

# BIM; a Mott MacDonald perspective.



Richard Shennan – Group BIM Champion



# BIM is more than just stunning 3D visualisation...

Virtual world

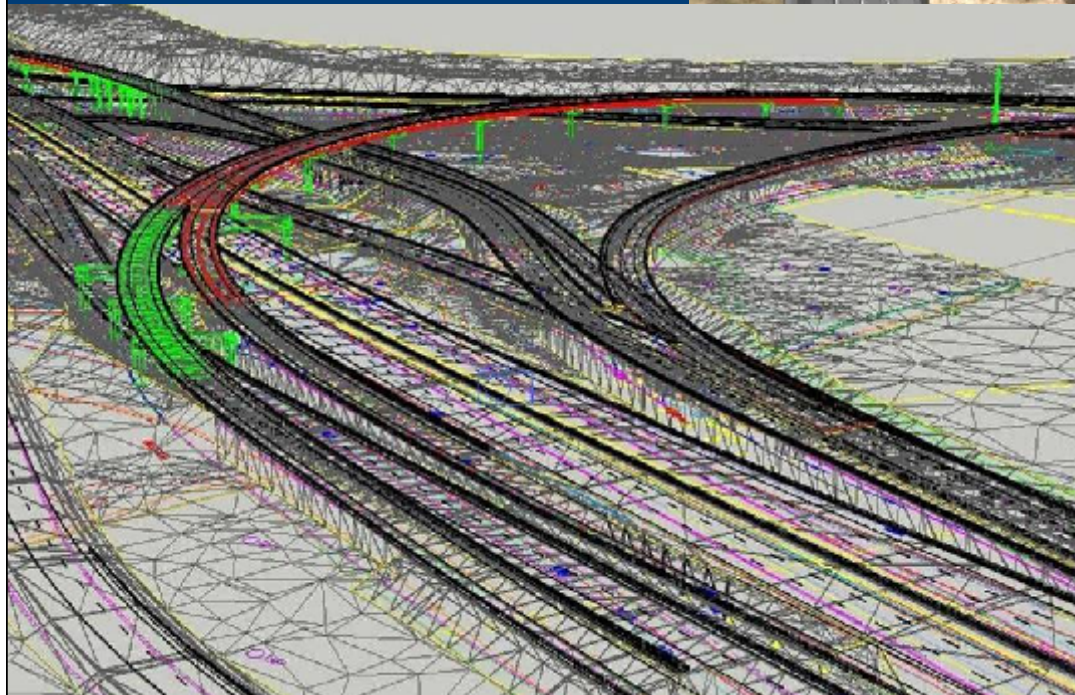


Real world

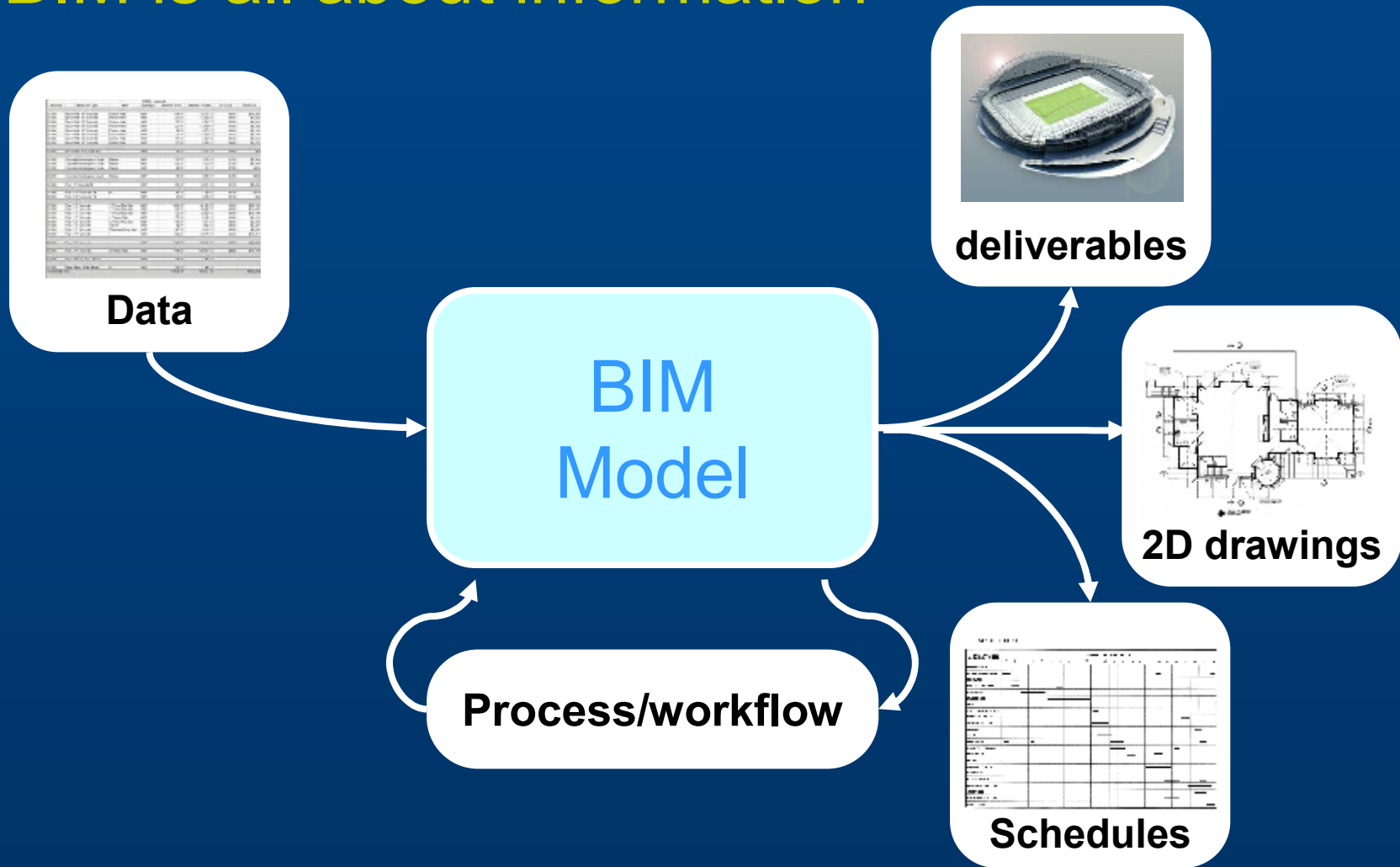


  
Mott MacDonald

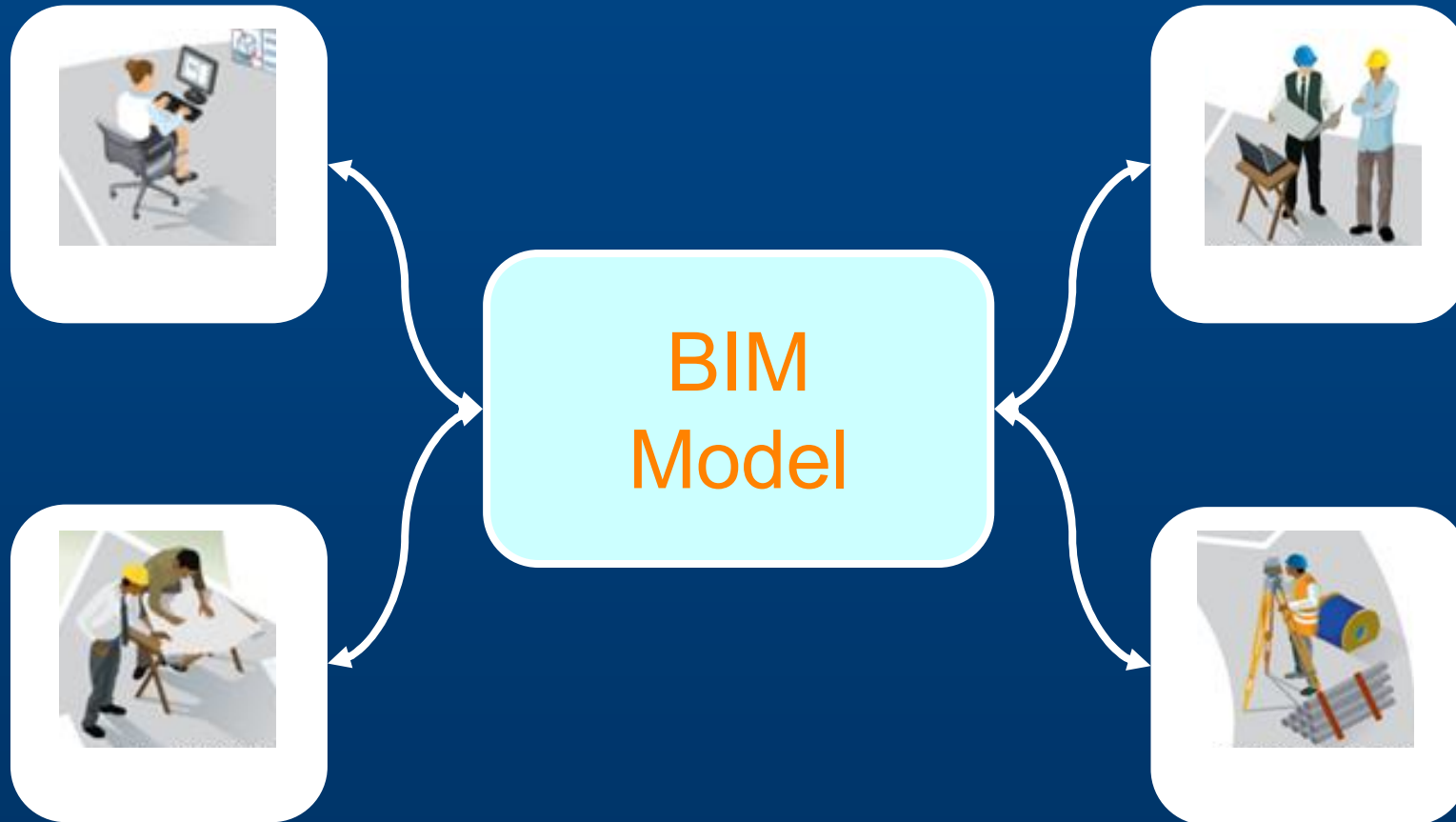
BIM is not just about buildings...



# BIM is all about information



# BIM is about collaboration



# BIM is all about outcomes

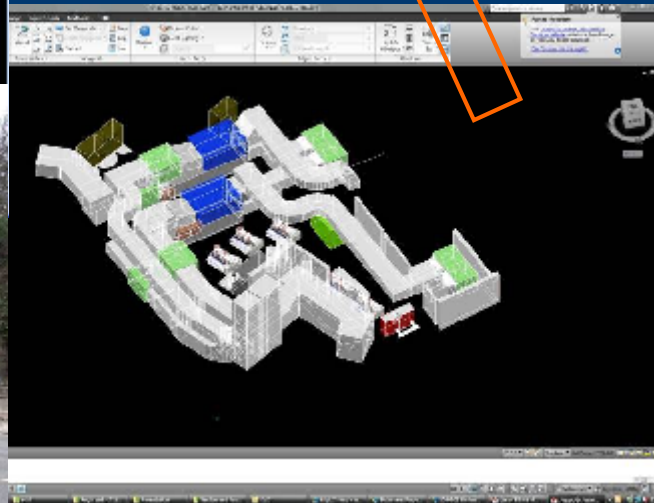
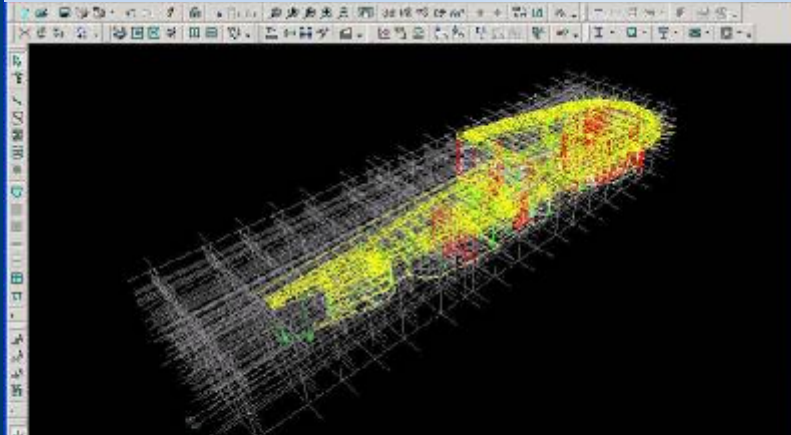
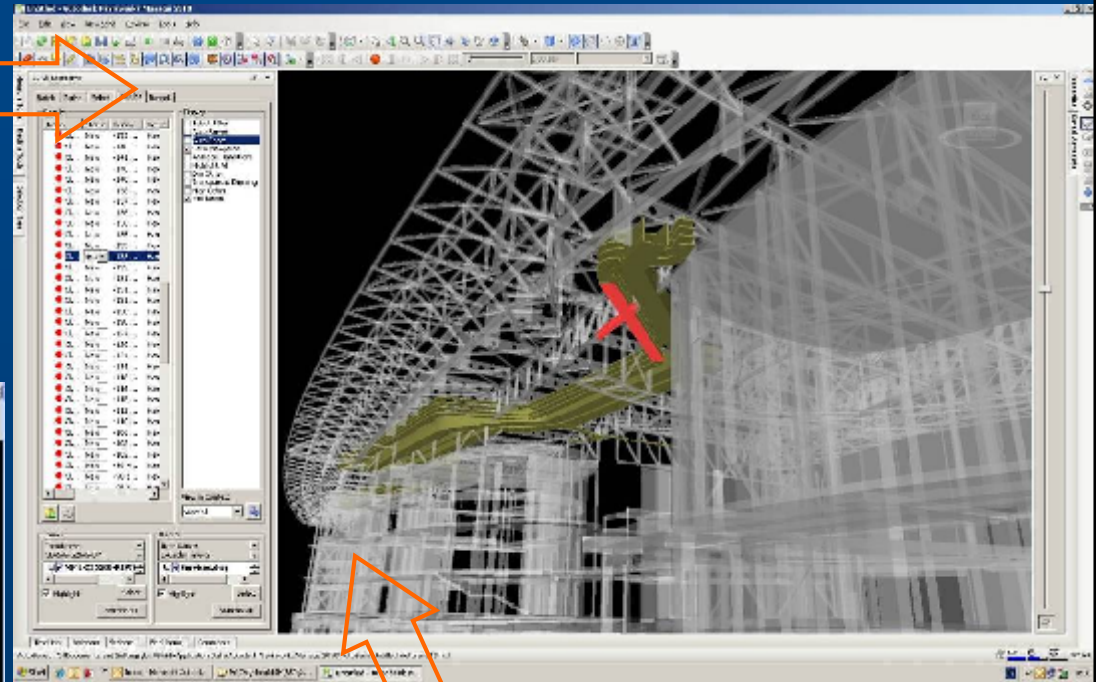
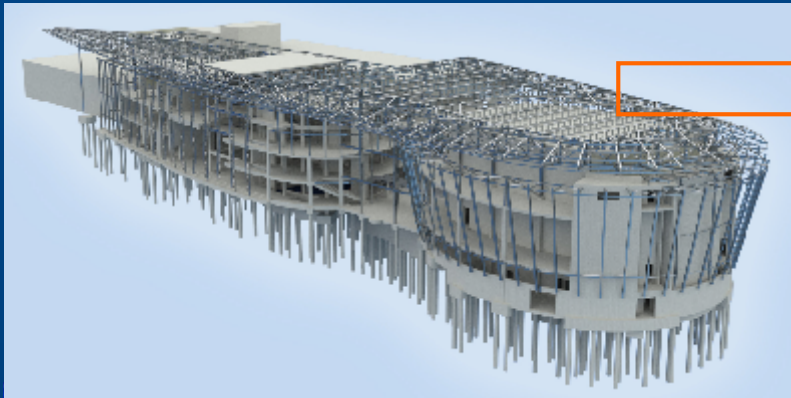
Define desired  
outcomes



