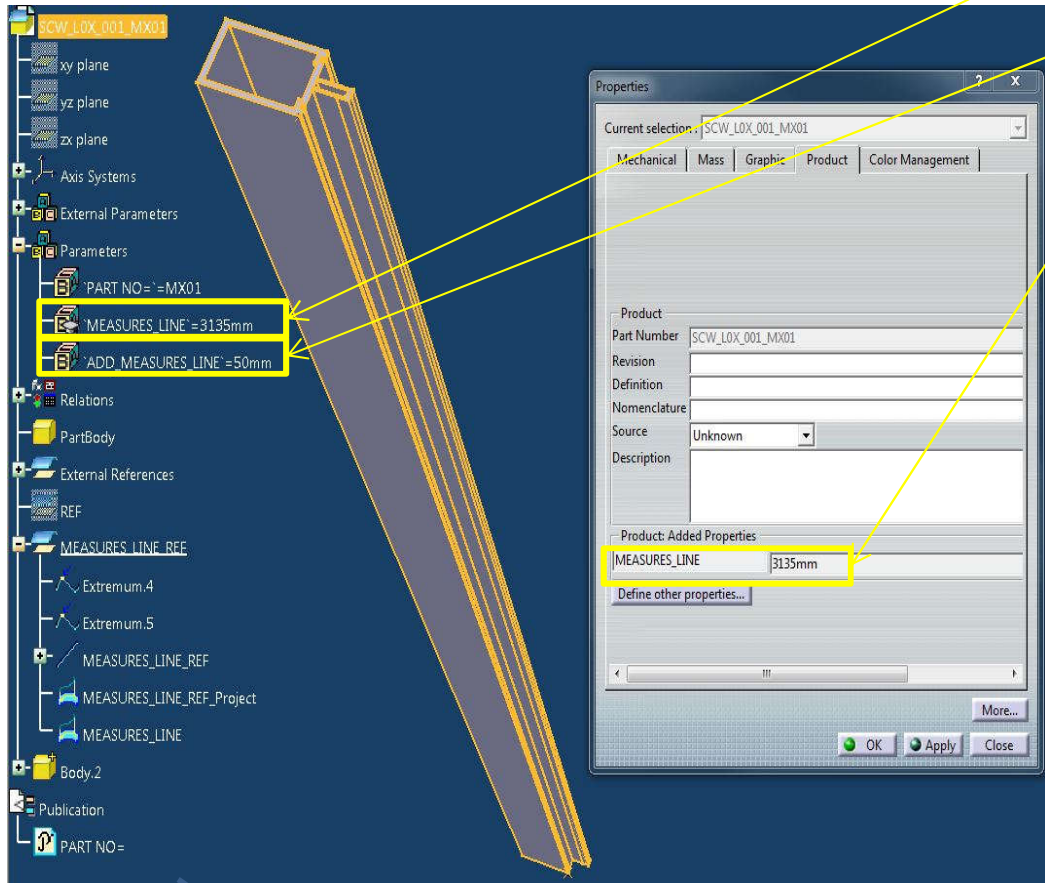
# Extrusion length measure for take-off & Fabrication

