Digital Construction With BIM 360

Steve Rudge – Excitech, Caroline Shaw – Balfour Beatty

Head of Construction, BIM Co-ordinator

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About the Speaker

Steve Rudge - Excitech

Head of Construction – Project BIM Manager

BIM Manager – MECD Project (Balfour Beatty)

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About the Speaker

Caroline Shaw – Balfour Beatty

BIM Coordinator

Balfour Beatty

The MECD Project

Digital Construction Using BIM 360

Balfour Beatty

Project – Manchester Engineering Campus Development (MECD)

Project description

- Costs in excess of £300 million
- More than 78,000m^2 (or 11 football pitches)
- Wide range of flexible hi-specification laboratories and lecture spaces
- A ‘maker space’ where students will see their engineering creations come to life.
- 1,300 academics, researchers and support staff will move to the new campus
- 6,750 students will be based at the new site

One of the largest construction projects undertaken by a Higher Education institution in the UK

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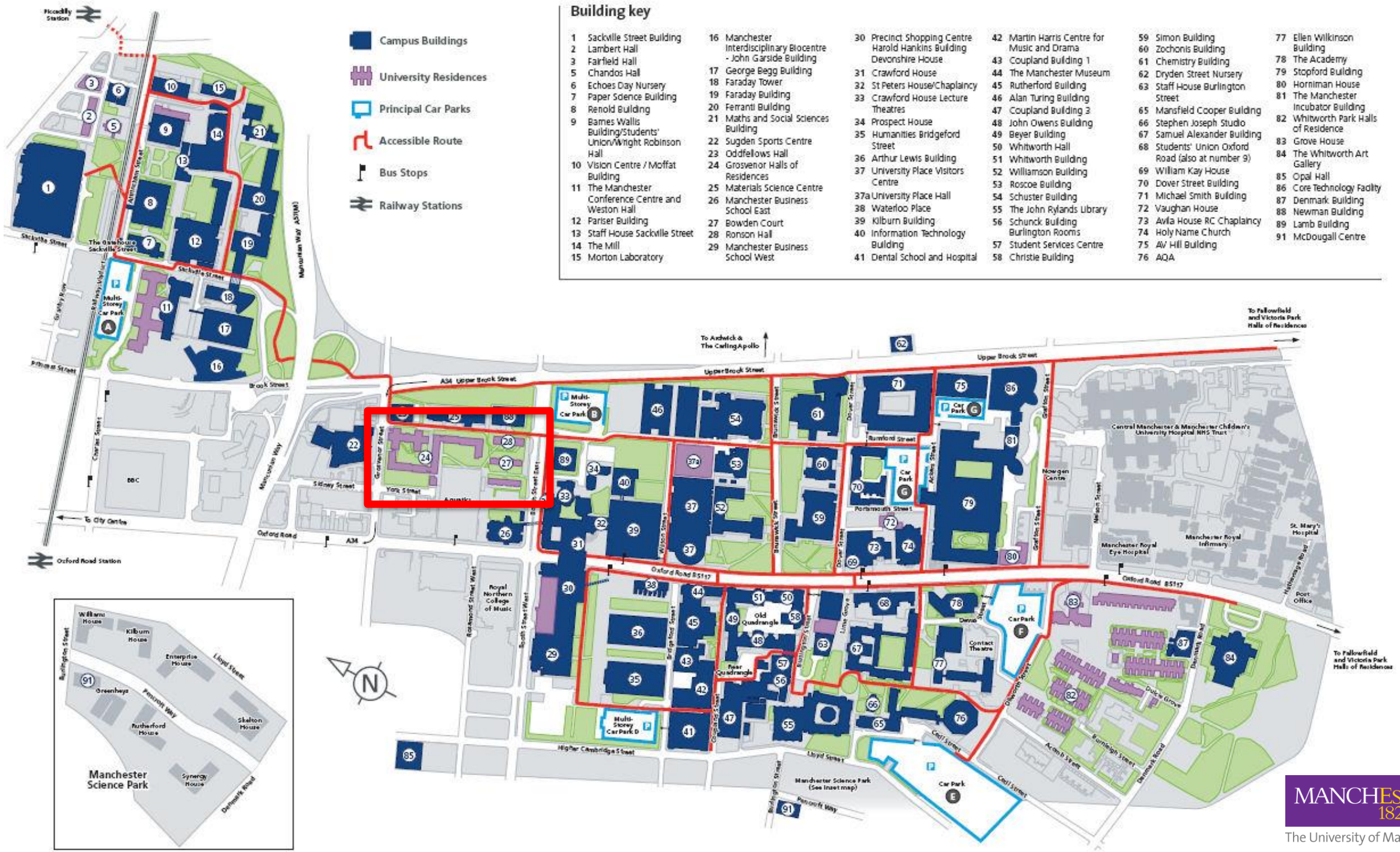
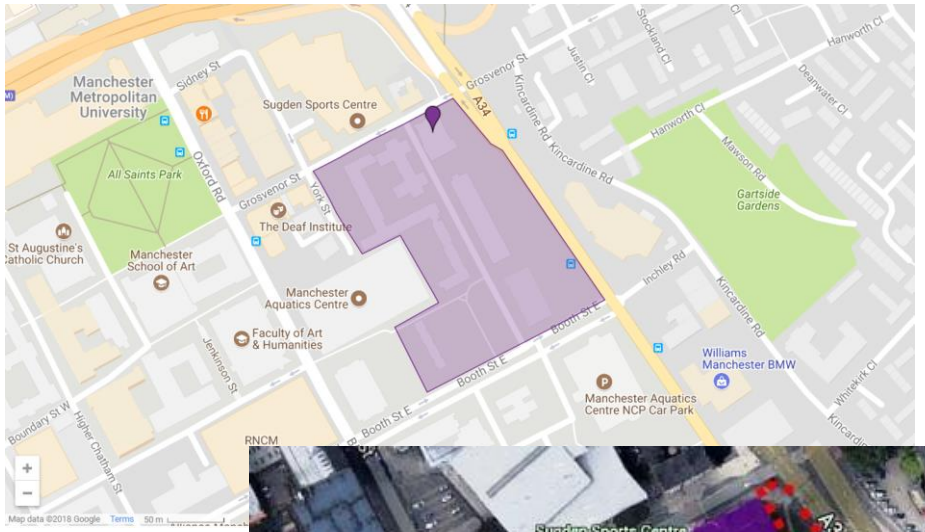
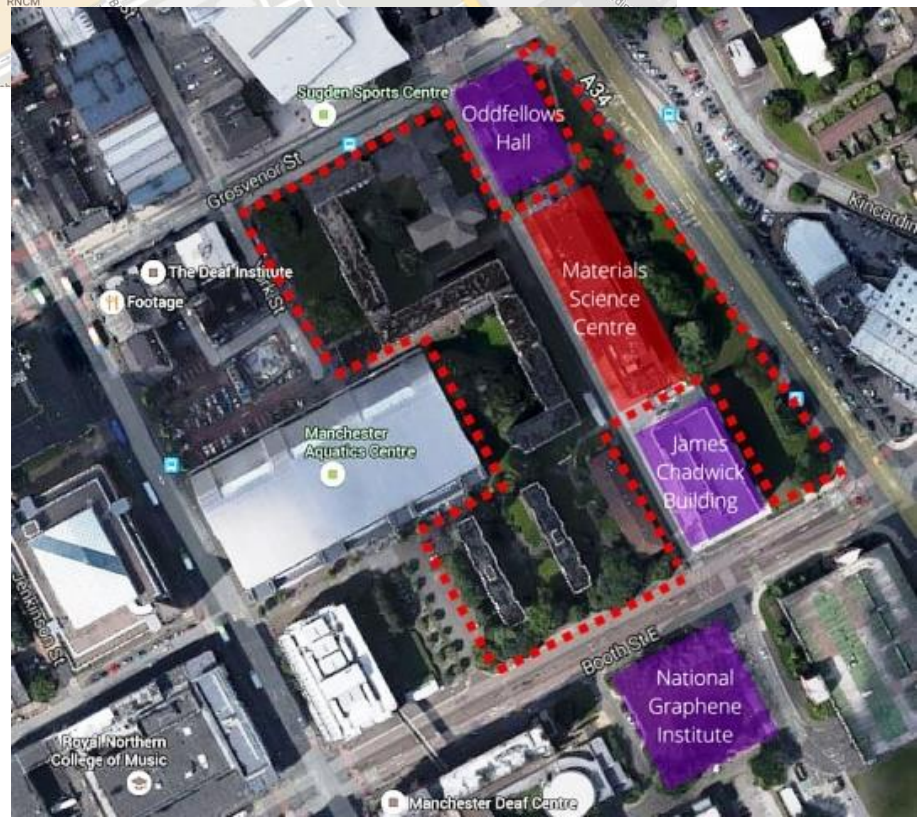