See that they are  
delivered



# BIM Models in 3D



Royal Welsh  
College of Music  
& Drama

  
Mott MacDonald

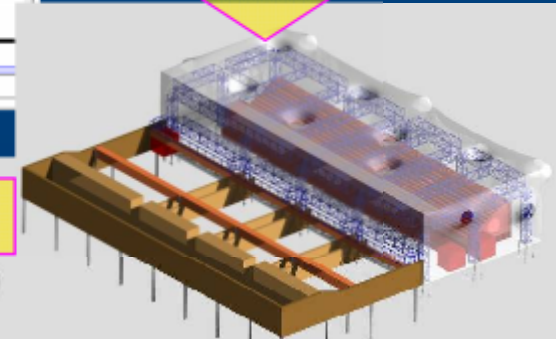
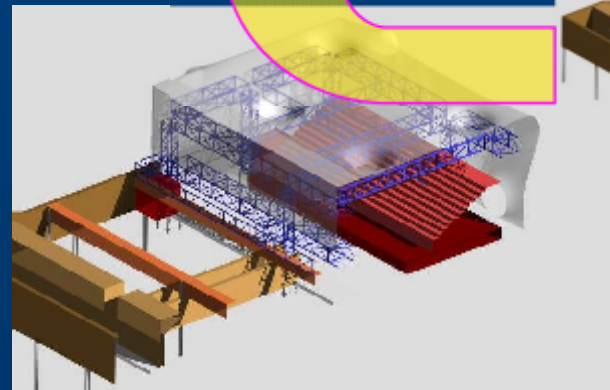
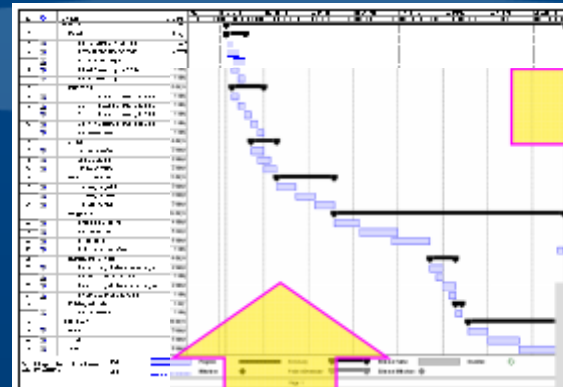
# BIM Models in 4D

## 4D BIM – Planning in action

BIM model linked to construction planning software

Virtual 'Tool Box' talks on site using the 4D BIM model to explain:  
Short term work planning  
Health and safety risks

Clash detection temporary elements and plant



London 2012  
Shooting Venue

**“Failing to plan is planning to fail.”**

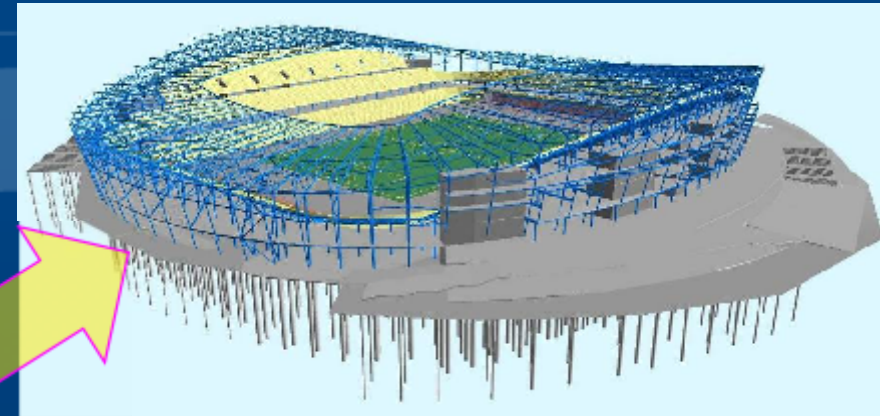
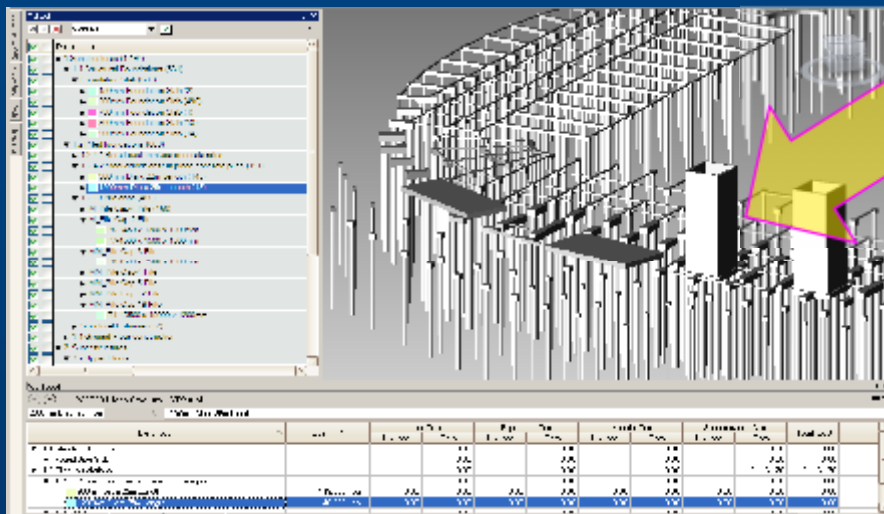
*Alan Lakein*



# BIM Models in 5D

## 5D BIM

Parametrically links the BIM design models with the project cost plan.



## Value Added

- Earlier cost plan accuracy
- Whole life cost and carbon planning
- Just in time ordering & reduction in waste



The screenshot shows a 'Life-Cost System Summary Report' for 'Mott MacDonald'. The report is a detailed table with columns for 'Element', 'Capital Cost', 'Total', 'Material', 'Quantity', 'Unit', 'Active', 'Operate / Maintain', and 'End of Life'. The table is organized into sections: 1. Substructure, 2. Superstructure, 3. Internal Finishes, 4. Fixings & Furnishings, and 5. Services. The total cost for the entire project is listed as 2,314,000.

Element	Capital Cost	Total	Material	Quantity	Unit	Active	Operate / Maintain	End of Life
<b>1 Substructure</b>	200	200	0.00	0.00	0.00	0.00	0.00	0.00
11 Foundations	200	200	0.00	0.00	0.00	0.00	0.00	0.00
<b>2 Superstructure</b>	2100	2100	0.00	0.00	0.00	0.00	0.00	0.00
21 Frame	2100	2100	0.00	0.00	0.00	0.00	0.00	0.00
22 External Walls	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23 Roof	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24 Floor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25 External Wall Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26 Windows and External Doors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27 Internal Walls and Partitions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28 Internal Floors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>3 Internal Finishes</b>	1,617,222	1,617,222	1,617,222	1,617,222	2,314,000	0.00	0.00	11,800.00
31 Wall Finishes	300	300	300	0.00	0.00	0.00	0.00	0.00
32 Floor Finishes	2,000	2,000	2,000	0.00	0.00	0.00	0.00	0.00
33 Ceiling Finishes	1,316,922	1,316,922	1,316,922	0.00	0.00	0.00	0.00	0.00
34 Wall Partitions	500	500	500	0.00	0.00	0.00	0.00	0.00
<b>4 Fixings &amp; Furnishings</b>	210	210	0.00	0.00	0.00	0.00	0.00	0.00
41 Fixings and Furnishings	210	210	0.00	0.00	0.00	0.00	0.00	0.00
<b>5 Services</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51 Sanitary Appliances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52 Sanitary Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53 Ventilation Appliances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54 Water Appliances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55 Water Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56 HVAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57 Electrical Installations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58 Fuel Installations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59 Lifting and Hoist Installations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# LifeCycle

- Capital cost, life cycle cost and CO<sub>2</sub> in one calculation

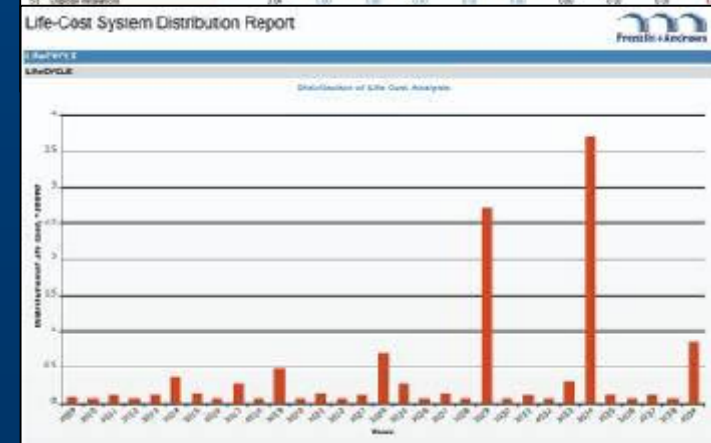


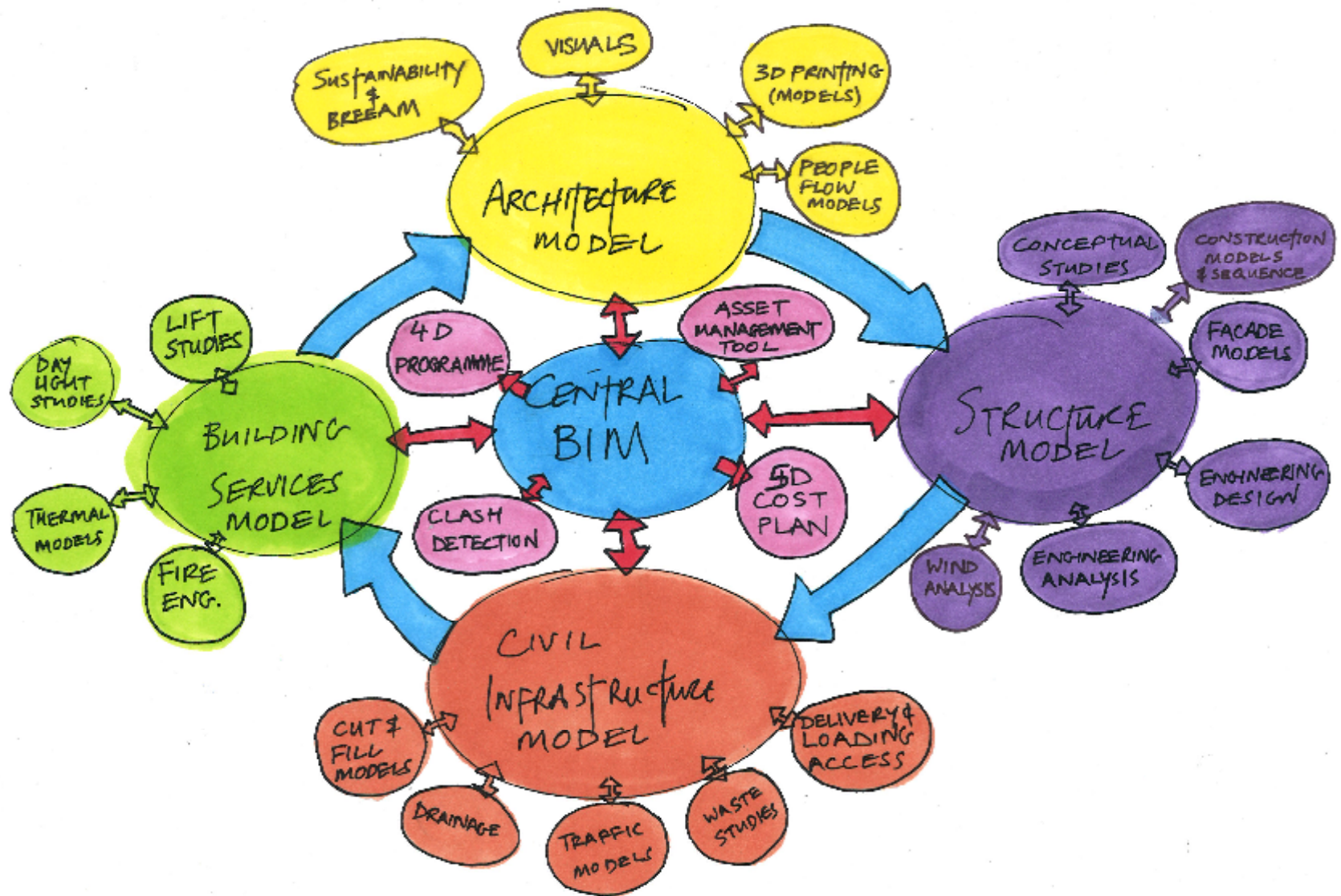
Life-Cost System Summary Report

LifeCYCLE (Simplified) LifeCYCLE

Summary of Life Costs

System	Capital Cost	Structural Services and Subsystems					Reactive Maintenance	Occupancy	End of Life	Total
		Asset Replacement	Inspections	Cleaning	Redecorations	Planned Maintenance				
<b>1. Substructure</b>	3.0k	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0k
<b>2. Superstructure</b>	3.0k	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0k
<b>3. Internal finishes</b>	3.0k	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0k
<b>4. Fittings &amp; Fixings</b>	3.0k	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0k
<b>5. Services</b>	3.0k	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0k





## BIM federated model Road Map

# BIM in asset management

The biggest potential value is over the life of the asset.

design

build

operate

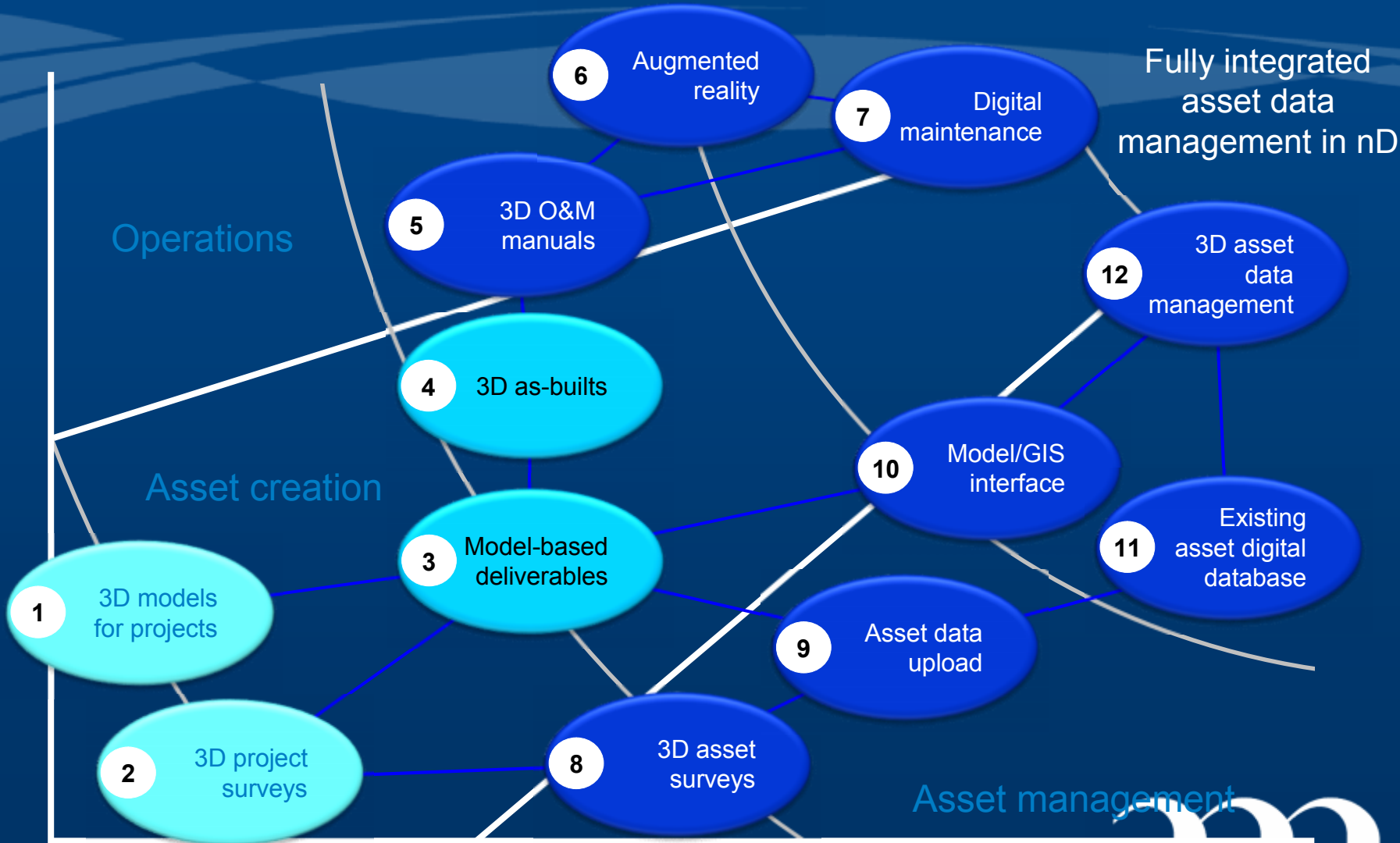
# The “corridor of aspiration” diagram



Key:



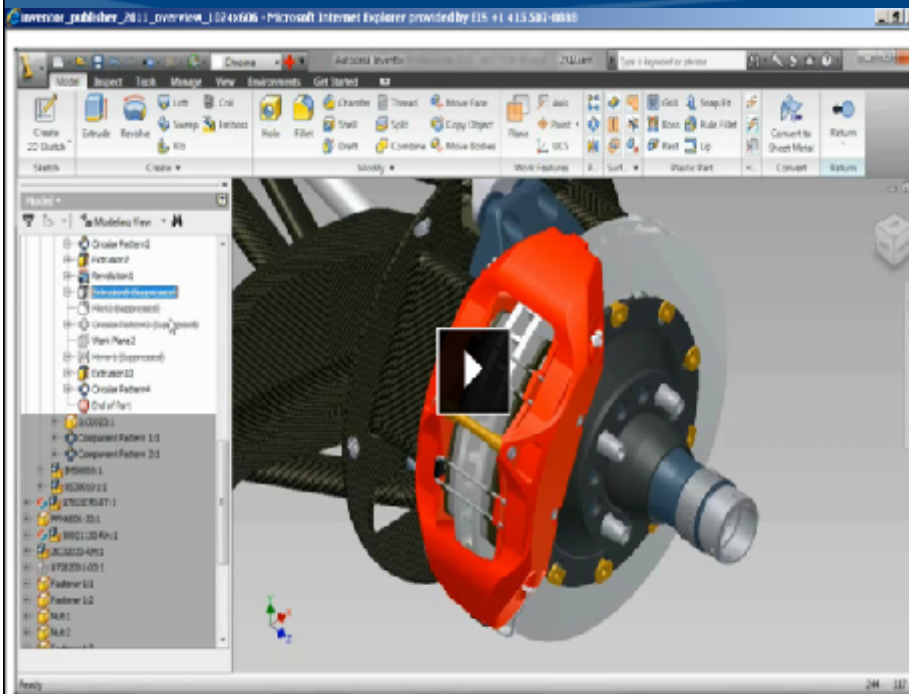
# Key connections and enablers



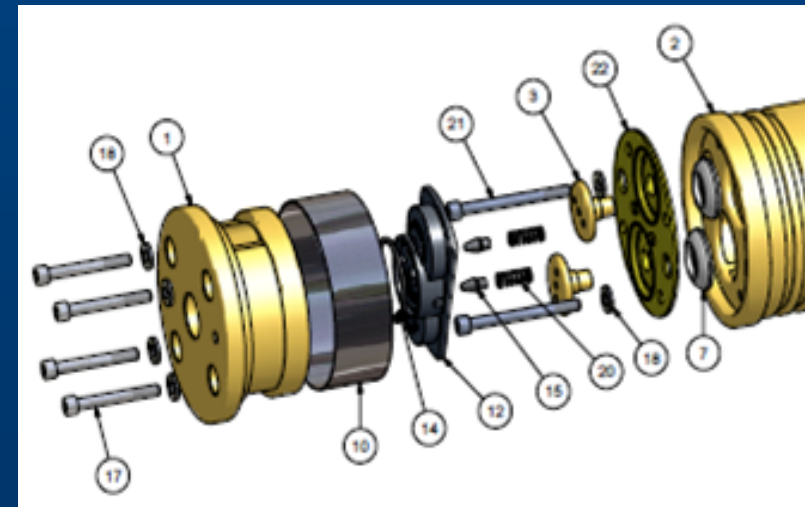
# Data-rich 3D O&M manuals

5

3D O&M manuals



Press “play” for demonstration

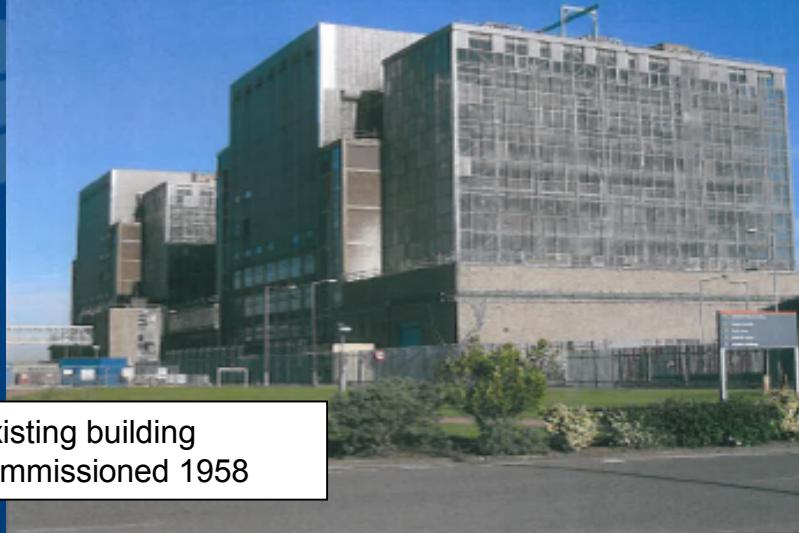


Haynes manual view

The logo for Mott MacDonald, featuring three stylized blue arches above the company name in a bold, sans-serif font.

Shortcut to Bradwell Scan Position 1

# Laser survey for existing assets



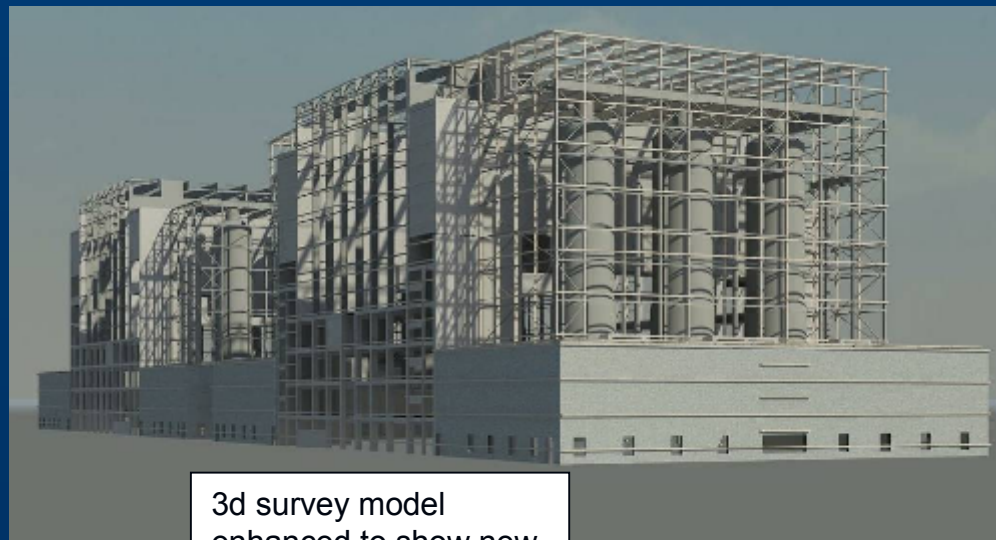
Existing building  
commissioned 1958



3D model of existing  
external envelope taken  
directly from the 3d laser  
scan 'point cloud' data

Using the 'revit' model  
to generate

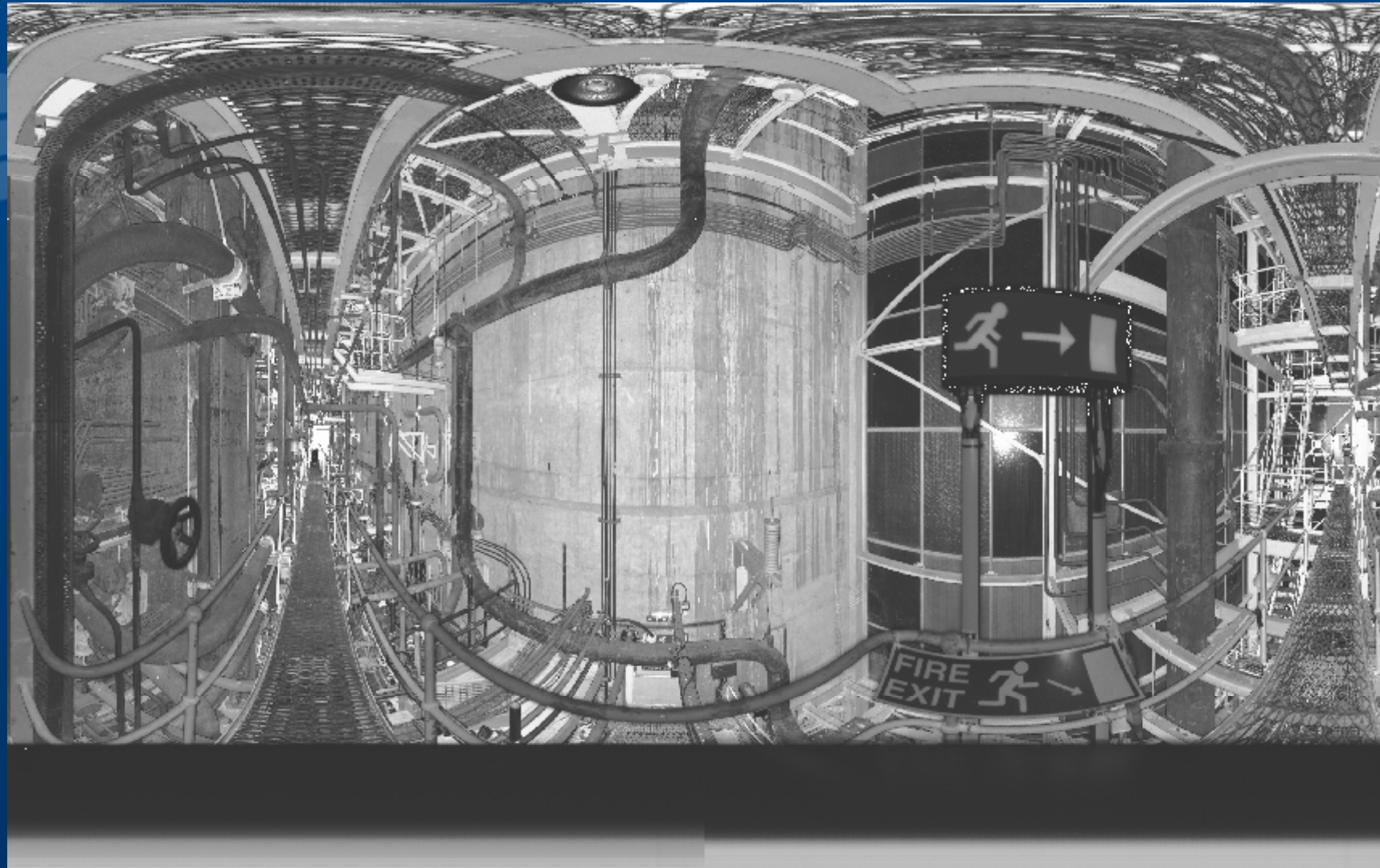
- 2d drawings for  
Setting out of the new  
works
- Produce fabrication  
drawings for the  
contractors
- Model used for  
demolition & new  
construction
- Model shared with  
main contractors  
supply chain



3d survey model  
enhanced to show new  
structure



# Interior laser scan



# 3D asset data management

12

3D asset data management

The screenshot displays the SAP Asset Manager interface. On the left, a tree view shows a hierarchy of assets: PROCESS (00, 10, 30), TRAIN3 (32, 33, 34, 35, 36), Cable Trays, Electrical equipment, Flow Elements / Orifices, Instrument Loops, Lights / Lamps, Mechanical Equipment, and Heat Exchangers (36-E001 to 36-E006). The 3D view in the center shows a complex industrial structure with pipes and tanks. A properties window for asset 36-E006 is open, showing the following data:

Equipment			
Equipment	FBFP-1	Category	Machine
Description	Collar Pump 1		Intermittent
Status	AVLBI		0001
Valid from	88/21/2000	Valid to	12/31/9999
General			
General data			
Class			
Object type	3880	Pump	
Authorizations	3880	SPRINTSERVICE	
Weight	888	KG	Global dimension
Inventory no.	18800125		Start-up date
			83/28/2000
Financial data			
Acquire value	188,888.88	USD	Acquire date
			81/14/2000
Manufacturer data			
Manufacturer	International Pumps	ManufactCountry	83
Model number	P10028	ConstructYear	1999 / 00
ManufacturerNo.	188234		
ManufacturerNo.	8881012345		



Easy access to an asset's master records



6

Augmented reality

# Augmented reality asset visualisation



Use of RFID smart tags



Visualising invisible assets

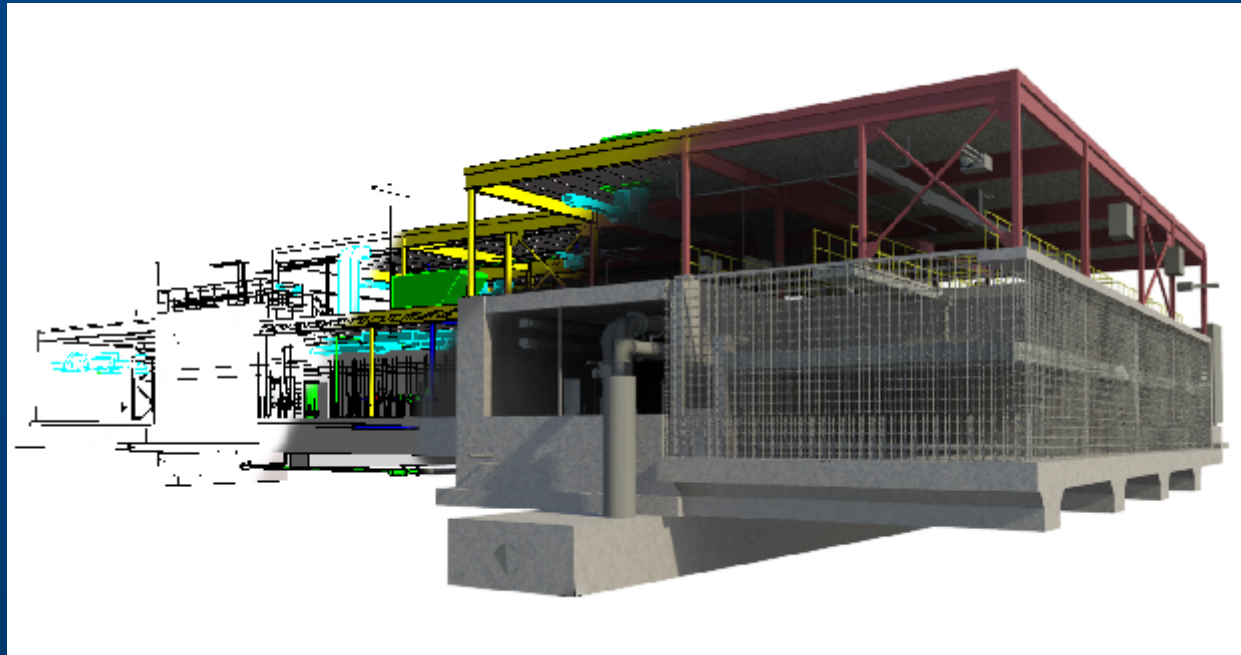
# Model-based deliverables



- Output from the BIM model delivered direct to tablet PCs and smartphones

## BIM Cultural Impacts:

- Fundamentally changing the way industry professionals work.