Extrusion Model measure length = 3035mm

Extend length for fabricate fixing space = 100mm

Total length = 3135mm

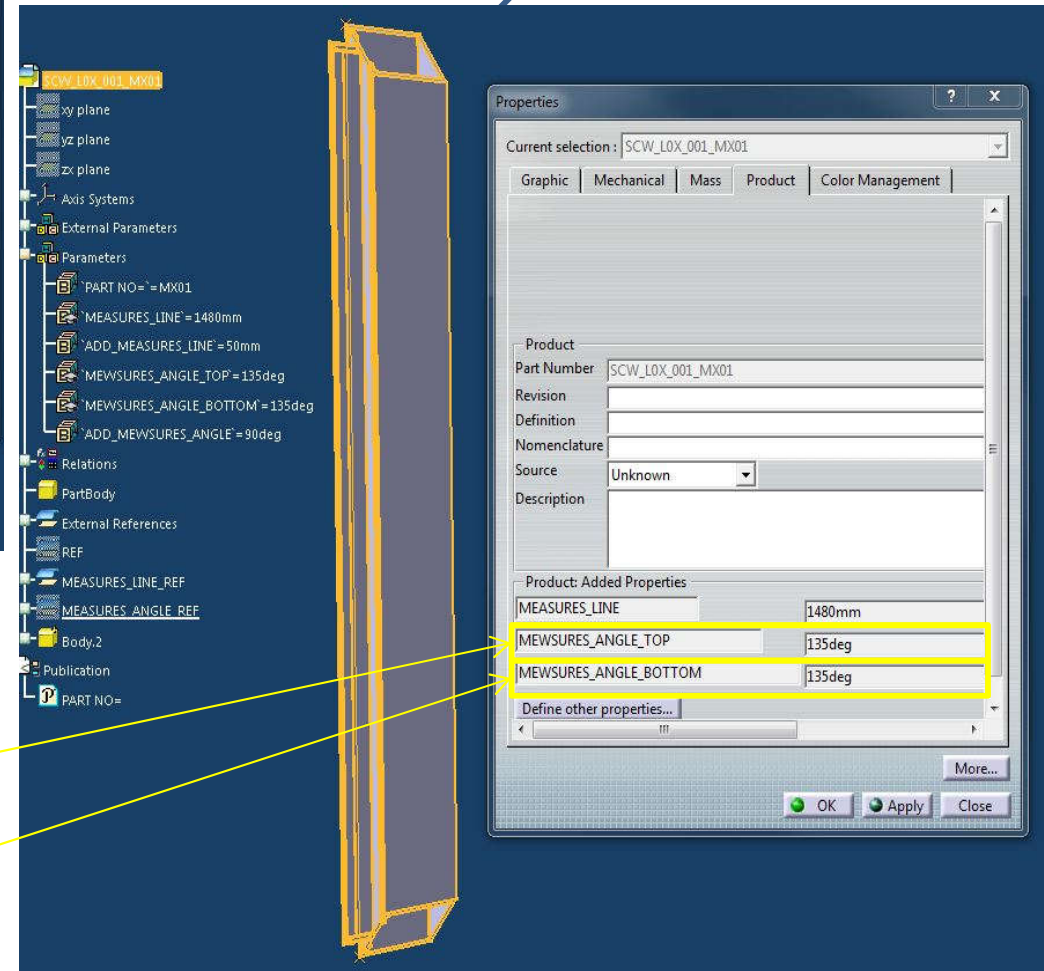
Angle Cutting Case



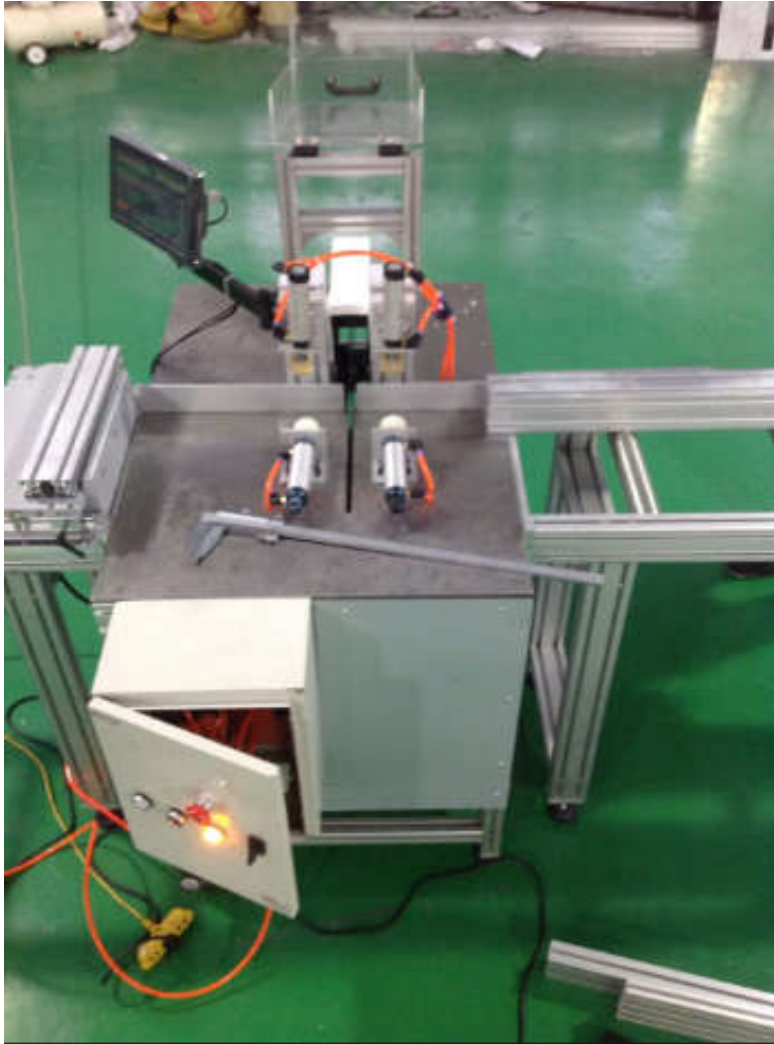
Horizontal Cutting Case

Extrusion Model measure cutting angle (Top) = 135deg

Extrusion Model measure cutting angle (Bottom) = 135deg



# Component Fabrication



- Extrusion CNC



- Sheet Metal CNC

# 8D Development - i-Core

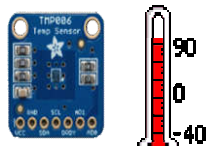
*i*-Core denotes an integrated circuit chip that could act as a “heart” of its carriers and make the construction resources “alive”.