Building key

1 Sackville Street Building
2 Lambert Hall
3 Fairfield Hall
5 Chandos Hall
6 Echoes Day Nursery
7 Paper Science Building
8 Renold Building
9 Barnes Wallis Building/Students' Union/Wright Robinson Hall
10 Vision Centre / Moffat Building
11 The Manchester Conference Centre and Weston Hall
12 Pariser Building
13 Staff House Sackville Street
14 The Mill
15 Morton Laboratory
16 Manchester Interdisciplinary Biocentre - John Garside Building
17 George Begg Building
18 Faraday Tower
19 Faraday Building
20 Ferranti Building
21 Maths and Social Sciences Building
22 Sugden Sports Centre
23 Oddfellows Hall
24 Grosvenor Halls of Residences
25 Materials Science Centre
26 Manchester Business School East
27 Bowden Court
28 Ronson Hall
29 Manchester Business School West
30 Precinct Shopping Centre Harold Hankins Building Devonshire House
31 Crawford House
32 St Peters House/Chaplaincy
33 Crawford House Lecture Theatres
34 Prospect House
35 Humanities Bridgeford Street
36 Arthur Lewis Building
37 University Place Visitors Centre
37a University Place Hall
38 Waterloo Place
39 Kilburn Building
40 Information Technology Building
41 Dental School and Hospital
42 Martin Harris Centre for Music and Drama
43 Coupland Building 1
44 The Manchester Museum
45 Rutherford Building
46 Alan Turing Building
47 Coupland Building 3
48 John Owens Building
49 Beyer Building
50 Whitworth Hall
51 Whitworth Building
52 Williamson Building
53 Roscoe Building
54 Schuster Building
55 The John Rylands Library
56 Schunck Building Burlington Rooms
57 Student Services Centre
58 Christie Building
59 Simon Building
60 Zochonis Building
61 Chemistry Building
62 Dryden Street Nursery
63 Staff House Burlington Street
65 Mansfield Cooper Building
66 Stephen Joseph Studio
67 Samuel Alexander Building
68 Students' Union Oxford Road (also at number 9)
69 William Kay House
70 Dover Street Building
71 Michael Smith Building
72 Vaughan House
73 Avila House RC Chaplaincy
74 Holy Name Church
75 AV Hill Building
76 AQA
77 Ellen Wilkinson Building
78 The Academy
79 Stopford Building
80 Horniman House
81 The Manchester Incubator Building
82 Whitworth Park Halls of Residence
83 Grove House
84 The Whitworth Art Gallery
85 Opal Hall
86 Core Technology Facility
87 Denmark Building
88 Newman Building
89 Lamb Building
91 McDougall Centre

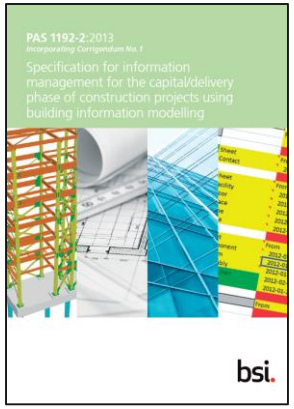
MANCHESTER 1824
The University of Manchester





- School of Chemical Engineering and Analytical Science
- School of Electrical and Electronic Engineering
- School of Materials
- School of Mechanical, Aerospace and Civil Engineering
- Foundation Studies
- Dalton Nuclear Institute
- International Centre for Advanced Materials
- The Faculty Office
- Plus a range of centrally timetabled teaching spaces