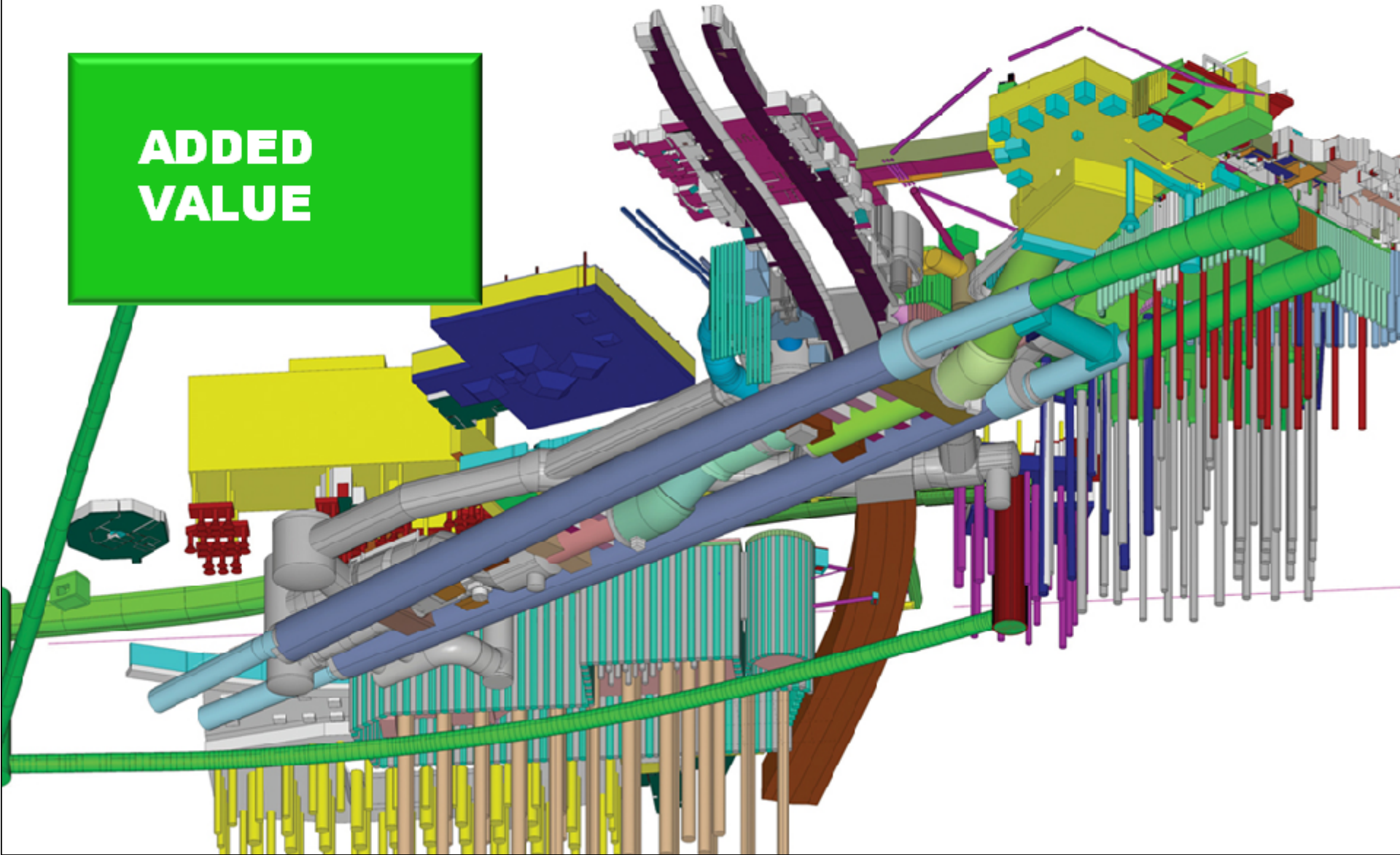
- Significant divergence of established workflows and processes.
- More collaborative and integrated than ever before.
- The technology is not the biggest barrier.

# Collaborative Connections

- **Identification of clear project goals and objectives.**
  - **Alignment of expectations**
  - **Quantification of success metrics**
  - **Project-wide technical execution plan**

# Success stories

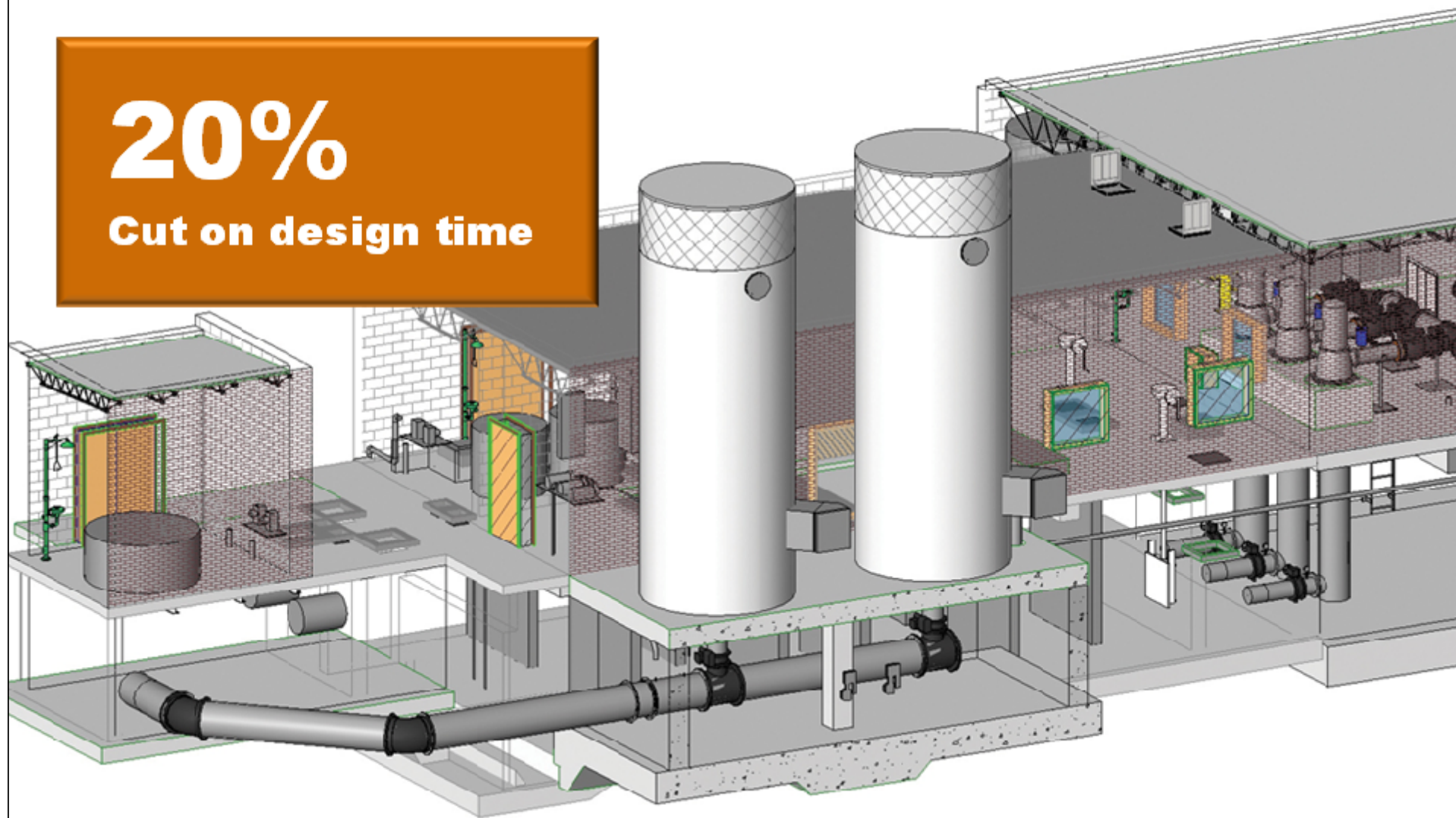
**ADDED  
VALUE**



# Success stories

**20%**

**Cut on design time**





# Success stories

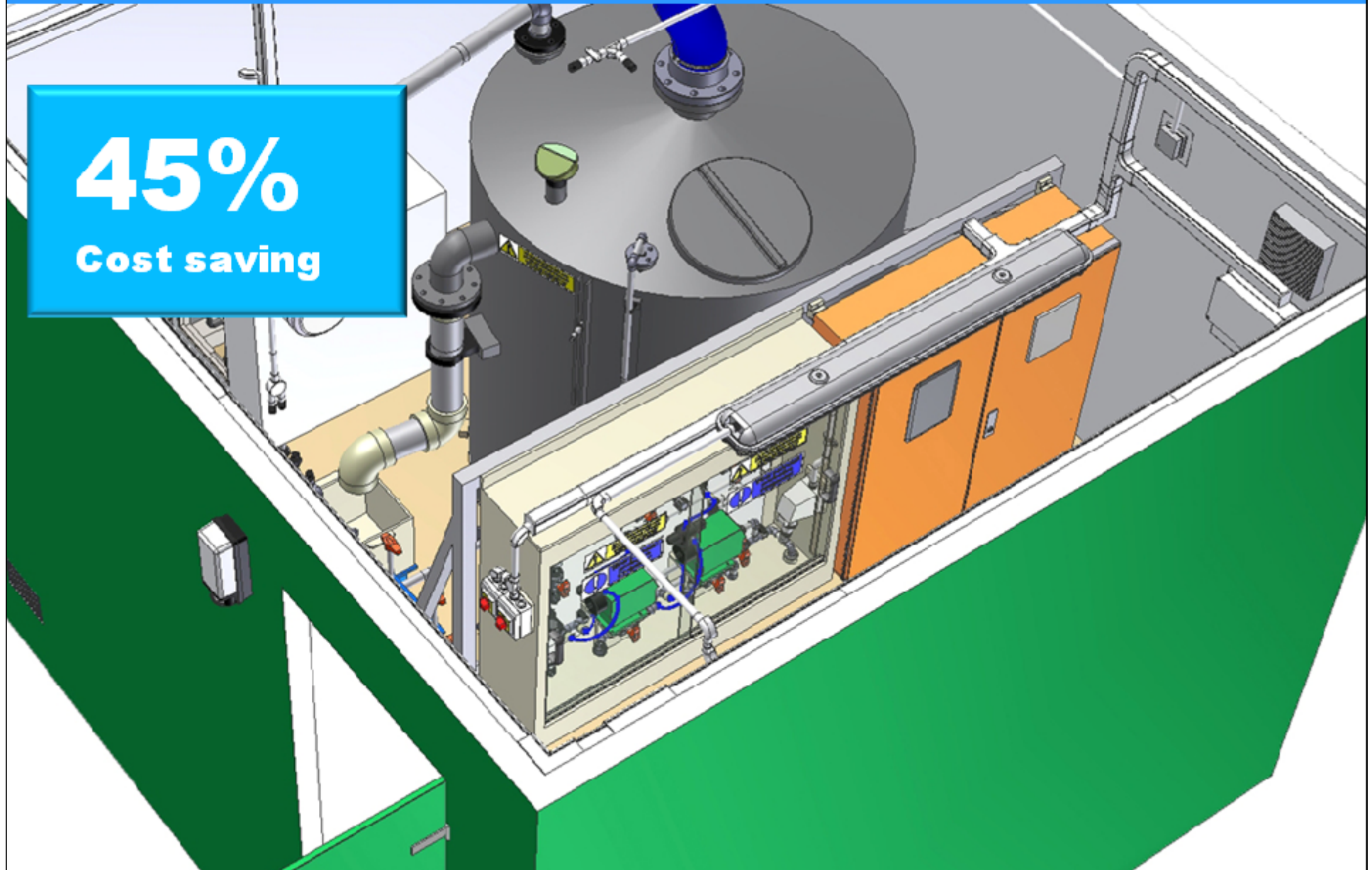
**30%**

**Time saving on  
architectural design**



# Success stories

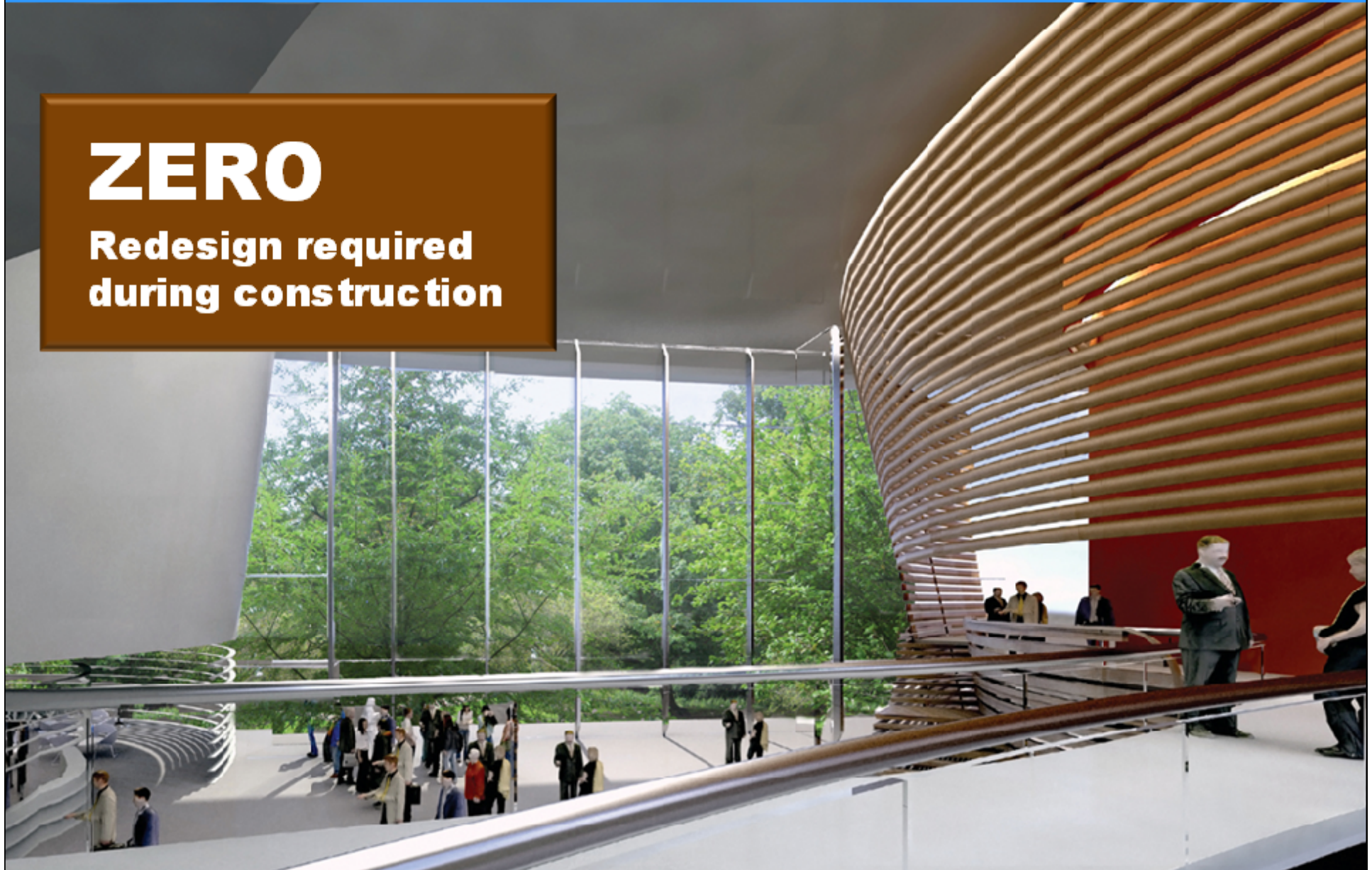
**45%**  
Cost saving



# Success stories

## ZERO

Redesign required  
during construction



We have a lot of experience to share



# BIM execution plan



4 BIM OBJECTIVES AND USES

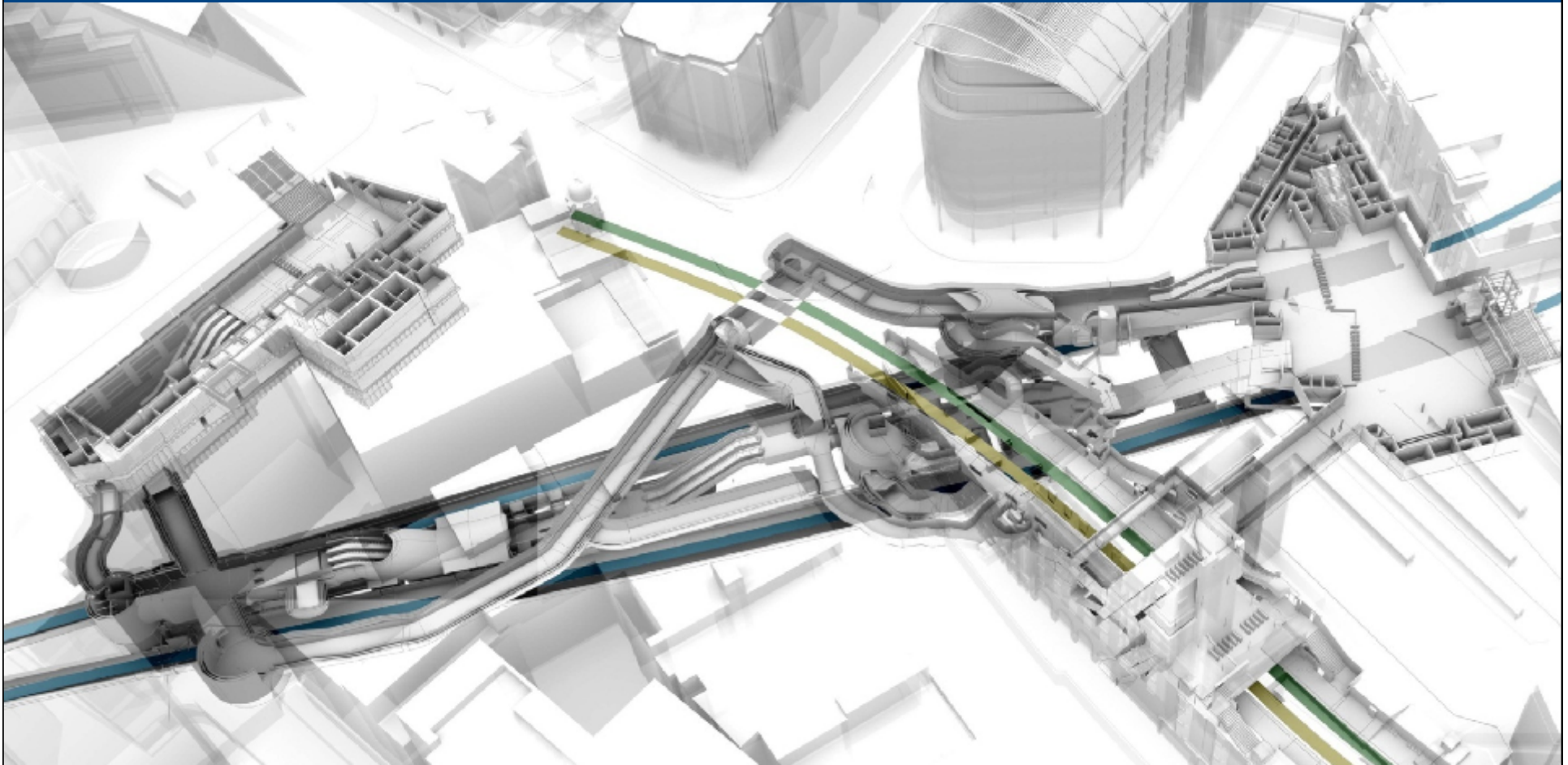
Briefly state the overall objectives of the project and list the Client's success factors. The subsequent BIM uses should show how the use of BIM will satisfy these goals and objectives.