Bluetooth/WIFI  
Data Exchange



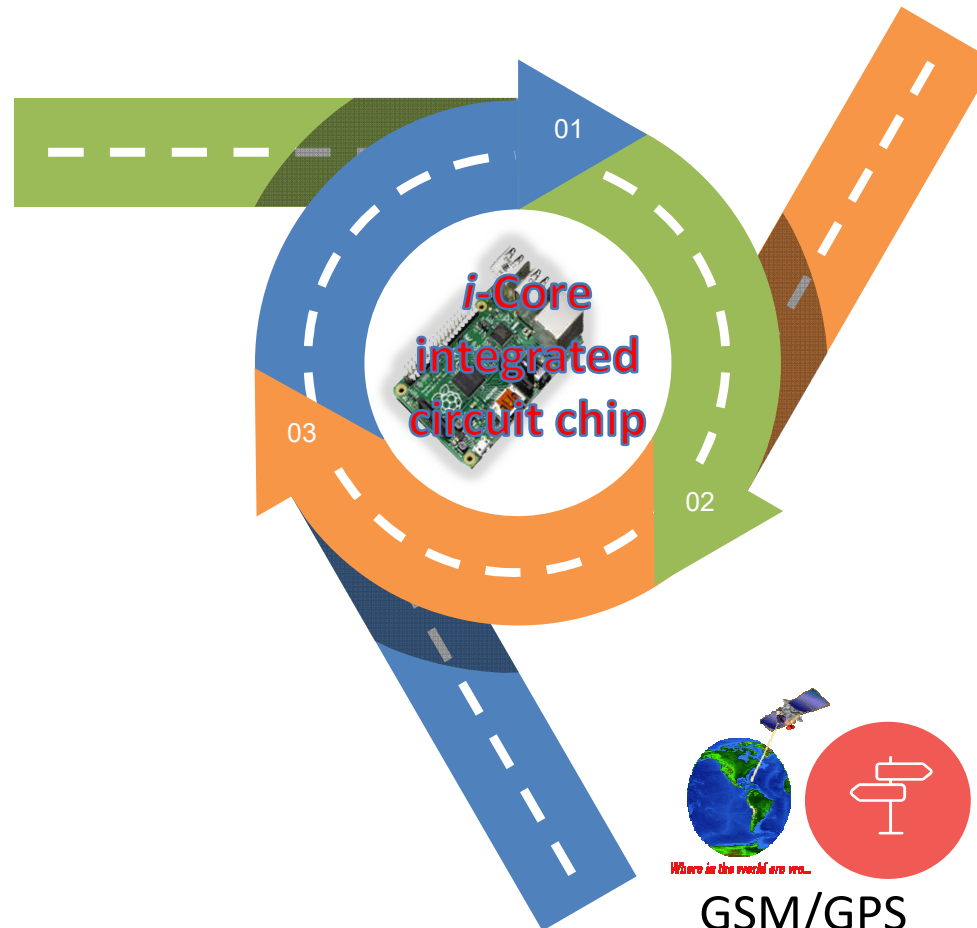
On site  
operation  
management



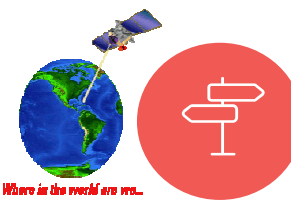
Temperature Sensor  
Safety Tracking



Health & Safety  
Management



*i*-Core  
integrated  
circuit chip



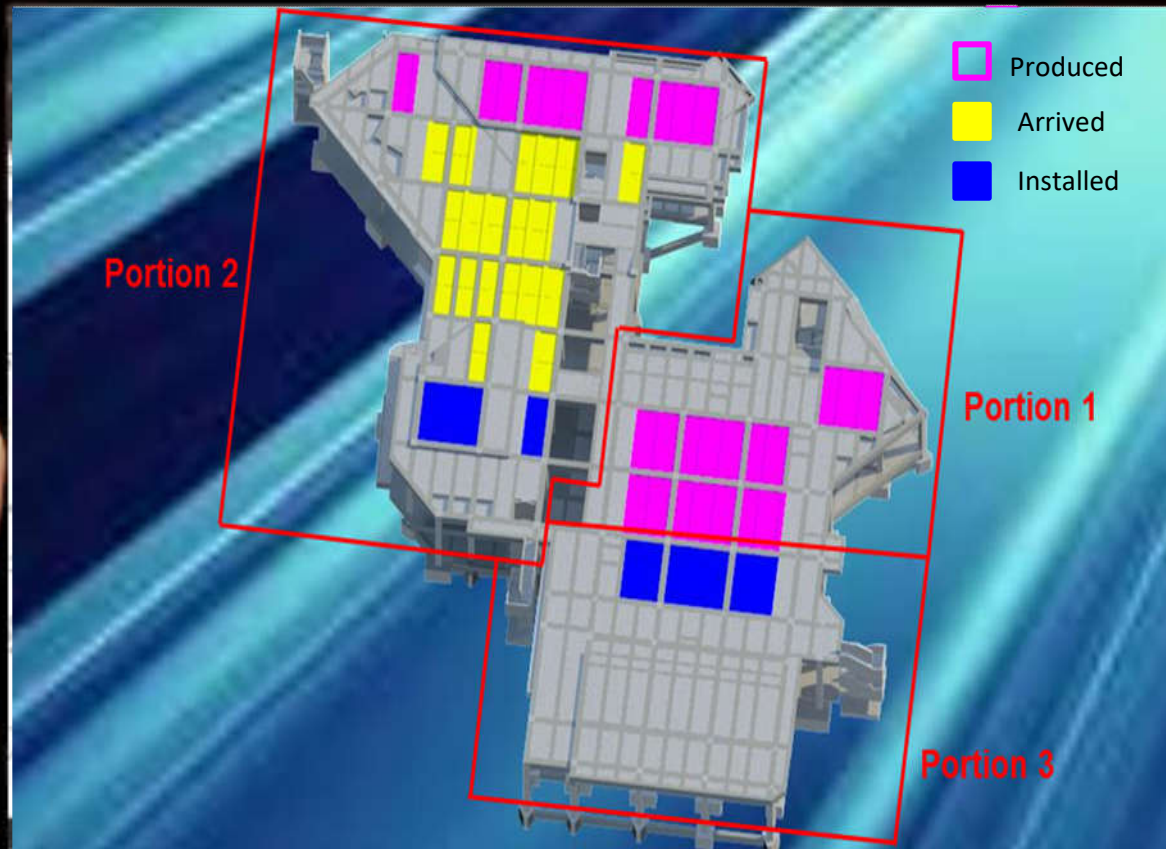
GSM/GPS  
Location Tracking



TIME  
MANAGEMENT  
Logistic and  
Supply Chain



i-Core  
Logistic  
Management

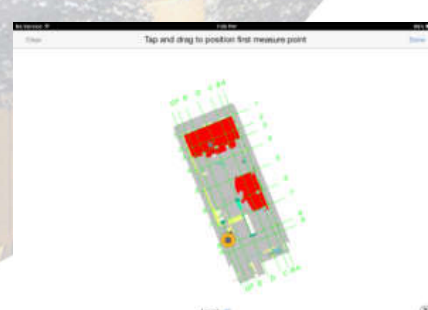
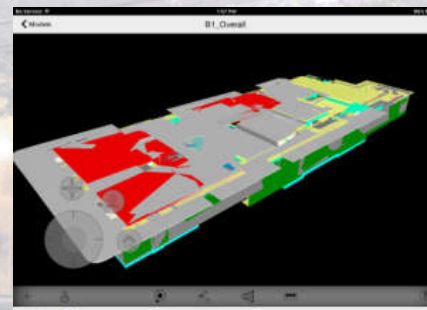
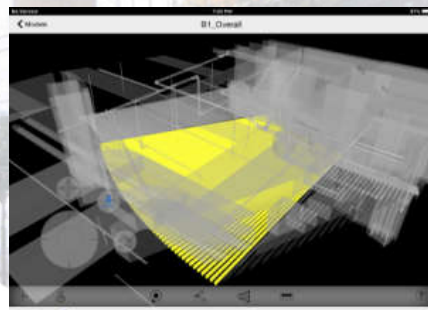
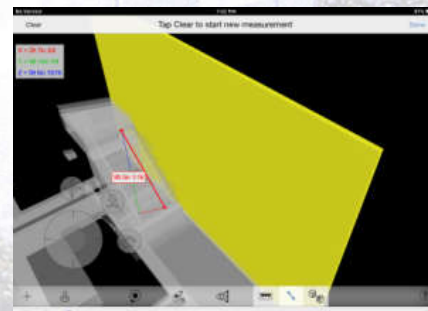
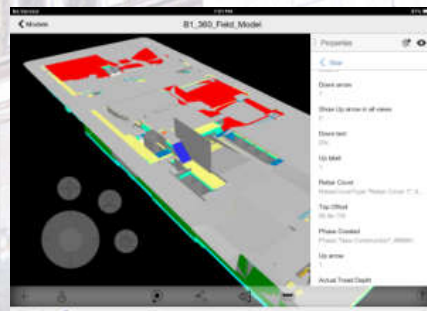
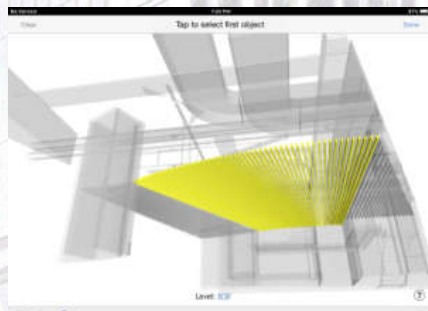
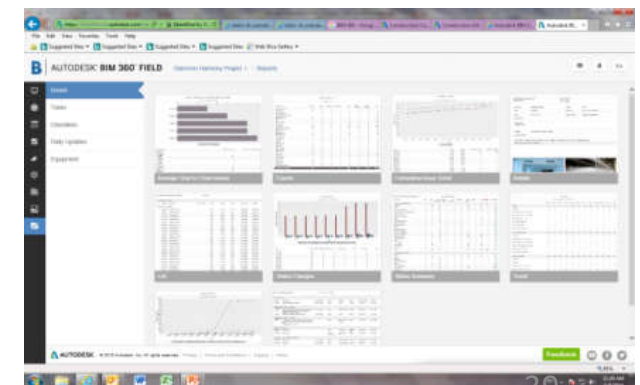
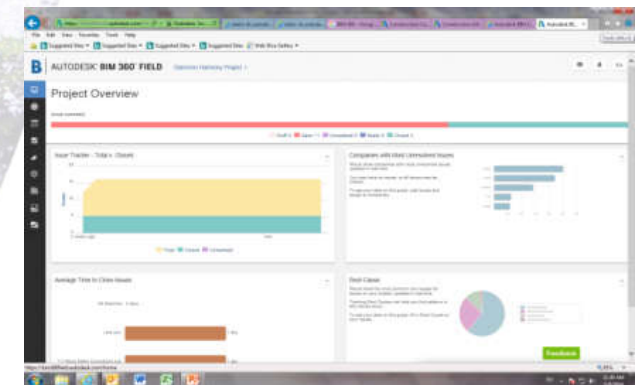
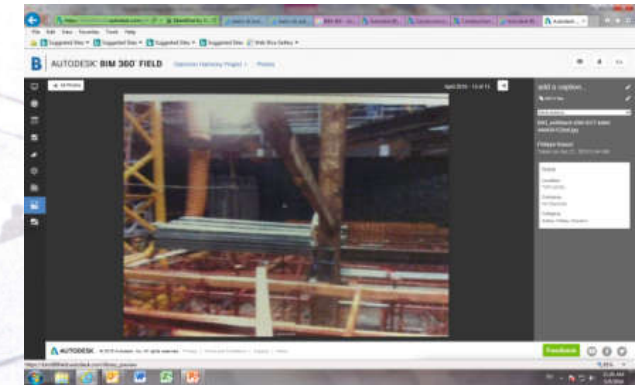