Project Delivery Stages



RIBA STAGE 1-3

SCHEME AND INITIAL DESIGN

Back in 2012/2013

RIBA STAGE 4

TECHNICAL DESIGN

2013 - 2016

RIBA STAGE 5

CONSTRUCTION

2016 - 2020

RIBA STAGE 6

HANDOVER

2020

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mecanoo

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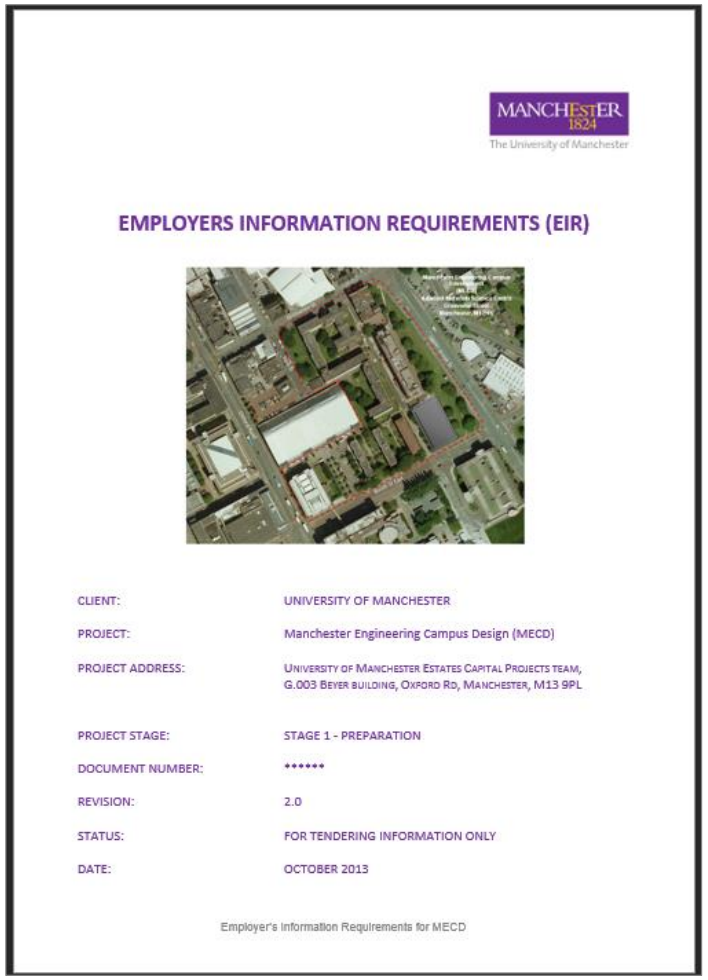
The University Requirements

The University Of Manchester



MANCHESTER 1824
The University of Manchester

EMPLOYERS INFORMATION REQUIREMENTS (EIR)

CLIENT:	UNIVERSITY OF MANCHESTER
PROJECT:	Manchester Engineering Campus Design (MECD)
PROJECT ADDRESS:	University of Manchester Estates Capital Projects team, G.003 Beyer building, Oxford Rd, Manchester, M13 9PL
PROJECT STAGE:	STAGE 1 - PREPARATION
DOCUMENT NUMBER:	******
REVISION:	2.0
STATUS:	FOR TENDERING INFORMATION ONLY
DATE:	OCTOBER 2013

Employer's Information Requirements for MECD

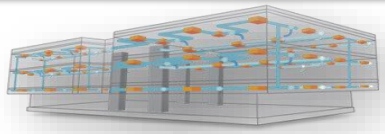
- Key Deliverables
- LOD Requirements
- Clash Management
- CDE Requirements
- Information Requirements (Space & Asset Management)