It is desirable to summarise the uses of BIM that are going to be deployed on this project and indicate who is going to own/control that element of BIM. Note that the headings represent a set of standard uses. Refer to the BIM uses definition sheet for the standard definitions. Add further uses if they are not covered by the standard headings.

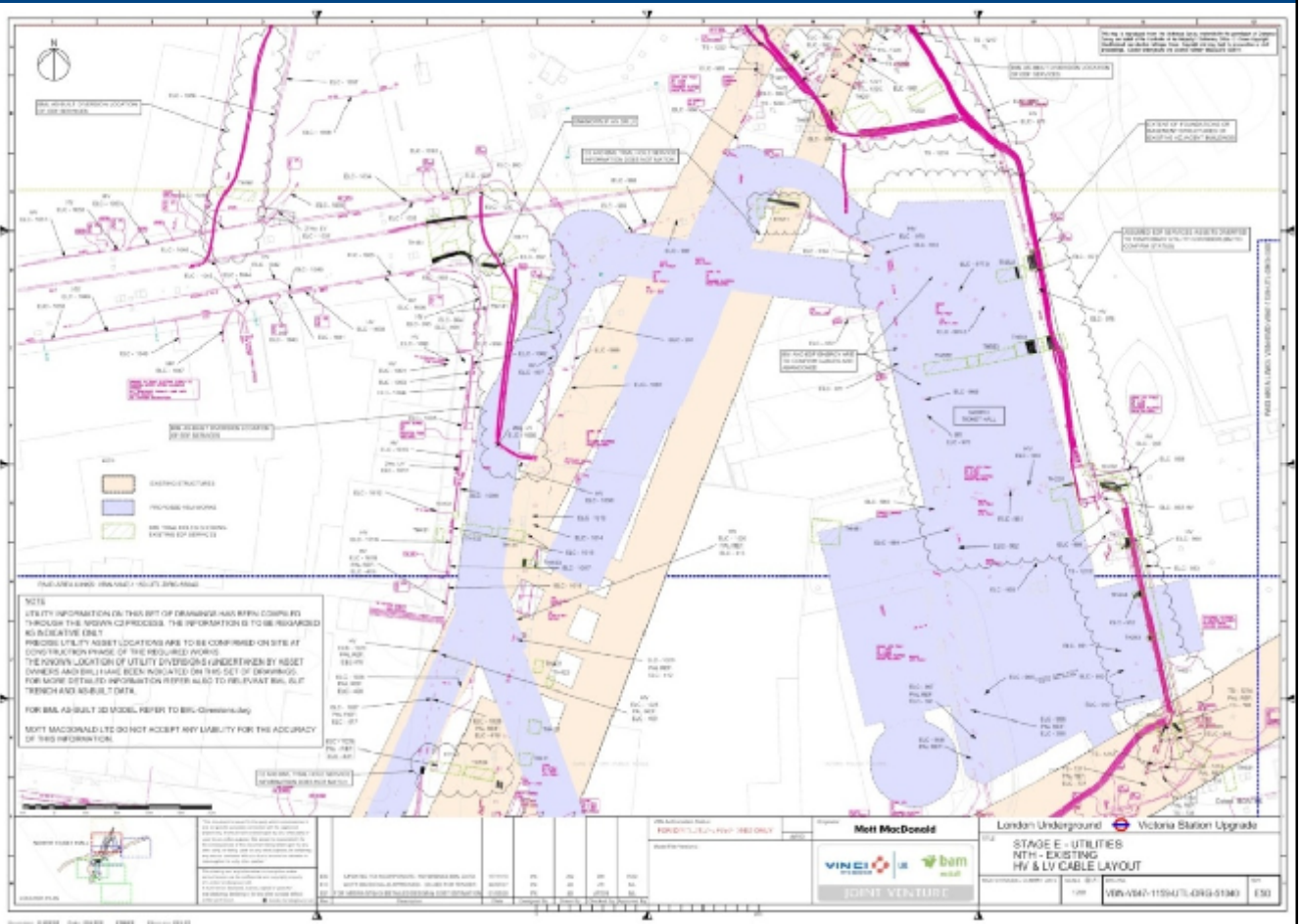
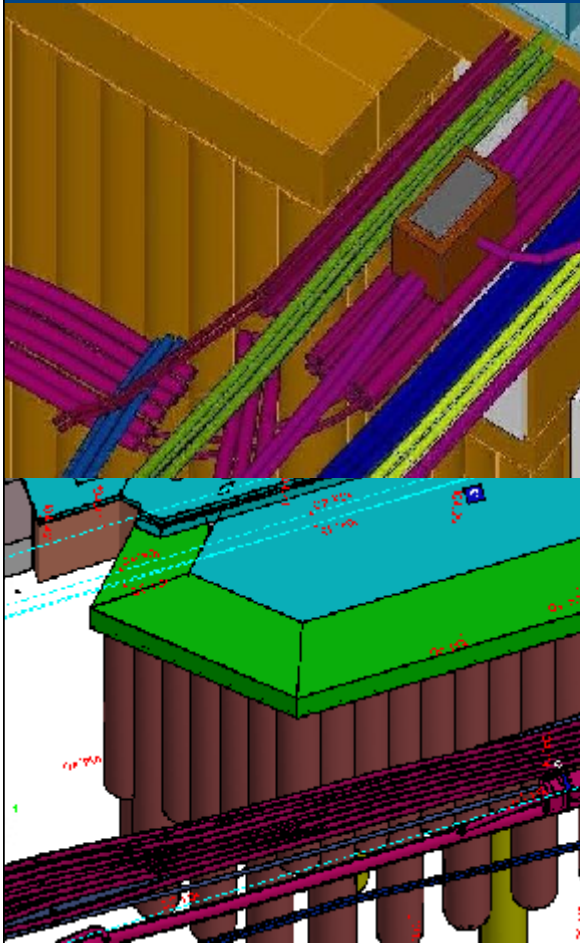
Yes/No	BIM use/feature	Owner	Comment/Deviation
	Existing conditions modelling		
	Cost estimation		
	Phase planning (4D)		
	Programming		
	Site analysis		
	Design authoring		
	Design reviews		
	Structural analysis		
	Energy analysis		
	Lighting analysis		
	Sustainability / LEED Evaluation		
	Code Validation		
	3D coordination		
	Site utilisation planning		
	Construction System Design		
	Digital fabrication		
	3D control and planning		
	Record modelling		

- Defines BIM project uses, level of model detail and ownership at each project stage