Link with BIM Model for precast concrete element  
production / arrival & site installation checking

# 8D Development - Snagging

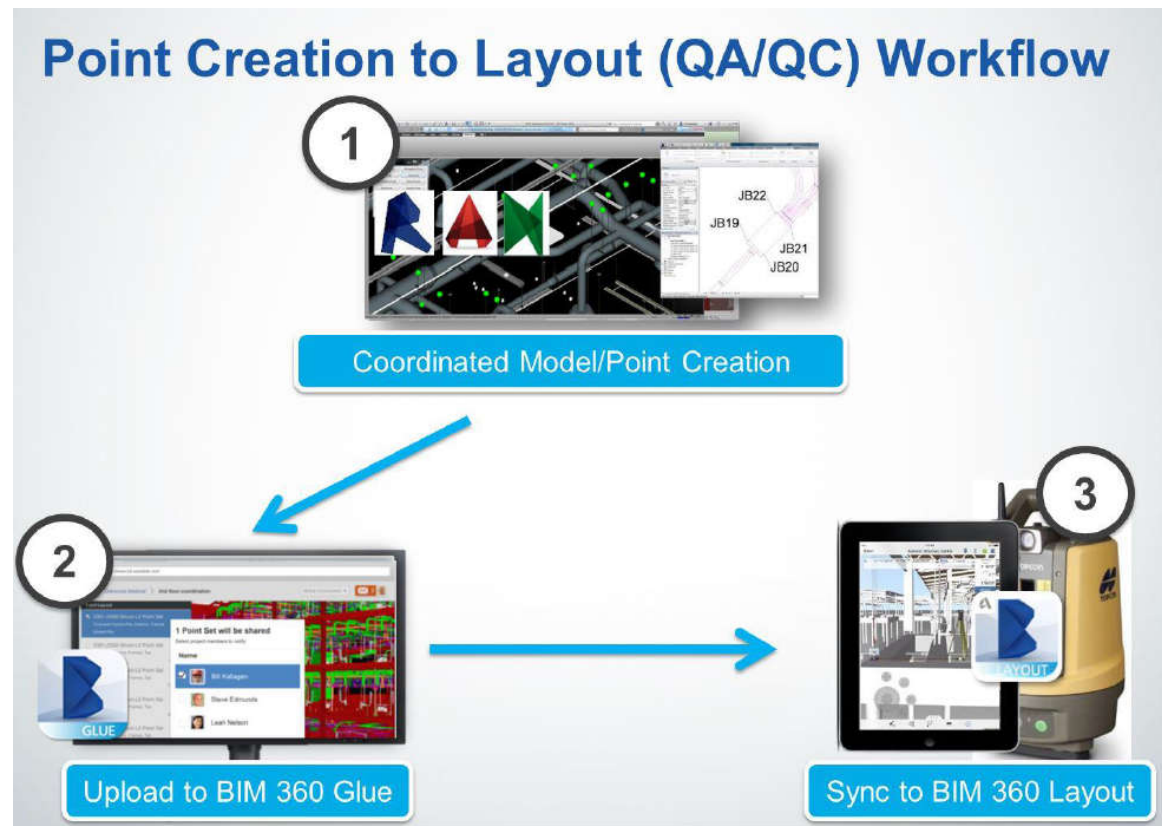
## BIM 360

- 🔧 Improve quality
- 🔧 Promote safety
- 🔧 Manage commissioning and handover
- 🔧 Improve issue management workflows
- 🔧 Monitor field performance



# Looking forward

- BIM 360 Layout
- Cross check accuracy between BIM model and actual work.





# BIM & Sustainability

**Task-Orientated/  
Problem Driven**

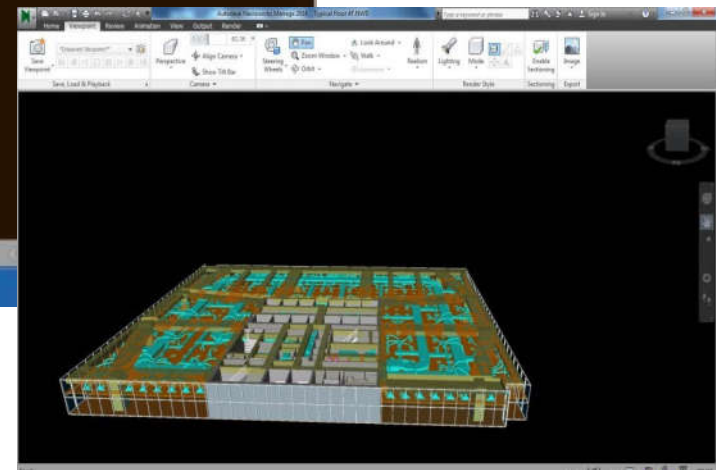
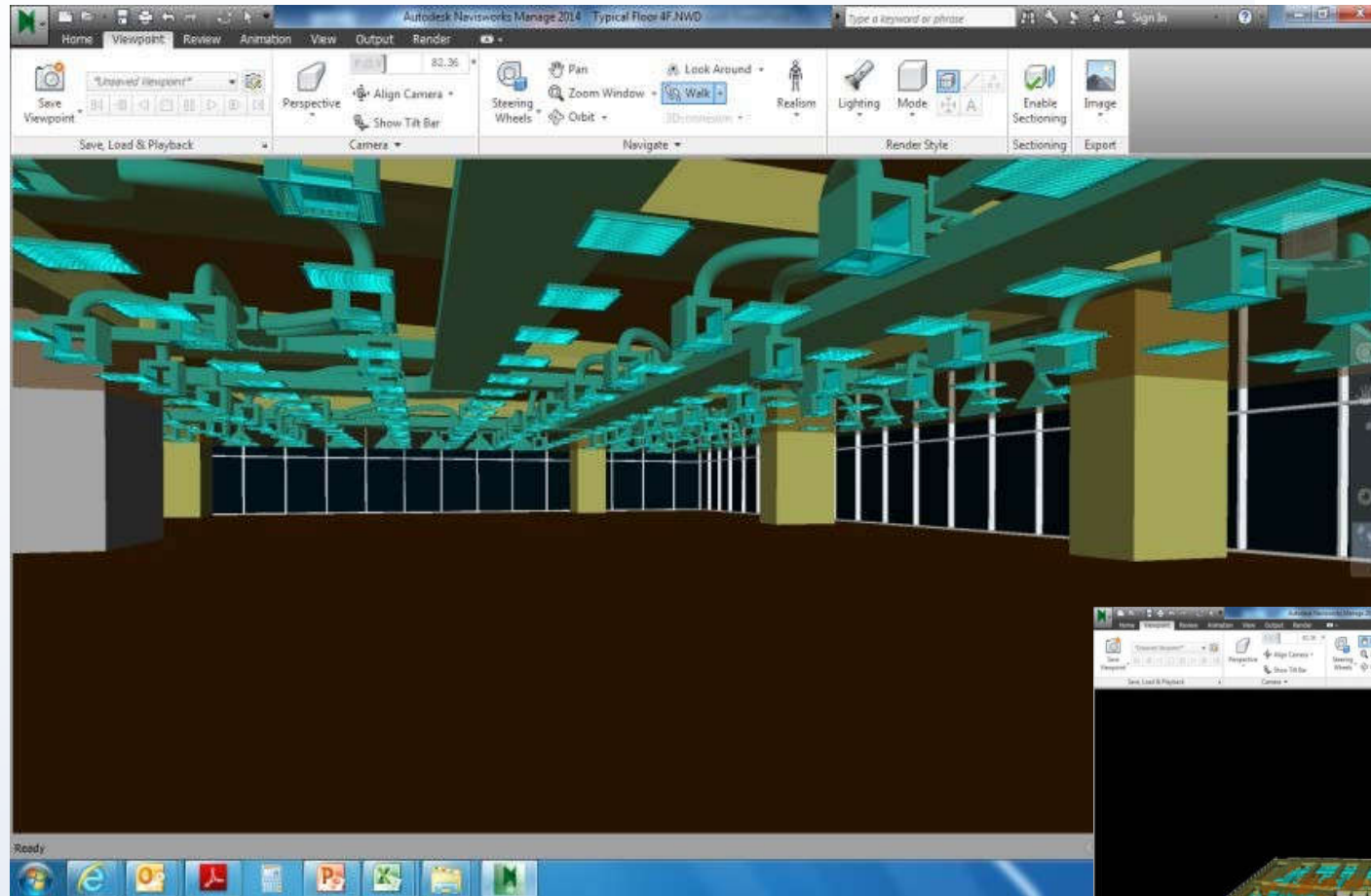
**Adopt Supply Chain**