Information Requirements

Architecture

AUTODESK REVIT

MEP



Structure

Data Capture

Schedules

Navisworks

conject

ORACLE

ARCHIBUS

Space Management

Risk & Timesheet Management

Microsoft SharePoint

O&M

Asset Register

Maintenance

Mobile

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Model Management

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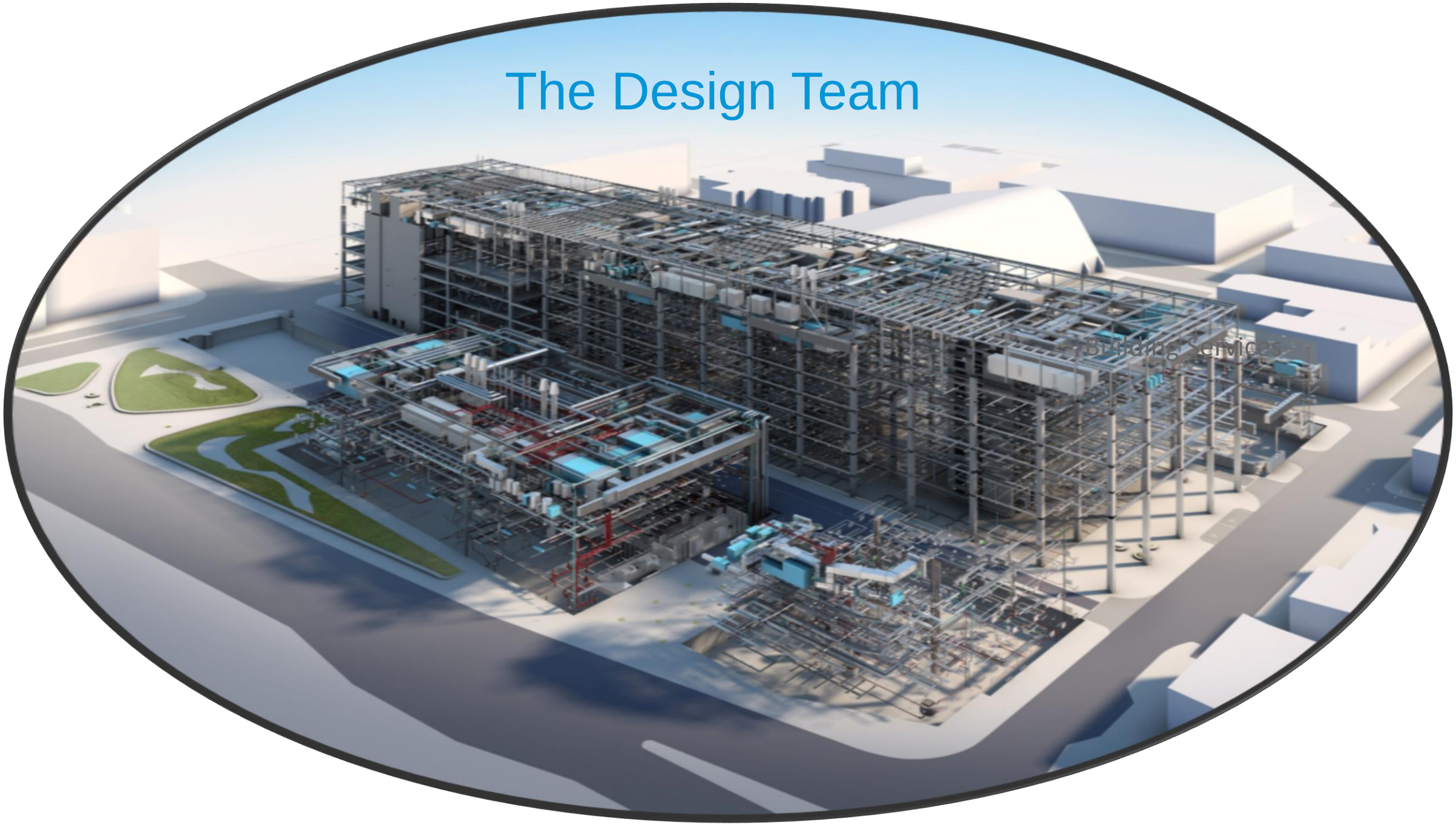
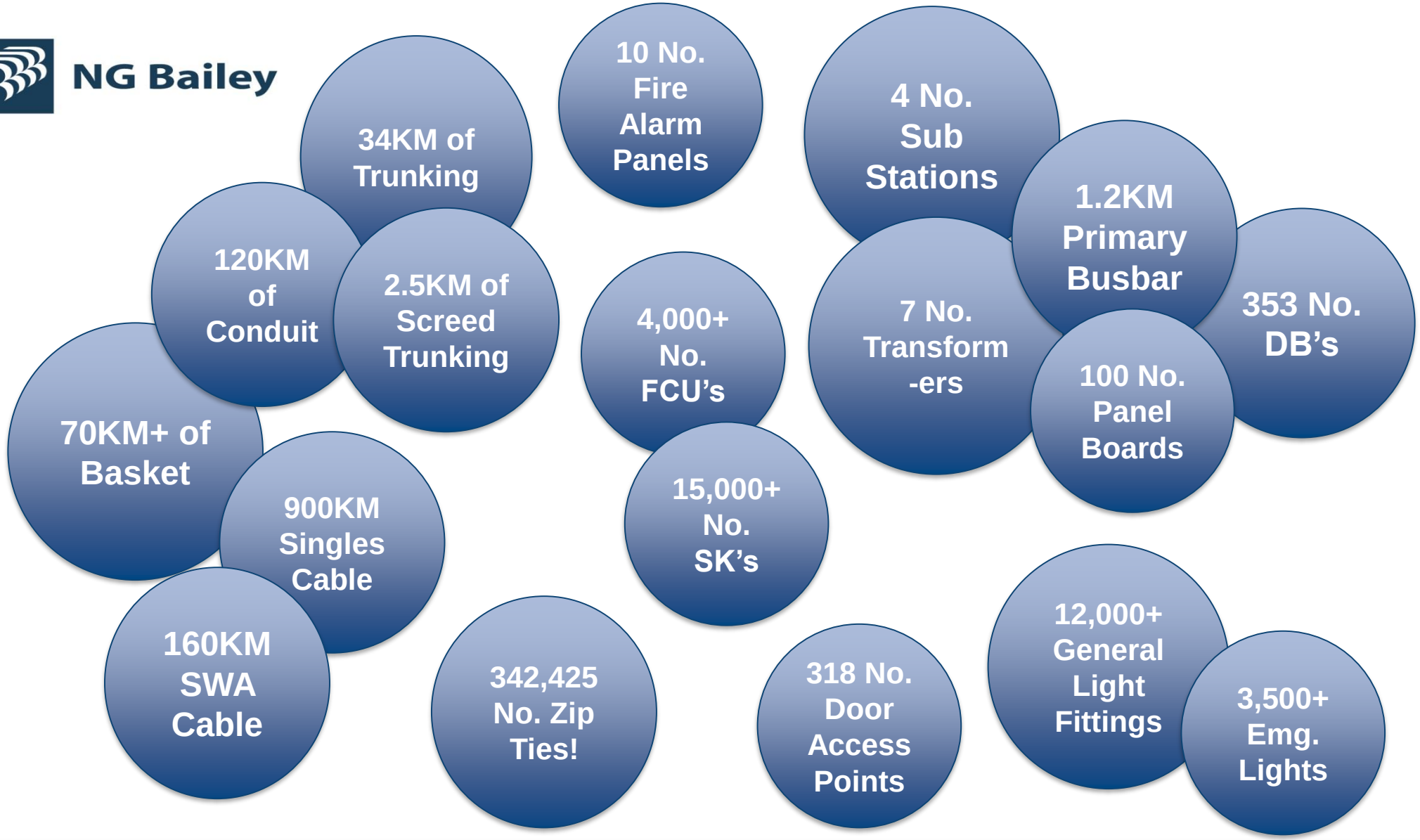
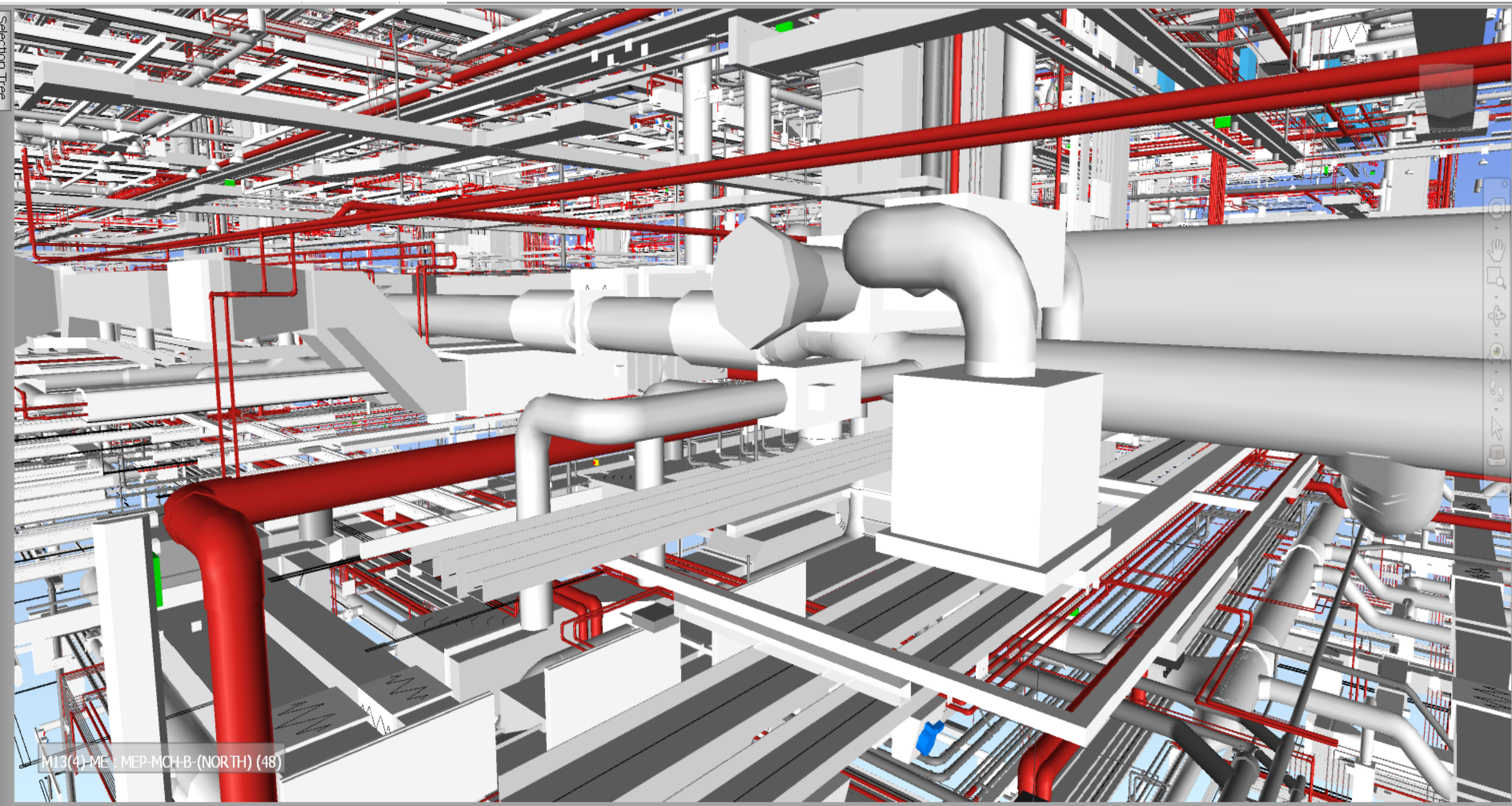
The Design Team