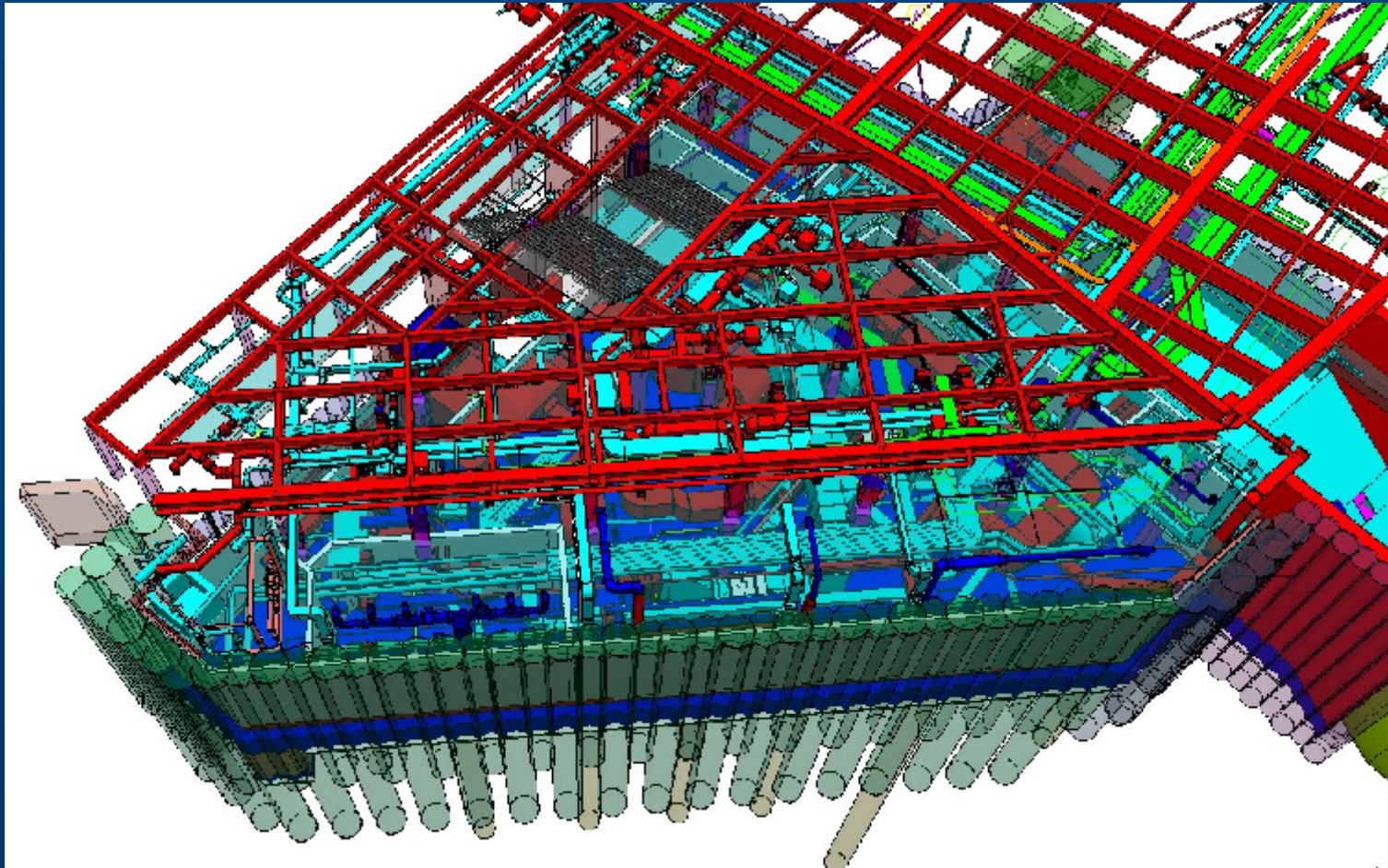
# Case studies



# Project constraints modelled

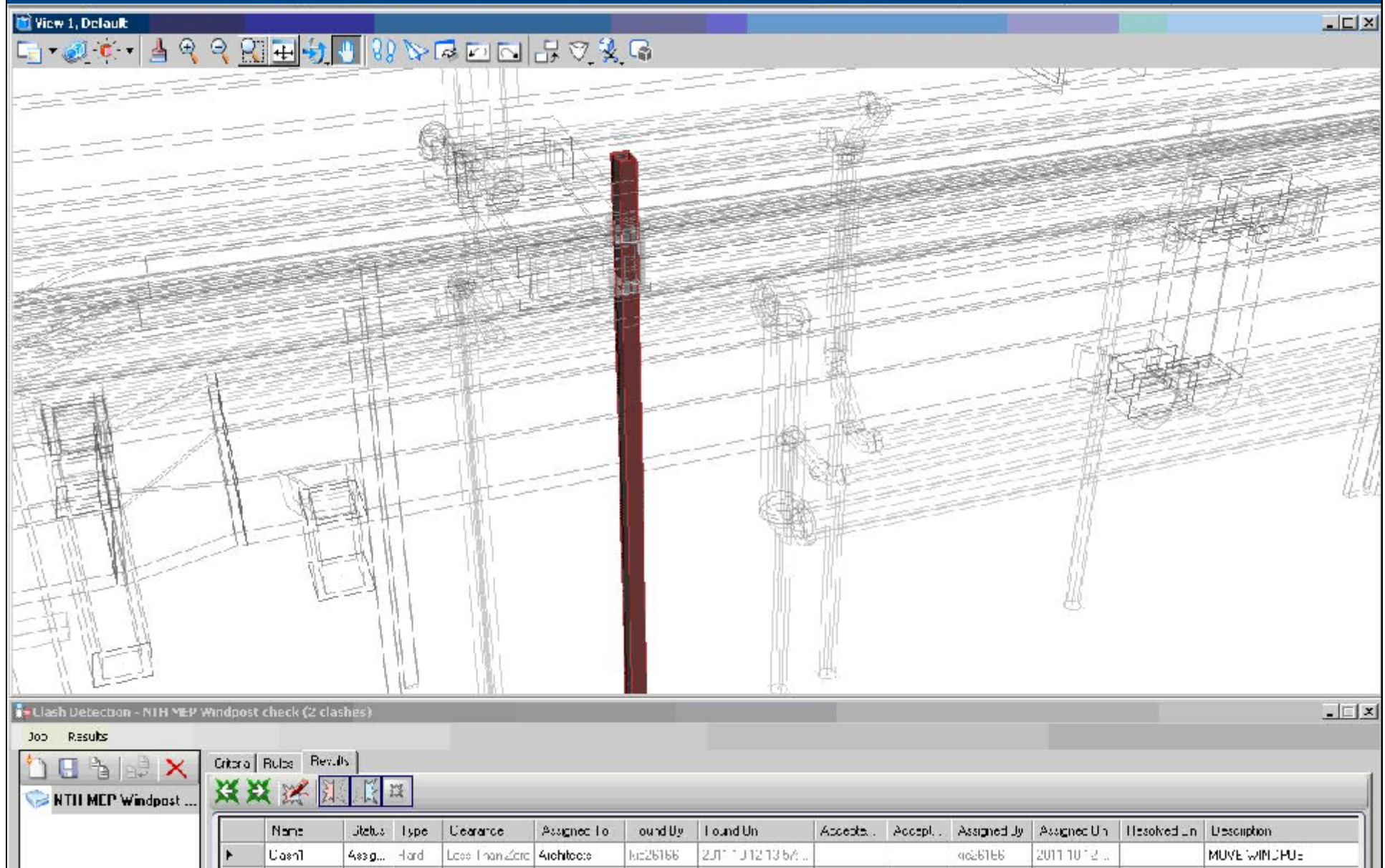


# Design co-ordination





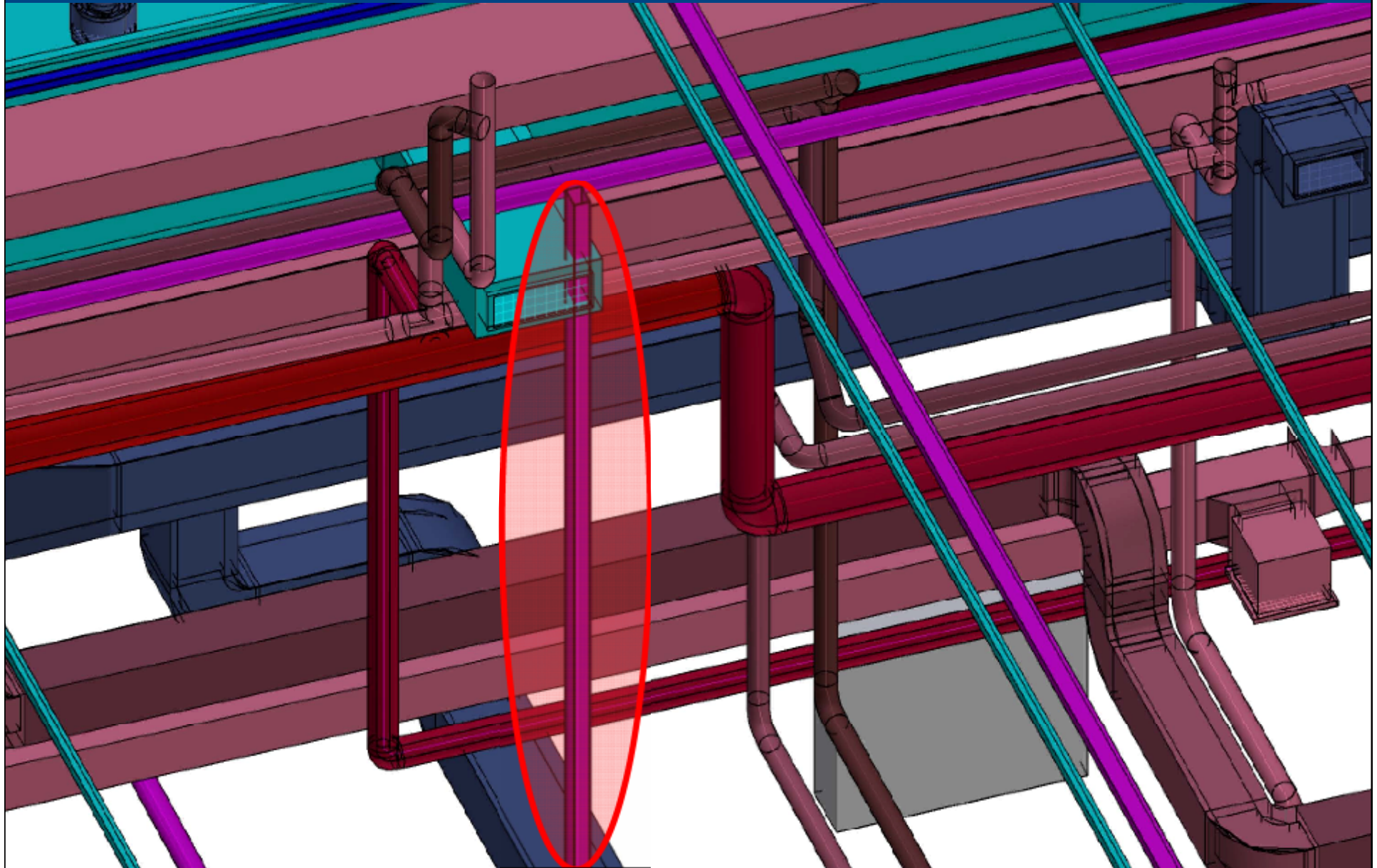
# Clash detection



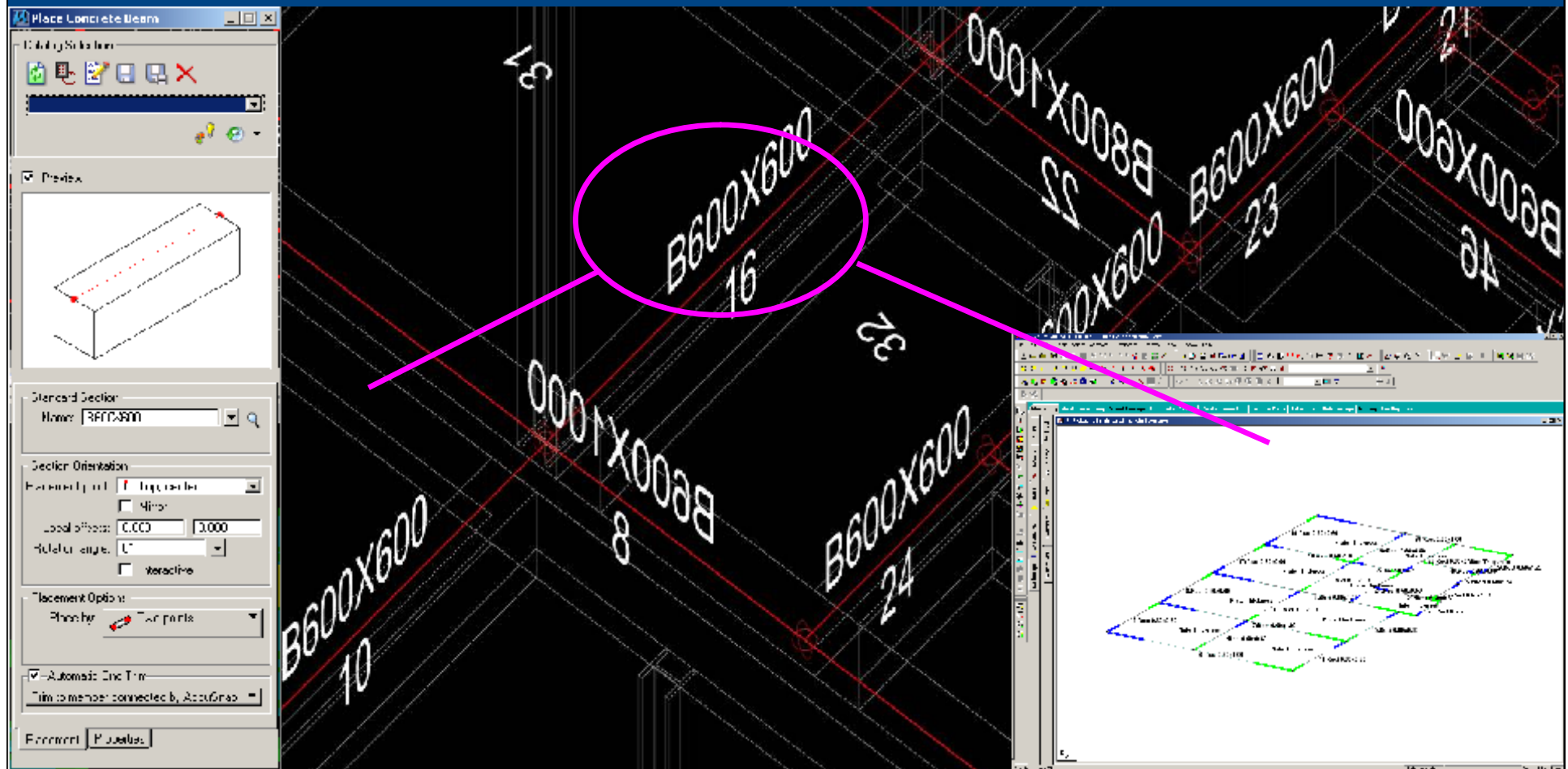
The screenshot shows a 3D wireframe model of a building structure. A prominent red vertical beam is visible in the center. The interface includes a toolbar at the top and a 'Clash Detection' window at the bottom. The 'Clash Detection' window has a 'Results' tab and a table with the following data:

Name	Item	Type	Clearance	Assigned To	Found On	Found On	Accepted	Accepted	Assigned By	Assigned On	Resolved On	Description
Clash1	488g...	Hard	Less Than 2rc	4richtoec	ku26166	2011-11-13 5:4...			4026166	2011-10-12 ..		MUVE WINDPU=