**Innovative  
Approaches**

**Work with  
Others**

# 6D - Carbon Foot Print



# 6D - Carbon Foot Print

## Example

Type	Size	Type Name	Count	Weight (Kg)	CO2e (9.16CO2e/kg)
115X1200 SAG	1200 x 115	SAG	79	3.45	31.602
400X200 SAG	400 x 200	SAG	8	2	18.32

## Example

Duct Fitting Schedule	System Type	Free Size	Qty	Area ( m2 )	Total area ( m2 )	Weight (kg)	CO2e (1.38kgCO2e/kg)
HY-天圆地方	SAD	150 mmx600 mm-200 mmø	2	0.58	1.15	5.76	7.95
HY-矩形插管四通-中心对齐	SAD	835 mmx356 mm-835 mmx356 mm-345 mmx200 mm-345 mmx200 mm	1	0.81	0.81	6.55	9.04
Rectangular Tube-Align Left	SAD	150 mmx600 mm-150 mmx150 mm	16	0.29	4.61	23.04	31.80
天方地圆 - 角度 - 法兰	SAD	115 mmx1200 mm-200 mmø	38	0.46	17.48	142.46	196.60
矩形接头 - 45度接入 - 法兰1	SAD	1000 mmx400 mm-1000 mmx400 mm	1	1.28	1.28	10.43	14.40

**Total Co2e used is = 2,281.662**

# 6D - Carbon Foot Print

**Concrete Volume and Grade for Outrigger Floor**

Item	Grade	Volume		Normal Emission Factor	Green Concrete
				CO2e ( Grade 30 = 370 kgCO2e/m3 Grade 45 = 362 kg CO2e/m3 Grade 80 = 613 kg CO2e/m3)	Emission Factor CO2e ( Grade 30 = 240 kgCO2e/m3 Grade 45 = 282.4 kg CO2e/m3 Grade 80 = 246 kg CO2e/m3)
1	24/F C45	1,317.850	m <sup>3</sup>	447061.7 kg	372160.84 kg
2	24/F C80	460.037	m <sup>3</sup>	282002.681kg	113169.102kg
3	25/F C45	1,721.498	m <sup>3</sup>	623182.276kg	486151.0352kg
4	25/F C80	659.781	m <sup>3</sup>	404445.753kg	162306.126kg
5	26/F C45	982.013	m <sup>3</sup>	355488.706kg	277320.4712kg
6	26/F C80	392.434	m <sup>3</sup>	240562.042kg	96538.764kg
7	24/F C30	7.869	m <sup>3</sup>	2911.53kg	1888.56kg
8	25/F C30	12.097	m <sup>3</sup>	4475.89kg	2903.28kg
9	26/F C30	7.460	m <sup>3</sup>	2760.2kg	1790.4kg
		<b>Total</b>		2362891kg	1514229kg

**Total Co2e reduced is = 2,362,891-1,514,229= 848,662kg**

**= 42,433**



**per year**

\*Average carbon absorption by a tree assumed: 20 kg/ year

	On site Weld Length (mm)	Weld Weight(kg)	Additional Brackets (kg)	Additional Bolts(nos.)	Additional Off Site Weld(mm)	Usage of electricity (kWh)	CO2e (0.78kgCO2e/kWh)
Original Design (Weld Joint)	4000(40mm FW)	26.36	0	0	/	191.7	149.526
Revised Design (Bolt Joint)	0	0	182.9(Total in 4 no.)	16 nos. x M24x100 bolts 2 no. x M24x900 bolts with nuts (permanent use)	7600 (20mm FW)	107.16	83.5848