NG Bailey

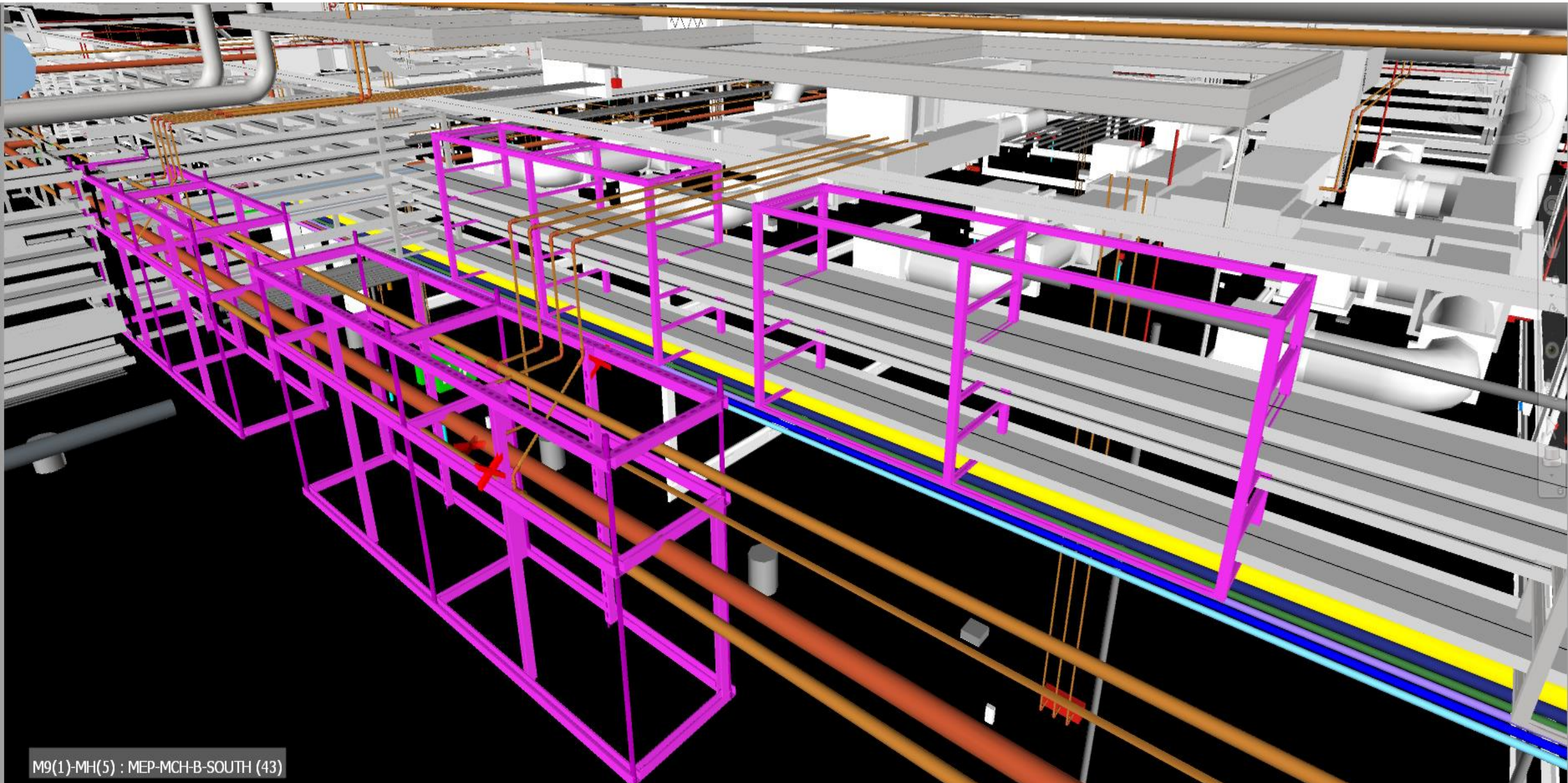

34KM of Trunking
10 No. Fire Alarm Panels
4 No. Sub Stations
1.2KM Primary Busbar
120KM of Conduit
2.5KM of Screed Trunking
4,000+ No. FCU's
7 No. Transform -ers
353 No. DB's
100 No. Panel Boards
70KM+ of Basket
900KM Singles Cable
15,000+ No. SK's
160KM SWA Cable
342,425 No. Zip Ties!
318 No. Door Access Points
12,000+ General Light Fittings
3,500+ Emg. Lights


Selection Tree
M13(4)-ME : MEP-MCH-B-(NORTH) (48)

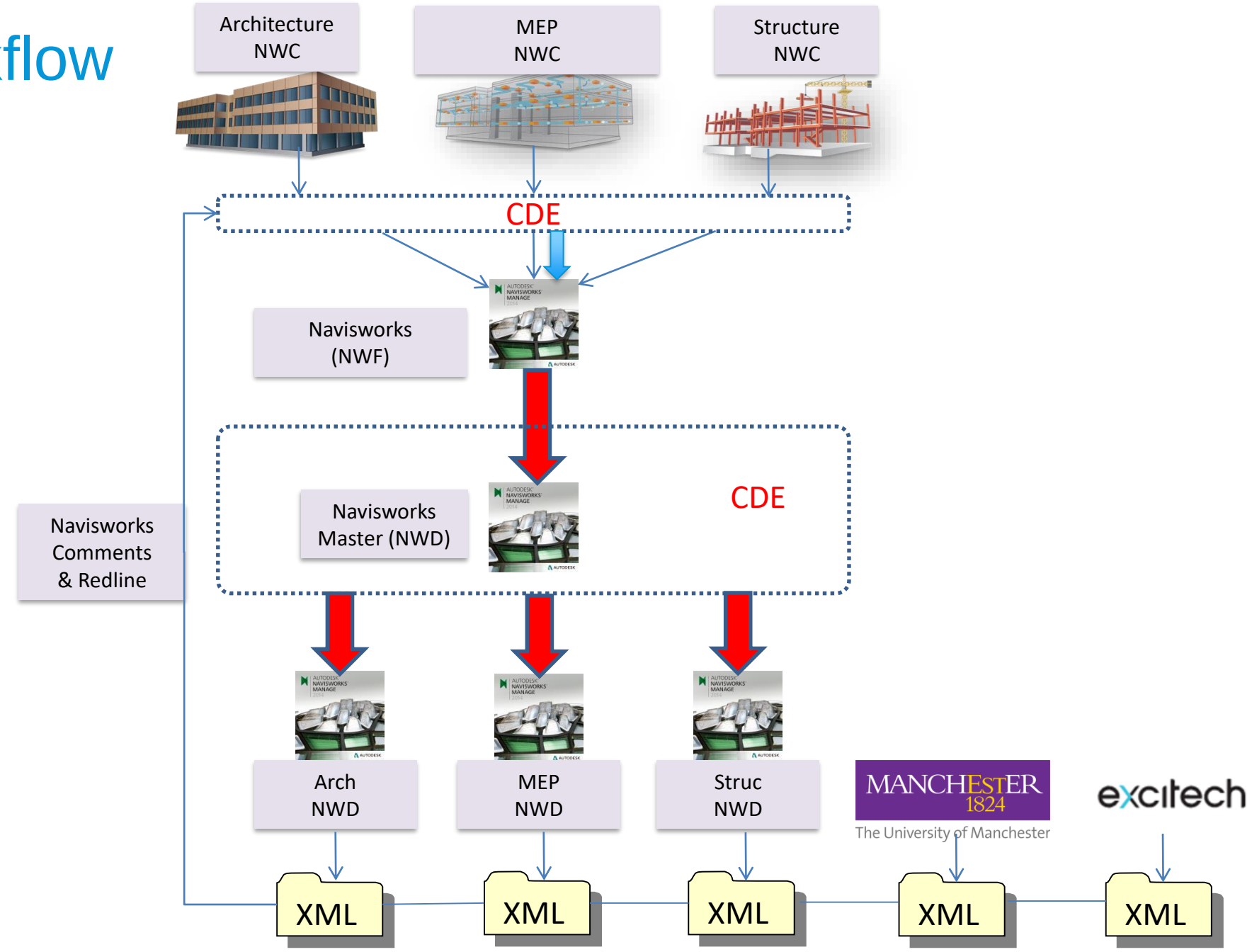
NG Bailey

Manchester Engineering Campus Development (MECD)