# Clash detection

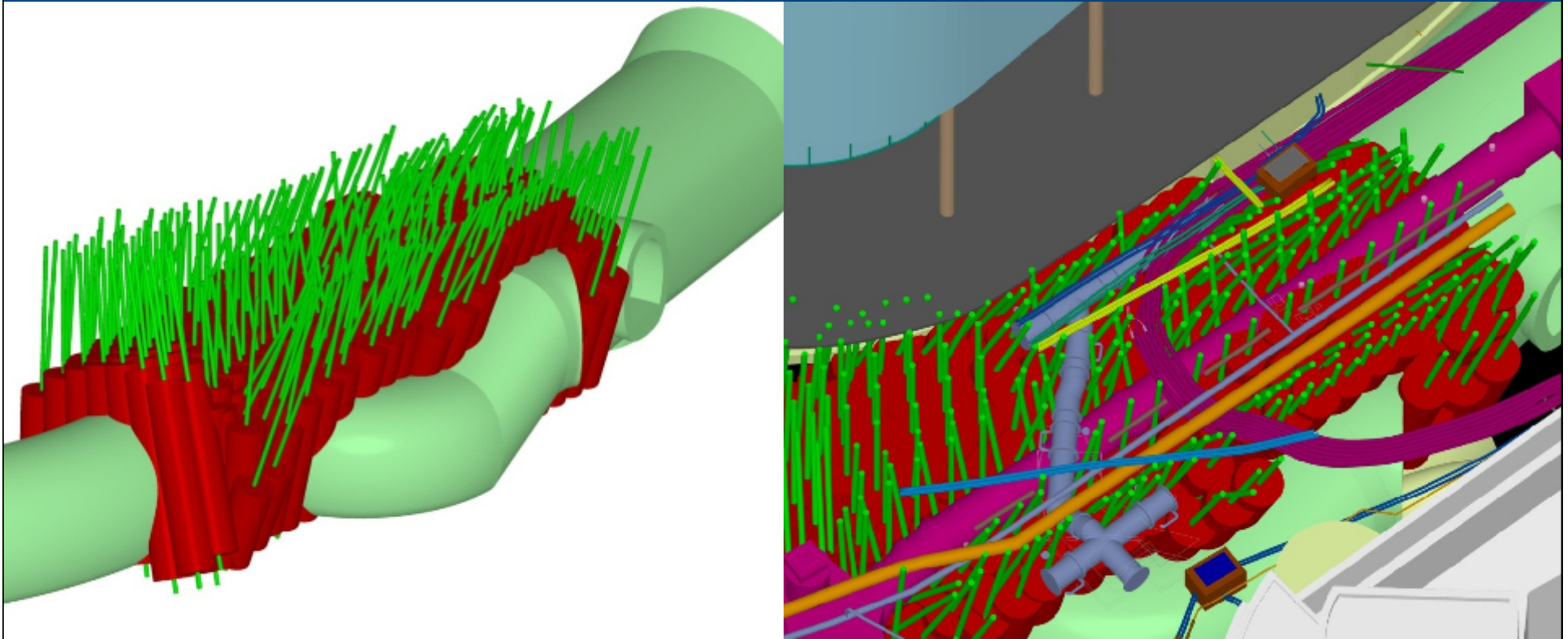


# Engineering analysis integration



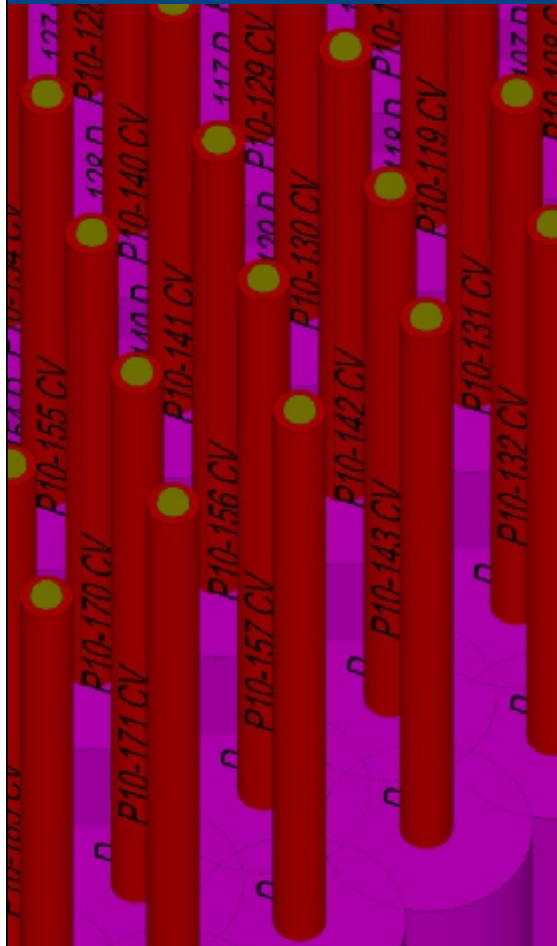
- Bi-directional use of model data

# New applications: ground treatment



- Clashes and voids eliminated before site works

# New applications: ground treatment



Microsoft Excel - Report.xls

KELLER

Project: Victoria Station Upgrade

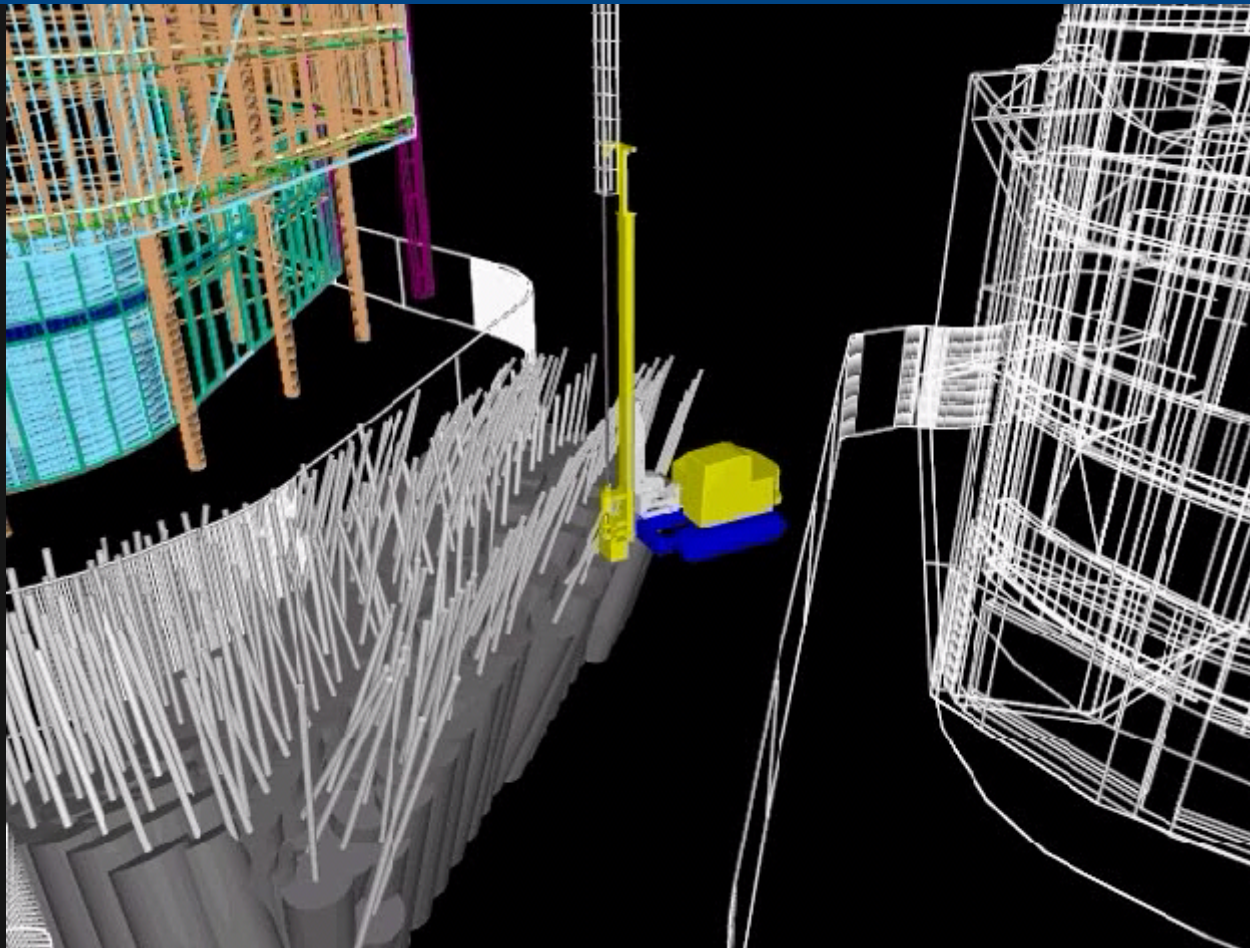
at Ground Locations

Item No	Item Name	Item Type	Item Code	Item Qty	Item Unit	Item Price	Item Total	Item Tax	Item Net	Item Desc
1	L1	Excess 600mm	785134	10.00	M	785134	7851.34	0.00	7851.34	Excess 600mm
2	F1	Case Valve 400mm	785135	10.00	M	785135	7851.35	0.00	7851.35	Case Valve 400mm
3	F1	D1 300mm	785136	10.00	M	785136	7851.36	0.00	7851.36	D1 300mm
4	F1	D1 300mm	785137	10.00	M	785137	7851.37	0.00	7851.37	D1 300mm
5	F1	D1 300mm	785138	10.00	M	785138	7851.38	0.00	7851.38	D1 300mm
6	F1	D1 300mm	785139	10.00	M	785139	7851.39	0.00	7851.39	D1 300mm
7	F1	D1 300mm	785140	10.00	M	785140	7851.40	0.00	7851.40	D1 300mm
8	F1	D1 300mm	785141	10.00	M	785141	7851.41	0.00	7851.41	D1 300mm
9	F1	D1 300mm	785142	10.00	M	785142	7851.42	0.00	7851.42	D1 300mm
10	F1	D1 300mm	785143	10.00	M	785143	7851.43	0.00	7851.43	D1 300mm
11	F1	D1 300mm	785144	10.00	M	785144	7851.44	0.00	7851.44	D1 300mm
12	F1	D1 300mm	785145	10.00	M	785145	7851.45	0.00	7851.45	D1 300mm
13	F1	D1 300mm	785146	10.00	M	785146	7851.46	0.00	7851.46	D1 300mm
14	F1	D1 300mm	785147	10.00	M	785147	7851.47	0.00	7851.47	D1 300mm
15	F1	D1 300mm	785148	10.00	M	785148	7851.48	0.00	7851.48	D1 300mm
16	F1	D1 300mm	785149	10.00	M	785149	7851.49	0.00	7851.49	D1 300mm
17	F1	D1 300mm	785150	10.00	M	785150	7851.50	0.00	7851.50	D1 300mm
18	F1	D1 300mm	785151	10.00	M	785151	7851.51	0.00	7851.51	D1 300mm
19	F1	D1 300mm	785152	10.00	M	785152	7851.52	0.00	7851.52	D1 300mm
20	F1	D1 300mm	785153	10.00	M	785153	7851.53	0.00	7851.53	D1 300mm
21	F1	D1 300mm	785154	10.00	M	785154	7851.54	0.00	7851.54	D1 300mm
22	F1	D1 300mm	785155	10.00	M	785155	7851.55	0.00	7851.55	D1 300mm
23	F1	D1 300mm	785156	10.00	M	785156	7851.56	0.00	7851.56	D1 300mm
24	F1	D1 300mm	785157	10.00	M	785157	7851.57	0.00	7851.57	D1 300mm
25	F1	D1 300mm	785158	10.00	M	785158	7851.58	0.00	7851.58	D1 300mm
26	F1	D1 300mm	785159	10.00	M	785159	7851.59	0.00	7851.59	D1 300mm
27	F1	D1 300mm	785160	10.00	M	785160	7851.60	0.00	7851.60	D1 300mm
28	F1	D1 300mm	785161	10.00	M	785161	7851.61	0.00	7851.61	D1 300mm
29	F1	D1 300mm	785162	10.00	M	785162	7851.62	0.00	7851.62	D1 300mm
30	F1	D1 300mm	785163	10.00	M	785163	7851.63	0.00	7851.63	D1 300mm
31	F1	D1 300mm	785164	10.00	M	785164	7851.64	0.00	7851.64	D1 300mm
32	F1	D1 300mm	785165	10.00	M	785165	7851.65	0.00	7851.65	D1 300mm
33	F1	D1 300mm	785166	10.00	M	785166	7851.66	0.00	7851.66	D1 300mm
34	F1	D1 300mm	785167	10.00	M	785167	7851.67	0.00	7851.67	D1 300mm
35	F1	D1 300mm	785168	10.00	M	785168	7851.68	0.00	7851.68	D1 300mm
36	F1	D1 300mm	785169	10.00	M	785169	7851.69	0.00	7851.69	D1 300mm
37	F1	D1 300mm	785170	10.00	M	785170	7851.70	0.00	7851.70	D1 300mm
38	F1	D1 300mm	785171	10.00	M	785171	7851.71	0.00	7851.71	D1 300mm
39	F1	D1 300mm	785172	10.00	M	785172	7851.72	0.00	7851.72	D1 300mm
40	F1	D1 300mm	785173	10.00	M	785173	7851.73	0.00	7851.73	D1 300mm
41	F1	D1 300mm	785174	10.00	M	785174	7851.74	0.00	7851.74	D1 300mm
42	F1	D1 300mm	785175	10.00	M	785175	7851.75	0.00	7851.75	D1 300mm
43	F1	D1 300mm	785176	10.00	M	785176	7851.76	0.00	7851.76	D1 300mm
44	F1	D1 300mm	785177	10.00	M	785177	7851.77	0.00	7851.77	D1 300mm
45	F1	D1 300mm	785178	10.00	M	785178	7851.78	0.00	7851.78	D1 300mm
46	F1	D1 300mm	785179	10.00	M	785179	7851.79	0.00	7851.79	D1 300mm
47	F1	D1 300mm	785180	10.00	M	785180	7851.80	0.00	7851.80	D1 300mm
48	F1	D1 300mm	785181	10.00	M	785181	7851.81	0.00	7851.81	D1 300mm
49	F1	D1 300mm	785182	10.00	M	785182	7851.82	0.00	7851.82	D1 300mm
50	F1	D1 300mm	785183	10.00	M	785183	7851.83	0.00	7851.83	D1 300mm
51	F1	D1 300mm	785184	10.00	M	785184	7851.84	0.00	7851.84	D1 300mm
52	F1	D1 300mm	785185	10.00	M	785185	7851.85	0.00	7851.85	D1 300mm
53	F1	D1 300mm	785186	10.00	M	785186	7851.86	0.00	7851.86	D1 300mm
54	F1	D1 300mm	785187	10.00	M	785187	7851.87	0.00	7851.87	D1 300mm
55	F1	D1 300mm	785188	10.00	M	785188	7851.88	0.00	7851.88	D1 300mm
56	F1	D1 300mm	785189	10.00	M	785189	7851.89	0.00	7851.89	D1 300mm
57	F1	D1 300mm	785190	10.00	M	785190	7851.90	0.00	7851.90	D1 300mm
58	F1	D1 300mm	785191	10.00	M	785191	7851.91	0.00	7851.91	D1 300mm
59	F1	D1 300mm	785192	10.00	M	785192	7851.92	0.00	7851.92	D1 300mm
60	F1	D1 300mm	785193	10.00	M	785193	7851.93	0.00	7851.93	D1 300mm
61	F1	D1 300mm	785194	10.00	M	785194	7851.94	0.00	7851.94	D1 300mm
62	F1	D1 300mm	785195	10.00	M	785195	7851.95	0.00	7851.95	D1 300mm
63	F1	D1 300mm	785196	10.00	M	785196	7851.96	0.00	7851.96	D1 300mm
64	F1	D1 300mm	785197	10.00	M	785197	7851.97	0.00	7851.97	D1 300mm
65	F1	D1 300mm	785198	10.00	M	785198	7851.98	0.00	7851.98	D1 300mm
66	F1	D1 300mm	785199	10.00	M	785199	7851.99	0.00	7851.99	D1 300mm
67	F1	D1 300mm	785200	10.00	M	785200	7852.00	0.00	7852.00	D1 300mm

- Auto report extraction from model listing unique reference, coordinates



# Jet grout plant selection

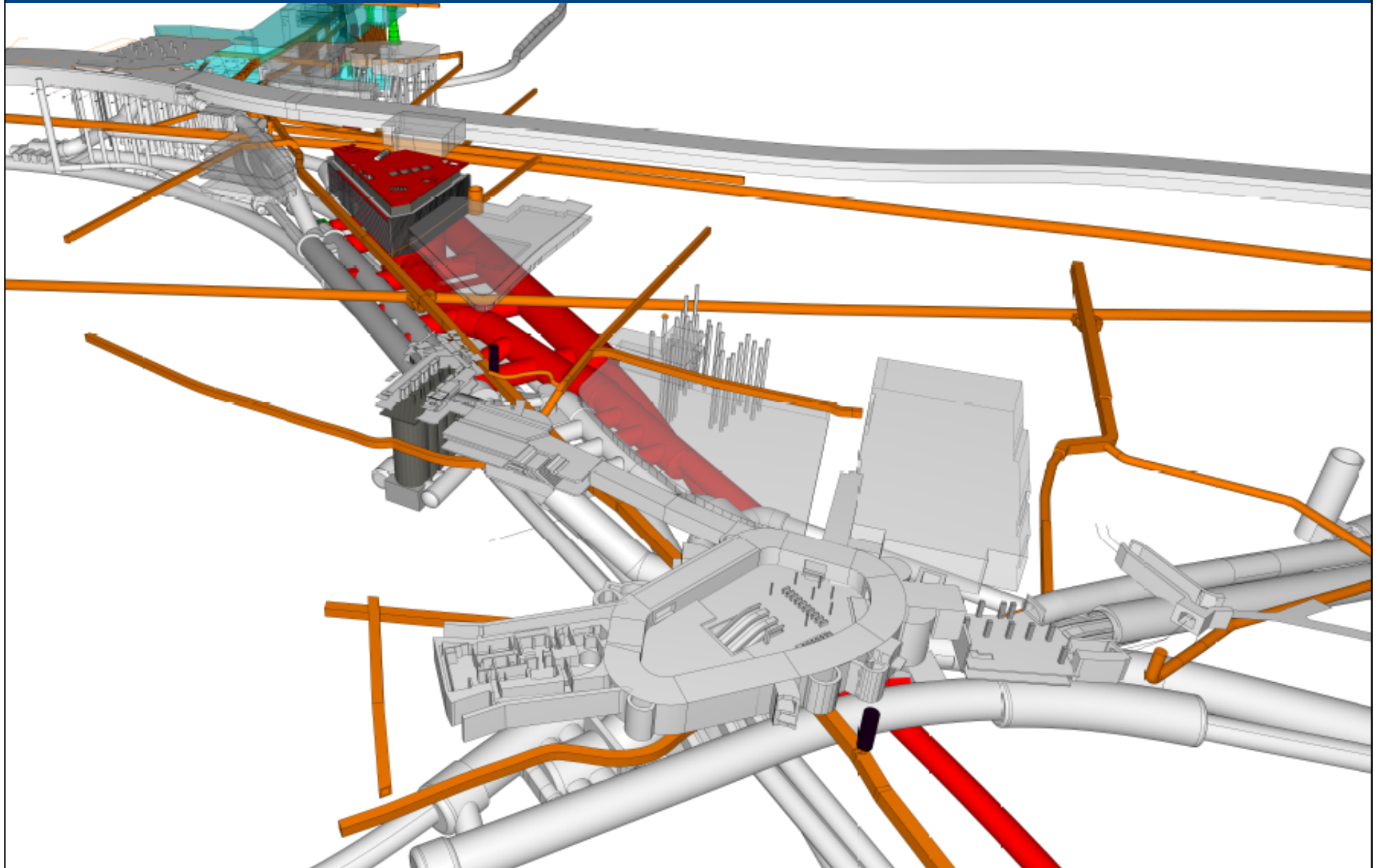


# Digital setting out



- GPS or LPS 3D total station system

# Bank Station Upgrade





# Bank Station Upgrade



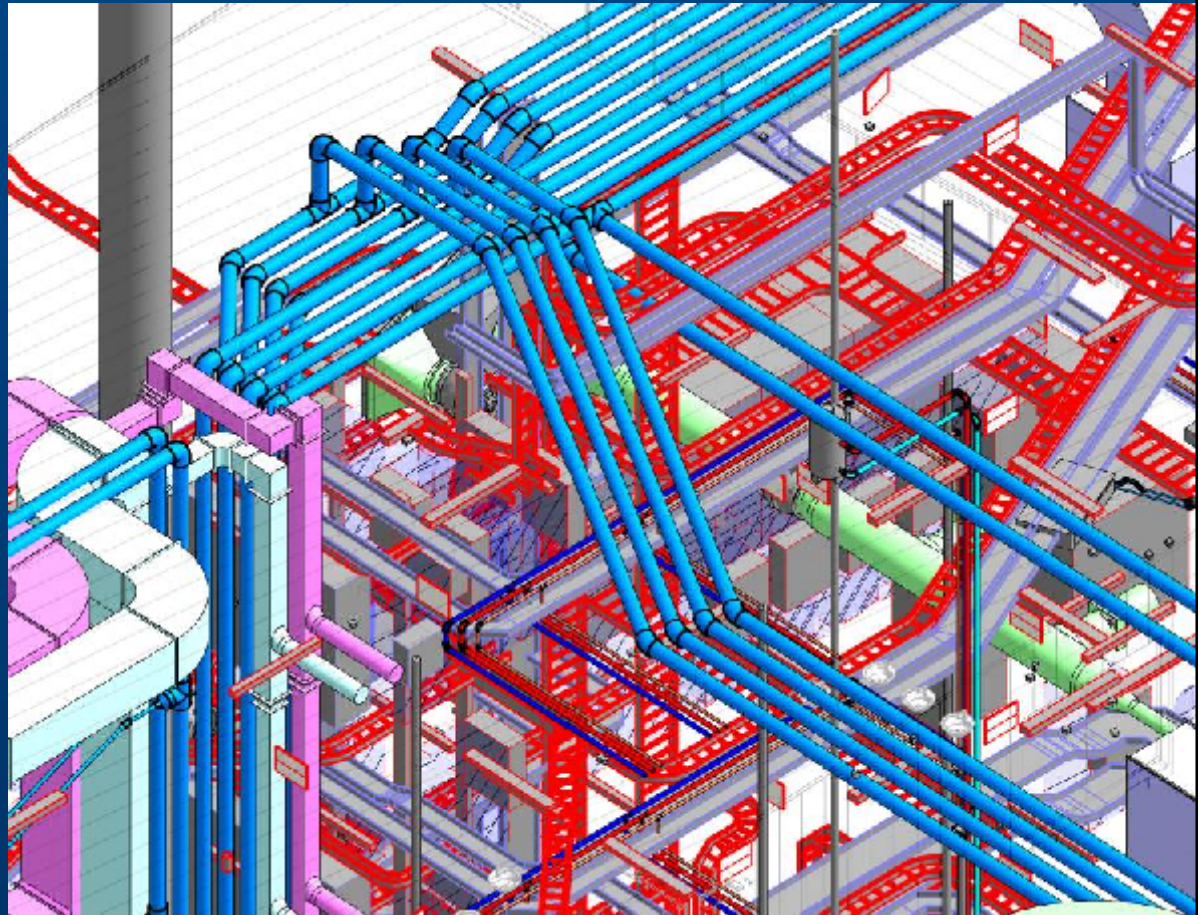
# Baku Arena Project Overview

- 6,500 seat gymnastics arena in Baku, Azerbaijan
- MM completed the MEP design to Stage E
- Other consultants
  - Pattern architects
  - Robert Bird structures
  - Broadway Malyan



# Extent of BIM Usage

- Ductwork
- AHUs
- Pipework
- Switchboards
- Lighting
- Cable Containment
- Small Power/data