**Total Co2e reduced is = 149.526-83.5848= kg**

**= 66  per year**

\*Average carbon absorption by a tree assumed: 20 kg/ year

# BIM as the core technology Integration & Collaboration

**Task-Orientated/  
Problem Driven**

**Adopt Supply Chain**



**Innovative  
Approaches**

**Work with  
Others**

# What *integrated, lean* means ... what it have to do with *bim/vdc* ...

- Clay Goser: co-owner at BJC HealthCare, S. Louis

- A way of doing things
- Level of care
- A philosophy
- A culture

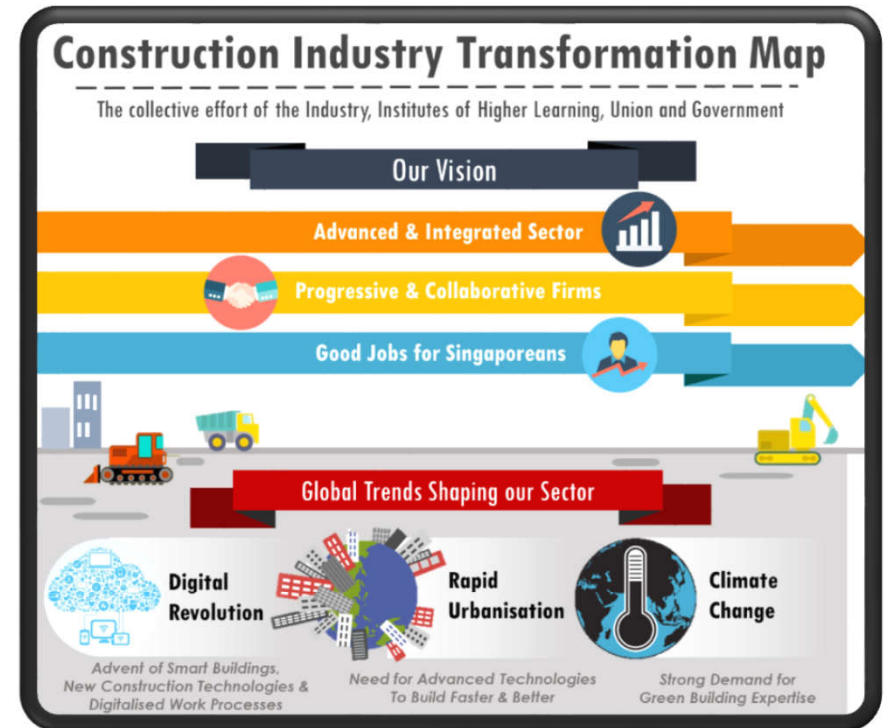
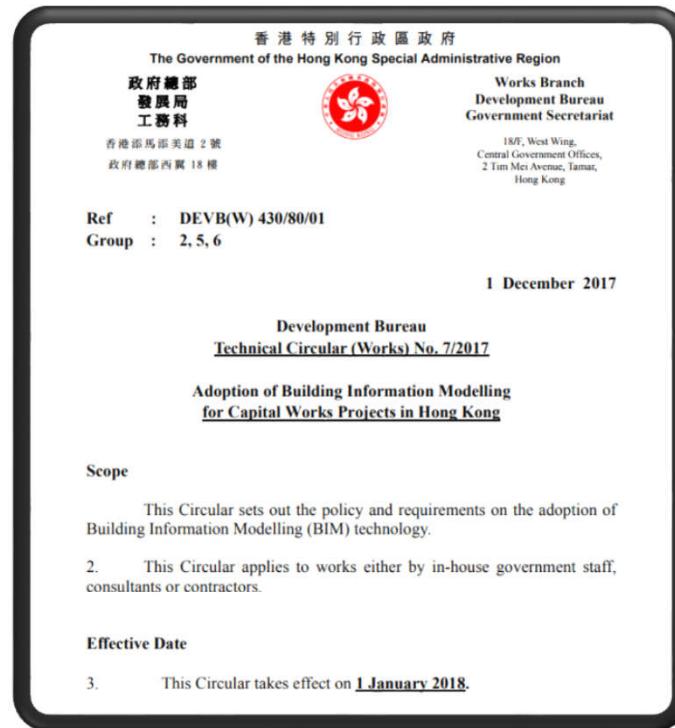


**Can you do IPD without BIM?**

**Clay:** You can't divorce Lean from BIM from IPD. Lean is a not a methodology, but a philosophy. BIM is a tool. You don't have to do BIM to be IPD. IPD is a means to an end.

Lean is the end. **BIM is a way to get there.** You can do IPD without BIM and have great results. BIM is a tool that helps facilitate communication – understanding what it is you are trying to achieve.

# By What means an integrated approach?



- HKSAR Works Bureau
- Singapore BCA



# Being *integrated*, can be very visible ...



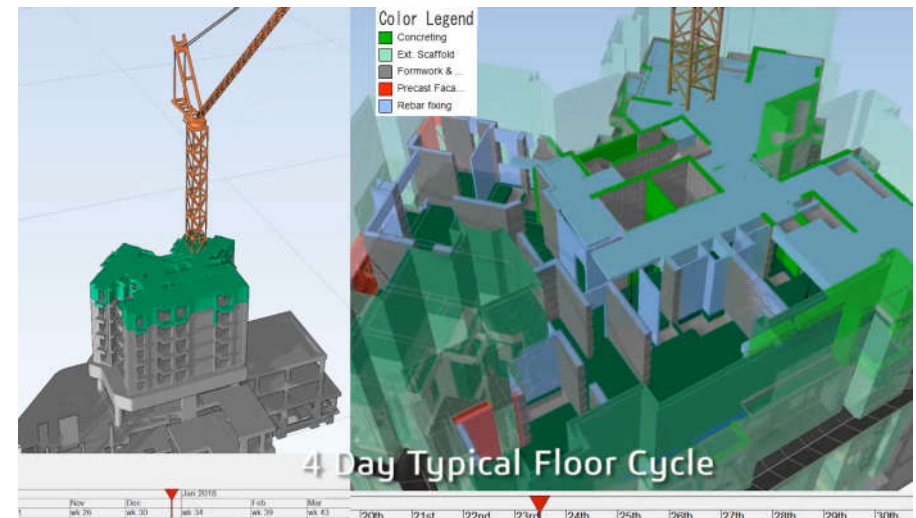
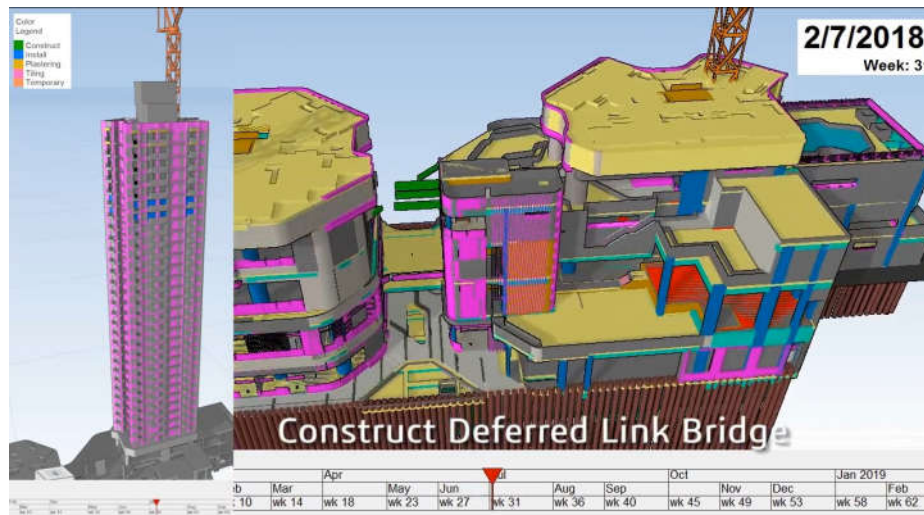
- A wrongly cut opening for an outdoor HR cabinet which leads raindrops in

# Design & process integration ...



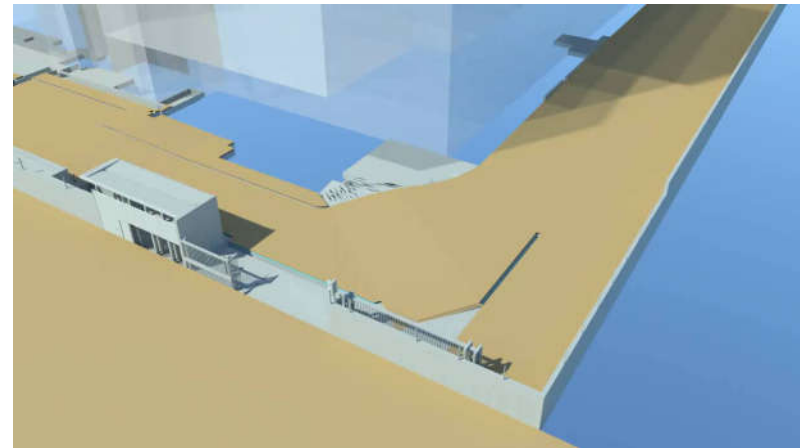
- Integrated What, How and When in Single Visualization