Construction Model



The Workflow



Key Issues

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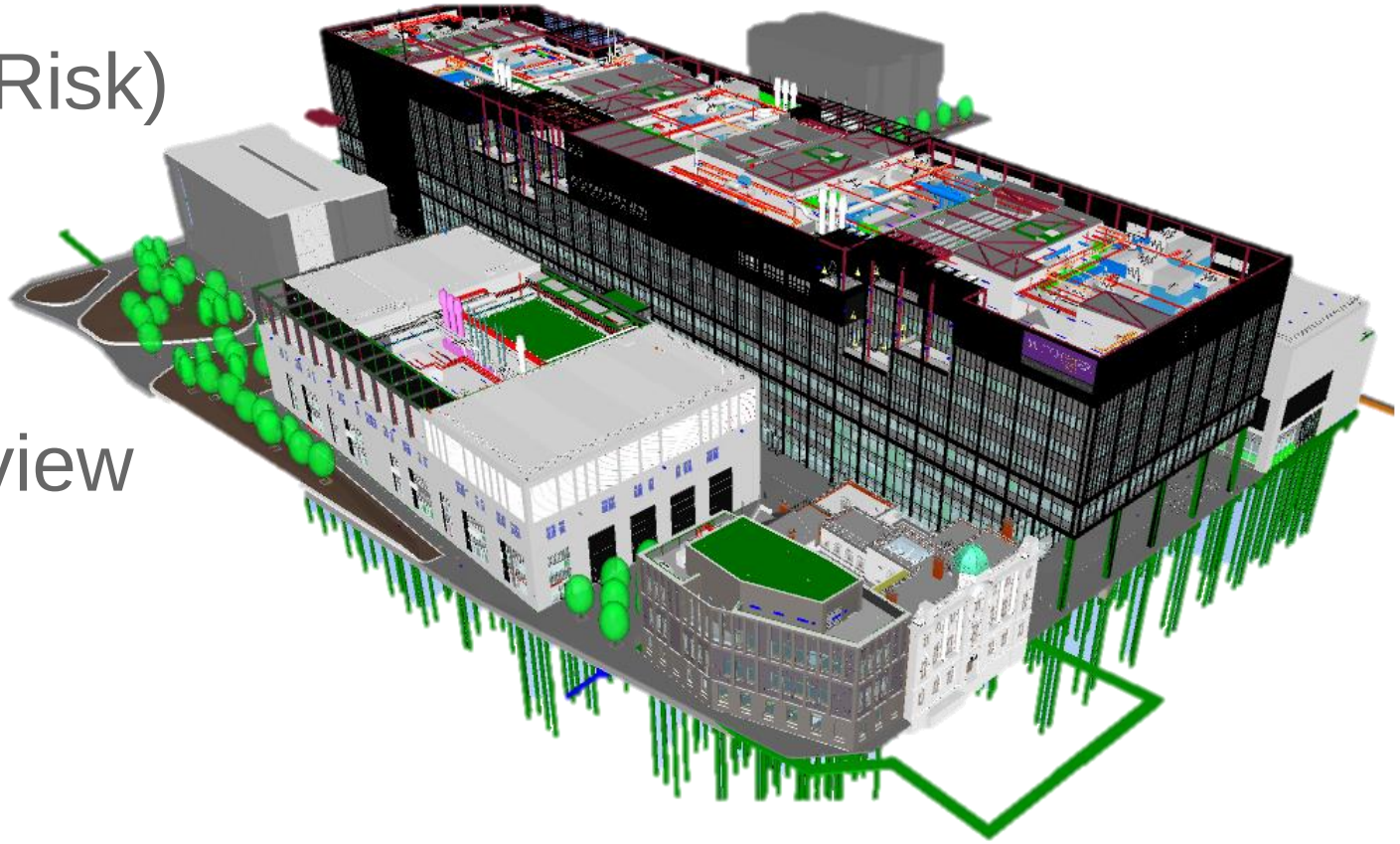
- No Single Source Model (Risk)
- Collating Comments
- Approving Clashes
- Manual Model Federation
- Downloading large file to view
- Latest Version