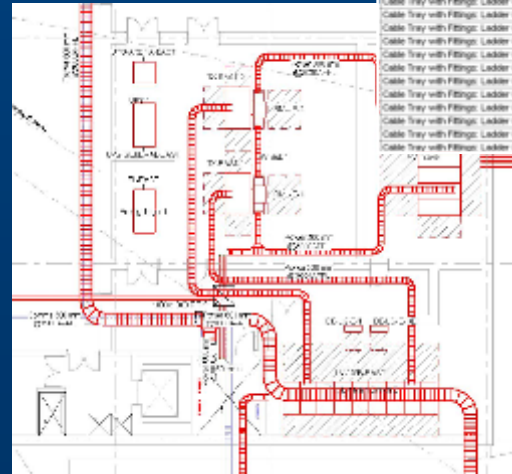




# Quantities

Type Mark	Count	Lighting Fixture Schedule Family and Type	Apparent Load	Efficacy
D1	48	Downlight - Recessed Can D1 - Fluorescent - 230V	15 VA	89 lm/W
D1E	11	Downlight - Recessed Can D1E - Fluorescent - 230V	15 VA	89 lm/W
D2	227	Downlight - Recessed Can D2 - Fluorescent - 230V	27 VA	89 lm/W
D2F	50	Downlight - Recessed Can D2F - Fluorescent - 230V	27 VA	89 lm/W
D3	61	Downlight - Recessed Can D3 - Fluorescent - 230V	27 VA	89 lm/W
D3E	17	Downlight - Recessed Can D3E - Fluorescent - 230V	27 VA	89 lm/W
D4	66	Plain Recessed Lighting Fixture D4 - 600x600 - 230	35 VA	84 lm/W
D4F	18	Plain Recessed Lighting Fixture D4F - 600x600 - 230	35 VA	84 lm/W
D5	26	Downlight - Recessed Can D5 - Fluorescent - 230V	36 VA	89 lm/W
D5E	5	Downlight - Recessed Can D5E - Fluorescent - 230V	38 VA	89 lm/W
D6	110	Downlight - Recessed Can D6 - Metal Halide - 230V	70 VA	89 lm/W
D7	57	Downlight - Recessed Can D7 - Fluorescent - 230V	35 VA	89 lm/W
D7L	10	Downlight - Recessed Can D7L - Fluorescent - 230V	36 VA	89 lm/W
F1	48	Downlight - Recessed Can F1 - Metal Halide - 230V	110 VA	89 lm/W
F7	144	Downlight - Recessed Can F7 - Metal Halide - 230V	110 VA	89 lm/W
I3	6	Linear Lighting Fixture: I3 - Wall Light	32 VA	95 lm/W
L1	41	Linear Lighting Fixture: L1 - 1500 1 Lamp - 230	32 VA	95 lm/W
L1E	22	Linear Lighting Fixture: L1E - 1500 1 Lamp - 230	32 VA	95 lm/W
I2	674	Linear Lighting Fixture: I2 - 1500 2 Lamp - 230	64 VA	91 lm/W
L2L	242	Linear Lighting Fixture: L2L - 1500 2 Lamp - 230	64 VA	91 lm/W
L4	72	Plain Recessed Lighting Fixture L4 - 600x1200 - 230	172 VA	89 lm/W
L4E	12	Plain Recessed Lighting Fixture L4E - 600x1200 - 230	172 VA	89 lm/W
L5	87	Plain Recessed Lighting Fixture L5 - 300x1200 - 230	70 VA	89 lm/W
L5L	19	Plain Recessed Lighting Fixture L5L - 300x1200 - 230	70 VA	89 lm/W
L8	10	Linear Lighting Fixture: L8 - 1500 2 Lamp - 230	64 VA	91 lm/W
L8E	3	Linear Lighting Fixture: L8E - 1500 2 Lamp - 230	64 VA	91 lm/W
I7	72	Linear Lighting Fixture: I7 - 1500 2 Lamp - 230	64 VA	91 lm/W
L7L	163	Linear Lighting Fixture: L7L - 1500 2 Lamp - 230	64 VA	91 lm/W
L8	3	Linear Lighting Fixture: L8 - 1500 2 Lamp - 230	64 VA	91 lm/W
L9E	42	Linear Lighting Fixture: L9E - 600x600 - 230	64 VA	91 lm/W
M1	11	Plain Recessed Lighting Fixture M1 - 600x600 - 230	80 VA	84 lm/W
M1L	24	Plain Recessed Lighting Fixture M1L - 600x600 - 230	80 VA	84 lm/W
M2	2	Plain Recessed Lighting Fixture M2 - 600x800 - 230	48 VA	84 lm/W
M2F	7	Plain Recessed Lighting Fixture M2F - 600x800 - 230	48 VA	84 lm/W
M3	18	Plain Recessed Lighting Fixture M3 - 600x800 - 230	48 VA	84 lm/W
F1	8	Street Light - Standard F1 - 70W MH - 230	80 VA	25 lm/W
W1	2	Linear Lighting Fixture: W1 - Wall Light	32 VA	95 lm/W
W1F	3	Linear Lighting Fixture: W1F - Wall Light	32 VA	95 lm/W
Grand total				2201

Family and Type	Cable Tray Schedule			Manufacture	Start	Model	Service Type	Size	Top Elevation
	Height	Height	Length						
Cable Tray with Fittings: Ladder Cable Tray	100 mm		20071		23		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		8667		26		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		8520		27		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		12183		30		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		11130		31		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1534		32		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		7340		33		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		171		34		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		133		35		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		8320		36		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1300		37		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		4091		38		Power	600 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1640		39		Power	600 mmx180	2358
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1640		40		Power	600 mmx180	2358
Cable Tray with Fittings: Ladder Cable Tray	100 mm		7684		41		Power	600 mmx180	1150
Cable Tray with Fittings: Channel Cable Tray	100 mm		76478		54		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		8683		55		Comms	600 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		11619		56		Comms	600 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		85874		58		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		5683		59		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		4254		60		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		1740		62		Comms	300 mmx180	2158
Cable Tray with Fittings: Channel Cable Tray	100 mm		8283		63		Comms	300 mmx180	1150
Cable Tray with Fittings: Channel Cable Tray	100 mm		1740		64		Comms	300 mmx180	2158
Cable Tray with Fittings: Channel Cable Tray	100 mm		4960		71		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		1184		72		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		4780		73		Comms	300 mmx180	2558
Cable Tray with Fittings: Channel Cable Tray	100 mm		1668		74		Comms	300 mmx180	2558
Cable Tray with Fittings: Ladder Cable Tray	100 mm		378		79		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		2940		80		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		8216		81		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1282		84		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		7449		85		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		4282		86		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		11180		108		Power	300 mmx180	2688
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1150		105		Power	300 mmx180	2688
Cable Tray with Fittings: Ladder Cable Tray	100 mm		1680		106		Power	300 mmx180	3658
Cable Tray with Fittings: Ladder Cable Tray	100 mm		11180		107		Power	300 mmx180	2688
Cable Tray with Fittings: Ladder Cable Tray	100 mm		11180		108		Power	300 mmx180	2688
Cable Tray with Fittings: Ladder Cable Tray	100 mm		178		108		Power	300 mmx180	3658

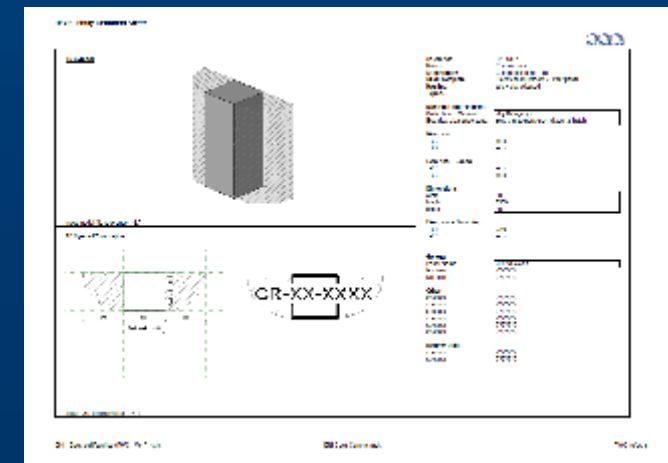
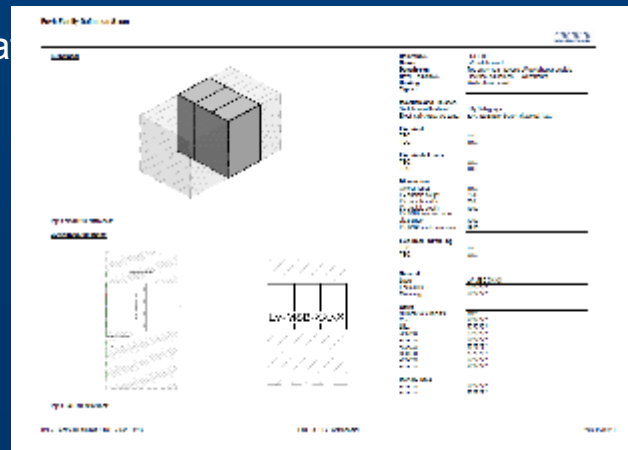
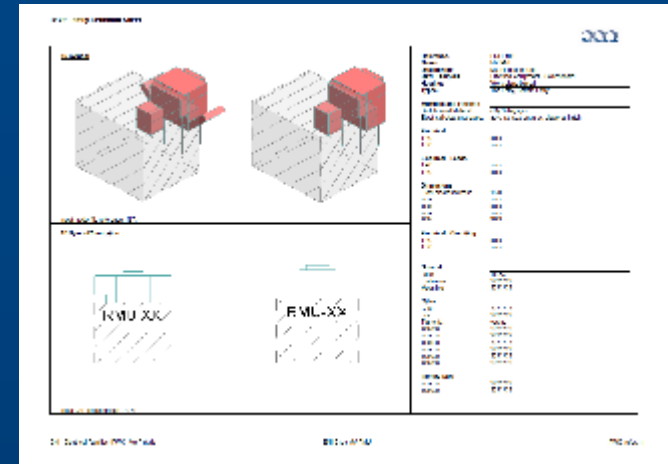


Quantities  
Equipment  
Luminaires  
Containment

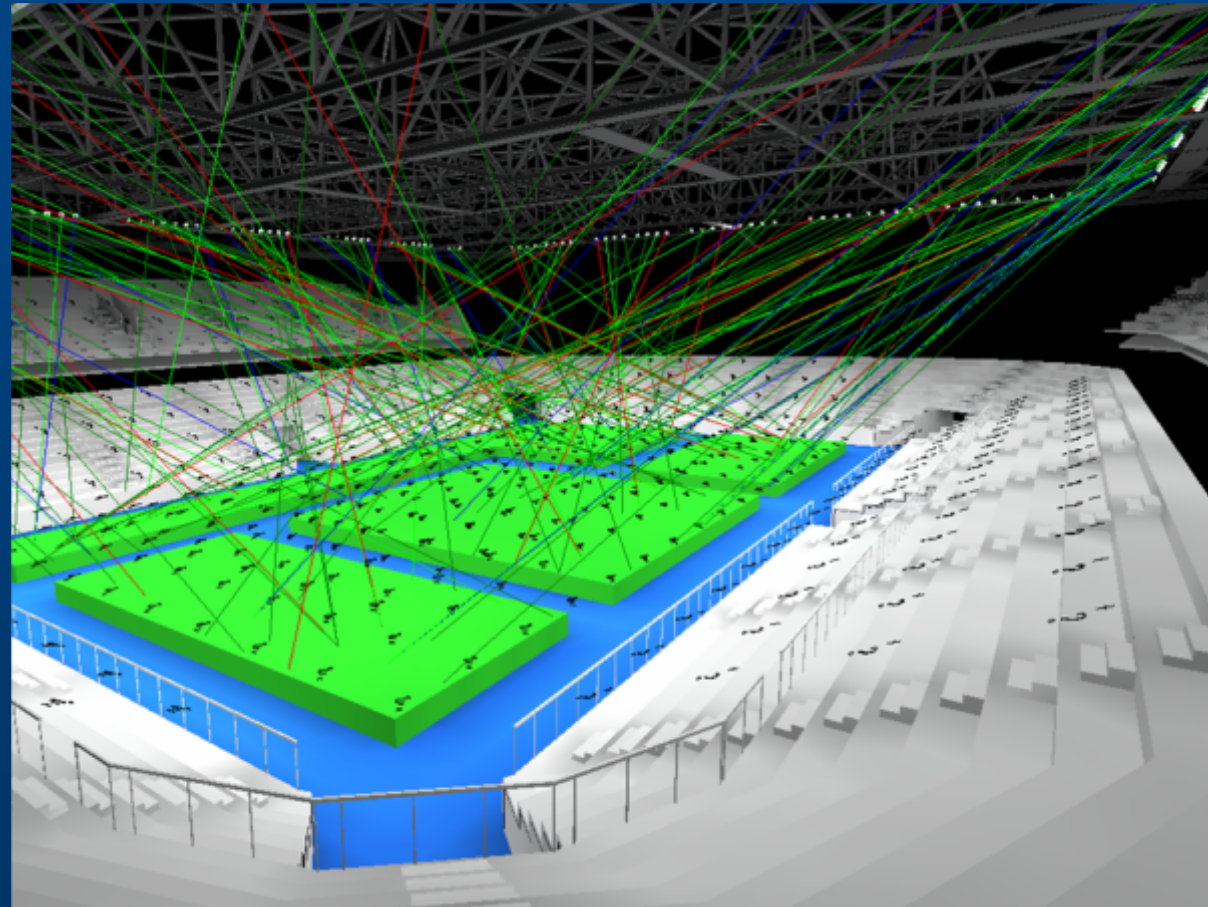
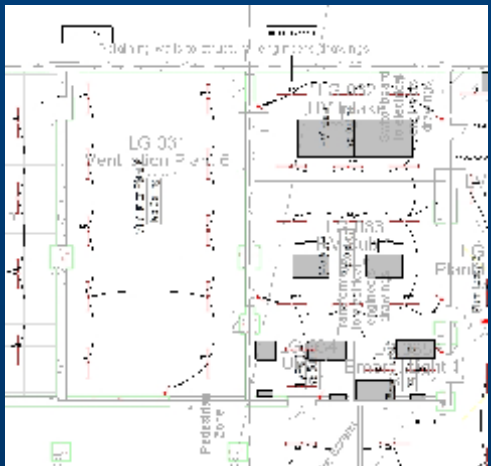
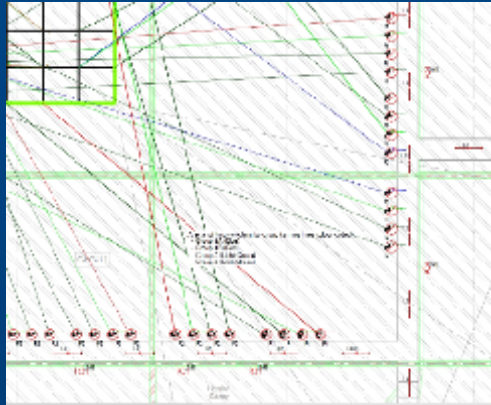


# Custom Equipment Families

- Main physical dimensions
- Equipment clearance zones
- System data
- Dynamic components
- (Weights)
- (Cost)
- (Lifecycle information)



# Lighting Design



External software exports (AGI32)  
Built-in calculations (developing)

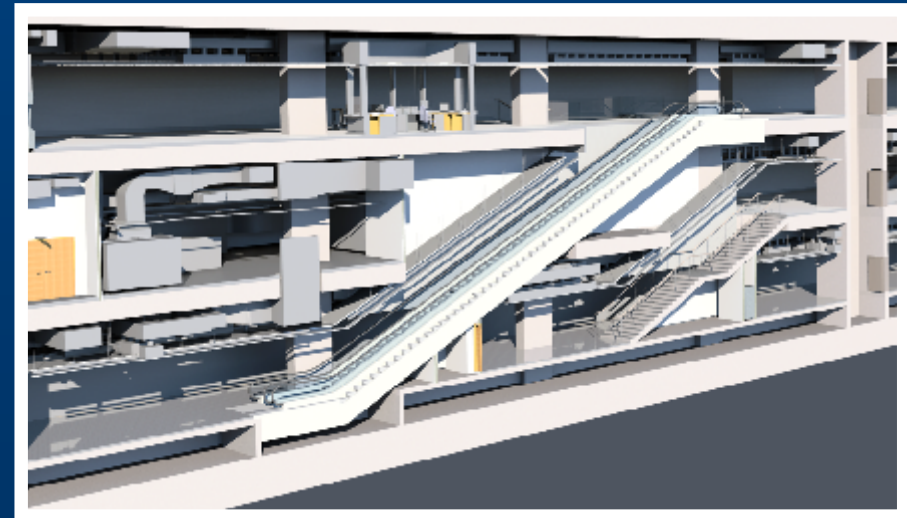
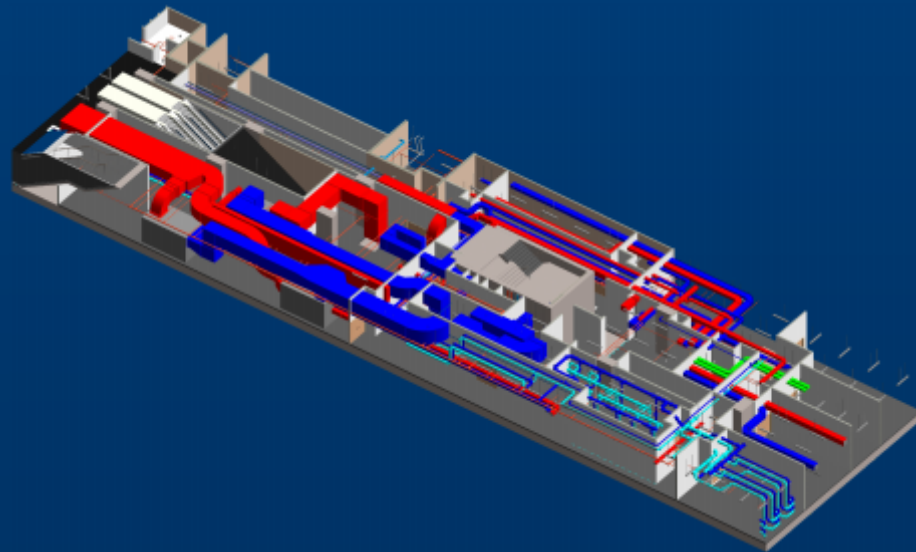


# Klang Valley MRT Project, Kuala Lumpur

## 3 underground stations

- **Architectural BIM**
- **Structural BIM**
- **MEP, Engineering**
- **MEP BIM (1/3 stations)**

- **Glasgow**
- **Birmingham**
- **KL, Singapore,**
- **Newcastle, Belfast**
- **Croydon**





We will support you on  
your BIM Journey