# Design & Process integration ...



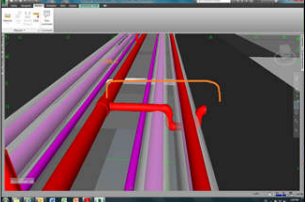
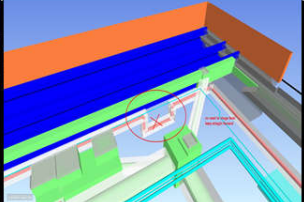
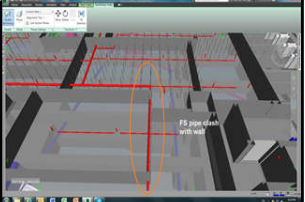
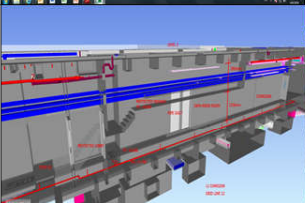
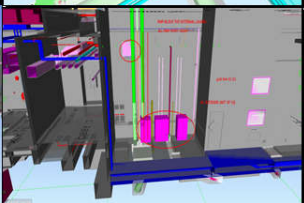
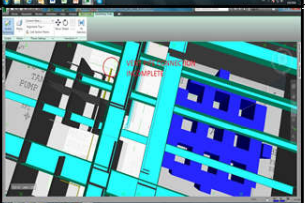
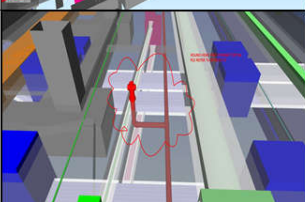


- Integrated What, How and When in Single Visualization

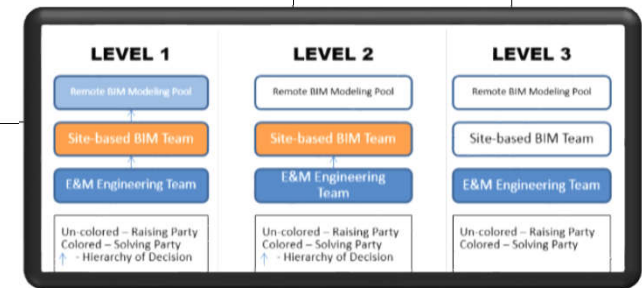
# Integrating vertical and horizontal logistic ...



- Logistic Planning of Plants and Traffic

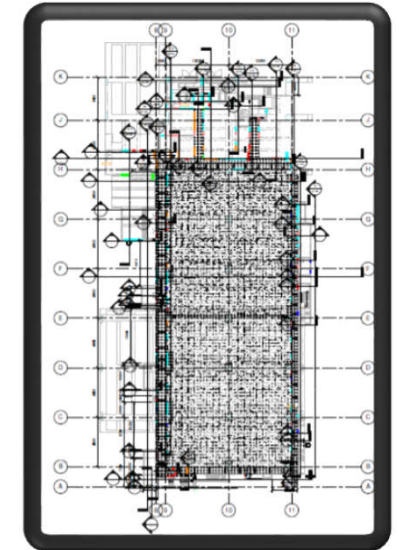
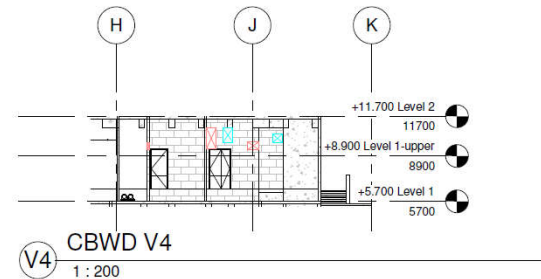
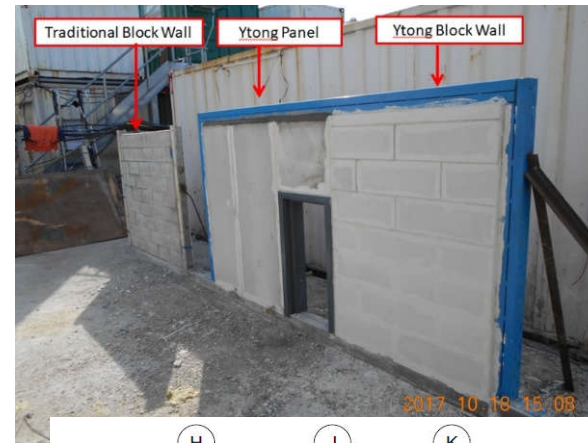
# design processes Integration...

Type	Examples	Level of resolution				
1.	Branch pipe routing to avoid <b>hard clashes</b>	1. simple cross-branch design 2. double-check federated model and rectify unreasonable issues arise from different design versions				<b>Level 1</b>
2.	Branch pipe routing to avoid <b>soft clashes</b>	1. simple headroom clash in corridors and staircases 2. pipe work blocking door/louvers 3. unconnected pipeworks				<b>Level 1</b>
3.	Discrepancy of 2D symbol and 3D object	1. Fire hydrant type and size				<b>Level 2</b>
4.	Simple modeling error	1. fixtures and equipment 3D to follow 2D settingout 2. downpipe/friser pipe/duct alignment				



- Multidiscipline Engineers Collaborate in Digital Environment

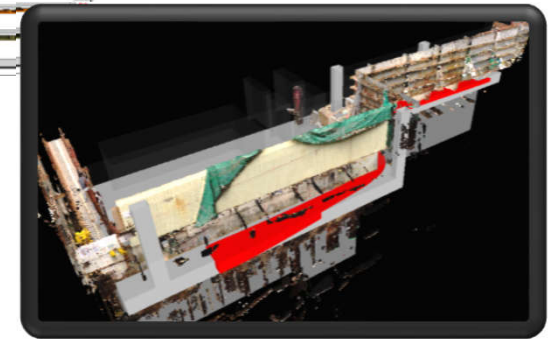
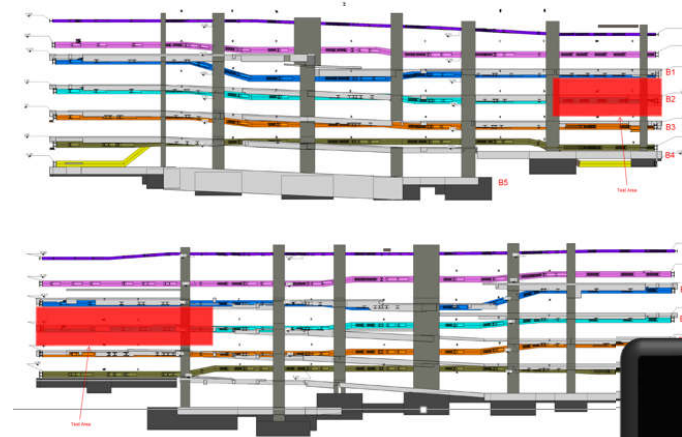
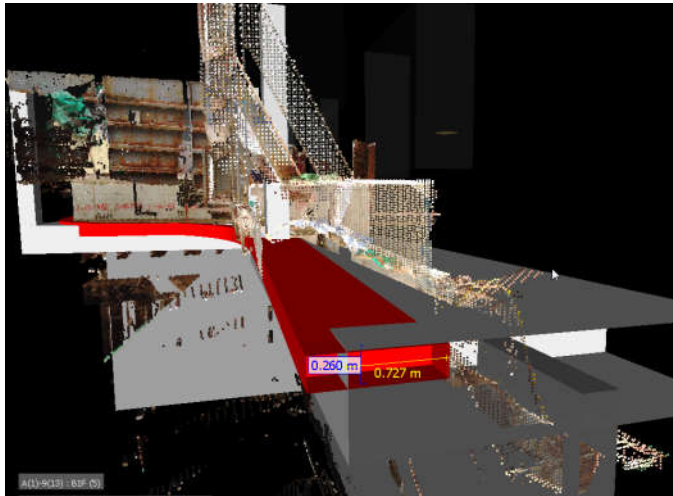
# Assembly processes design integration ...



- System Partition Installation Process Integrated

# Site context/constraint integration ...

- Section views for record water proof status



- Site Context integrated with Building Processes Planning

# Procurement processes integration ...

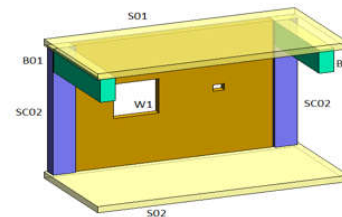
## Readiness of BIM for Quantity Taking Off ?

...application of BIM in HK seems lagging behind other places ... because HKSAR Gov't has not taken an active role...



Ref.	Tony's Question	Paul's Response
1.	Is BIM applied in all public works projects now ?	At present, the benefits of BIM are more apparent in complex building works projects (e.g. civils and works). A case in point is quantity taking off. The existing off-the-shelf BIM software cannot compute the quantity of various construction materials according to the standard adopted in public works projects. Not require BIM to be adopted in all public works project.
2.	Has the Gov't included terms on the application of BIM in Gov't works contracts ?	5 public works contracts have incorporated provisions on using BIM, incl. Central-Wanchai Bypass. 3 are construction contracts and 2 are consultancy contracts.
3.	Will the Gov't make mandatory the application of BIM in all public works projects ?	The Gov't plans to select some complex projects, at the design and construction stage, as pilots in order to assess the cost-effectiveness of BIM in public works. To facilitate a better understanding, the selected projects to be selected would be designed and managed by in-house staff. The assessment includes merits of BIM in terms of design quality, works safety and coordination among project stakeholders (e.g. consultants and contractors).
4.	Has the Gov't conducted comprehensive assessment on the effectiveness of applying BIM ?	In 2012, 200 civil servants (professional and technical staff) trained. The Gov't will provide more civil servants with appropriate BIM training.
5.	Have the authorities provided civil servants with training in applying BIM ?	The Gov't plans to share the experience in the pilot projects with industry stakeholders. CIC has set up a working group to discuss the strategies for promoting BIM in the industry.
6.	Will the authorities step up their efforts in promoting the development and application of BIM ?	

Sample Model



Some of the HKSMM4 Rules

- Formwork deduction for overlapping area between the elements
- Concrete and formwork deduction for the openings ( expect the area of opening is too small)
- Supporting height for slab and beam to be stated
- Edge and break in wall and slab to be stated

QTO Result Summary

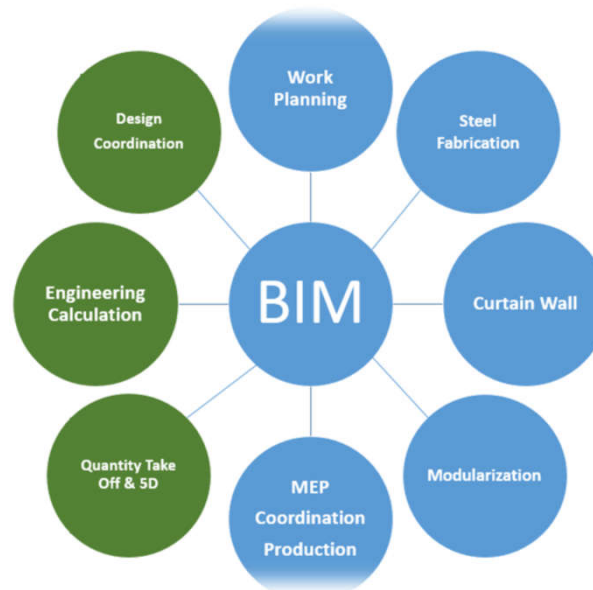
Concrete and formwork are measured at the same time

Instance Label	Length (m)	Width (m)	Height (m)	Supporting Height (m)	Adj for Conc(m3)	Adj for Fwk(m2)	Concrete (m3)	Formwork (m2)	E&B (m)
SC01	0.60	0.35	4.05	0	0	0	0.85	7.69	0
SC02	0.60	0.35	4.05	0	0	0	0.85	7.69	0
S01	6.66	3.24	0.200	4.05	0	-1.13	4.32	19.44	19.80
S02	6.66	3.24	0.200	0	0	0	4.32	21.58	19.80
W01	5.28	0.20	4.05	0	-0.26	-2.64	4.06	40.13	1.44
B01	2.81	0.40	0.95	3.30	0	0	0.84	5.95	0
B02	2.70	0.40	0.95	3.30	0	0	0.81	5.73	0

- Digital Build-of-Material (BOM/BQ) Integrates Procurement from Design Models

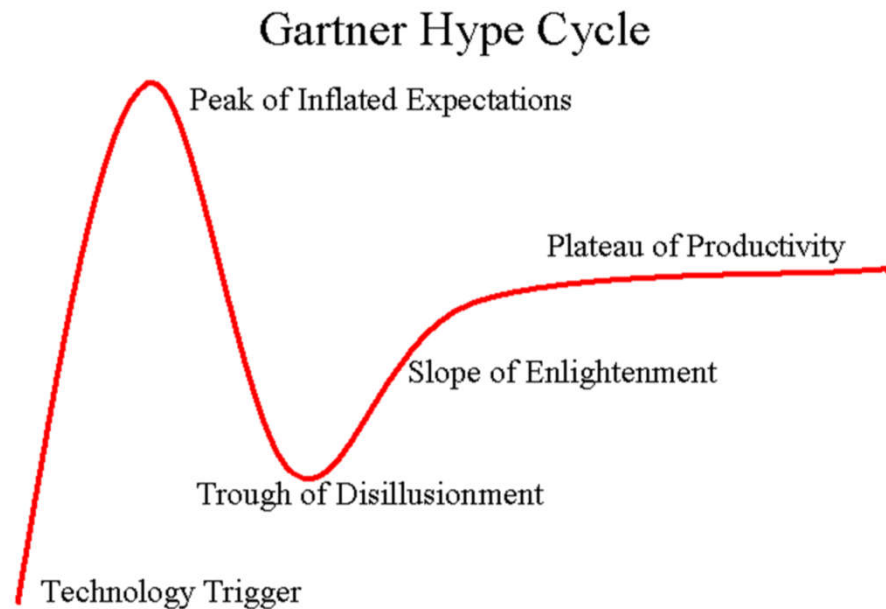


# That We are heading to ...



- Lean Practice
- Integrated Digital Delivery
- Integrated Design Delivery
- Integrated Project Team Collaboration

# Like any new Paradigm, shall go thr' ...



**Thank You.**

**BUILDING A NEW DIMENSION**