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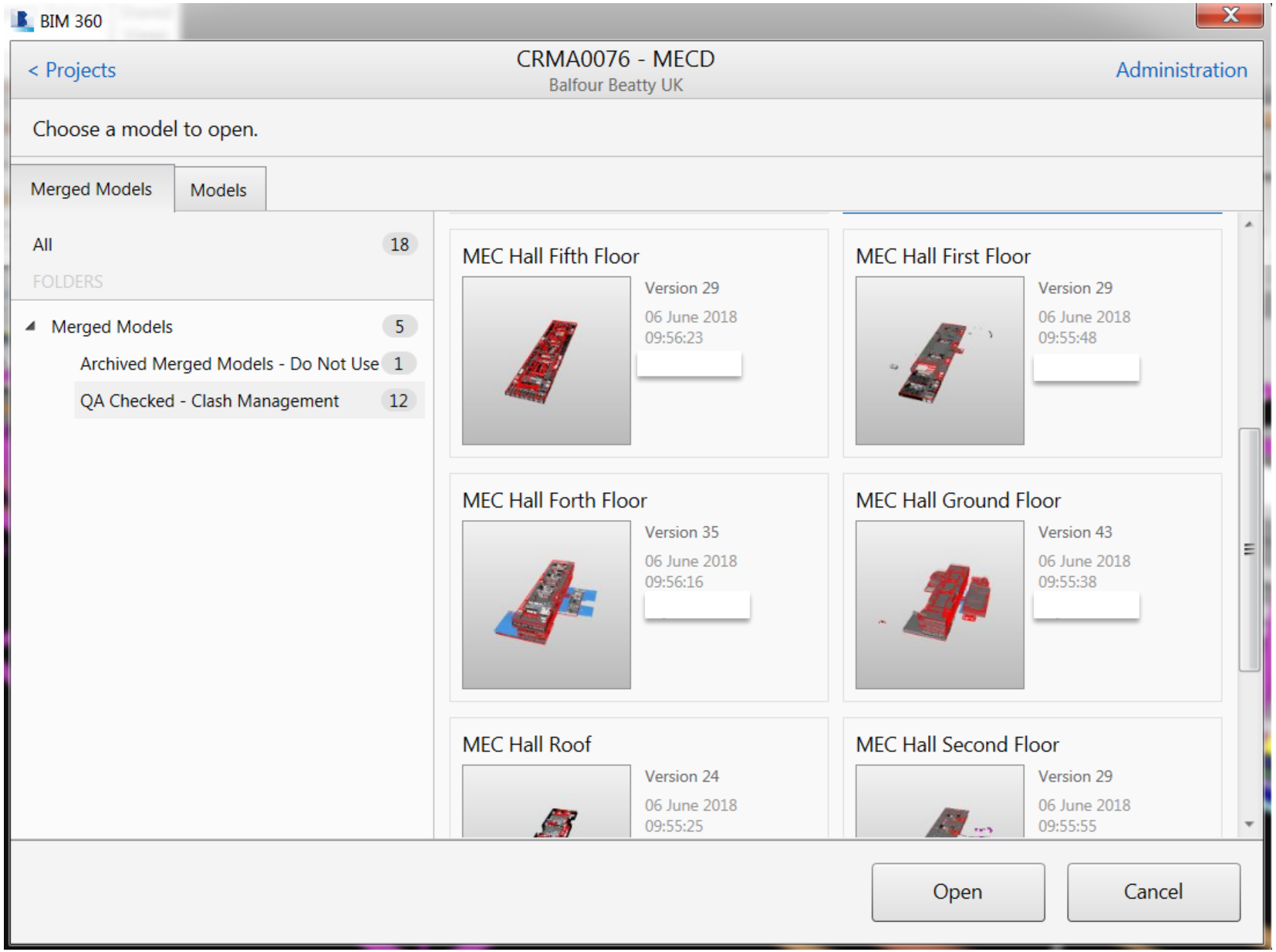
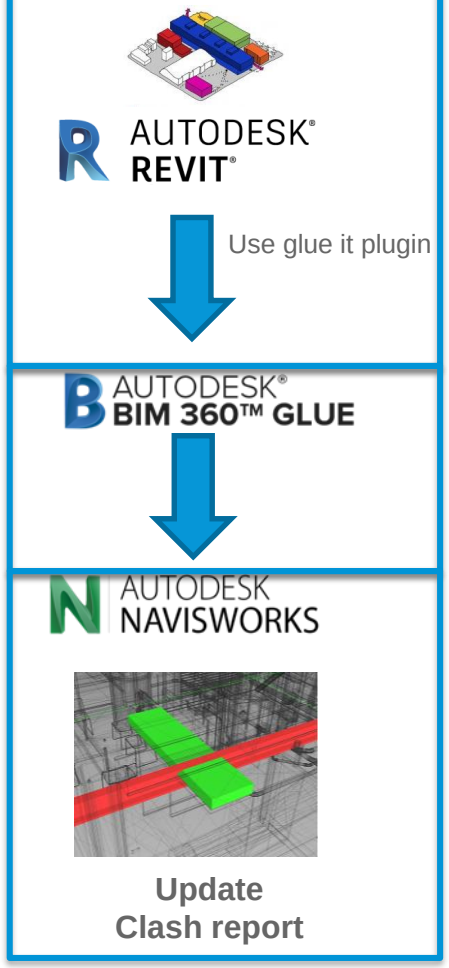
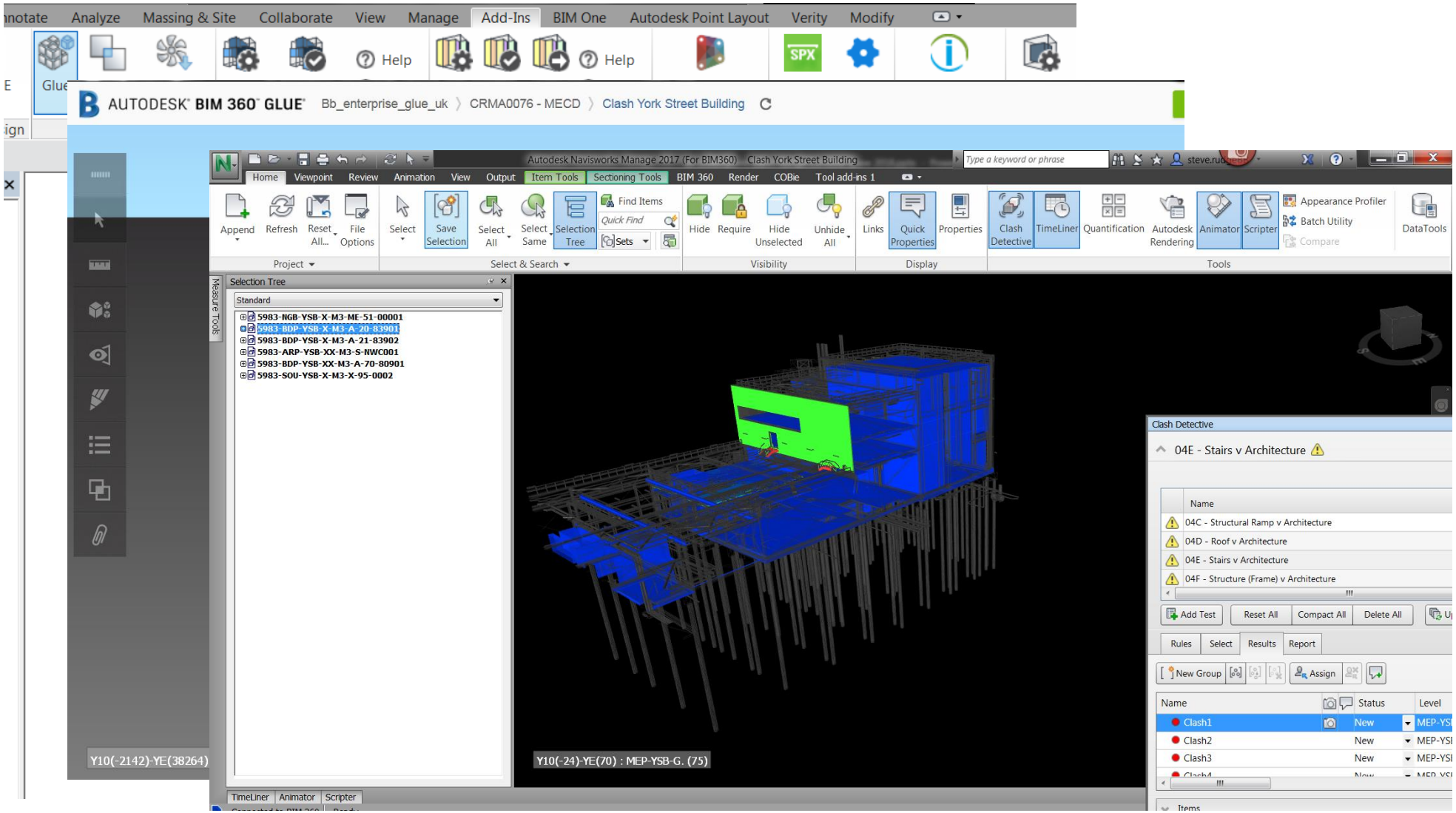
Construction Model



Balfour Beatty





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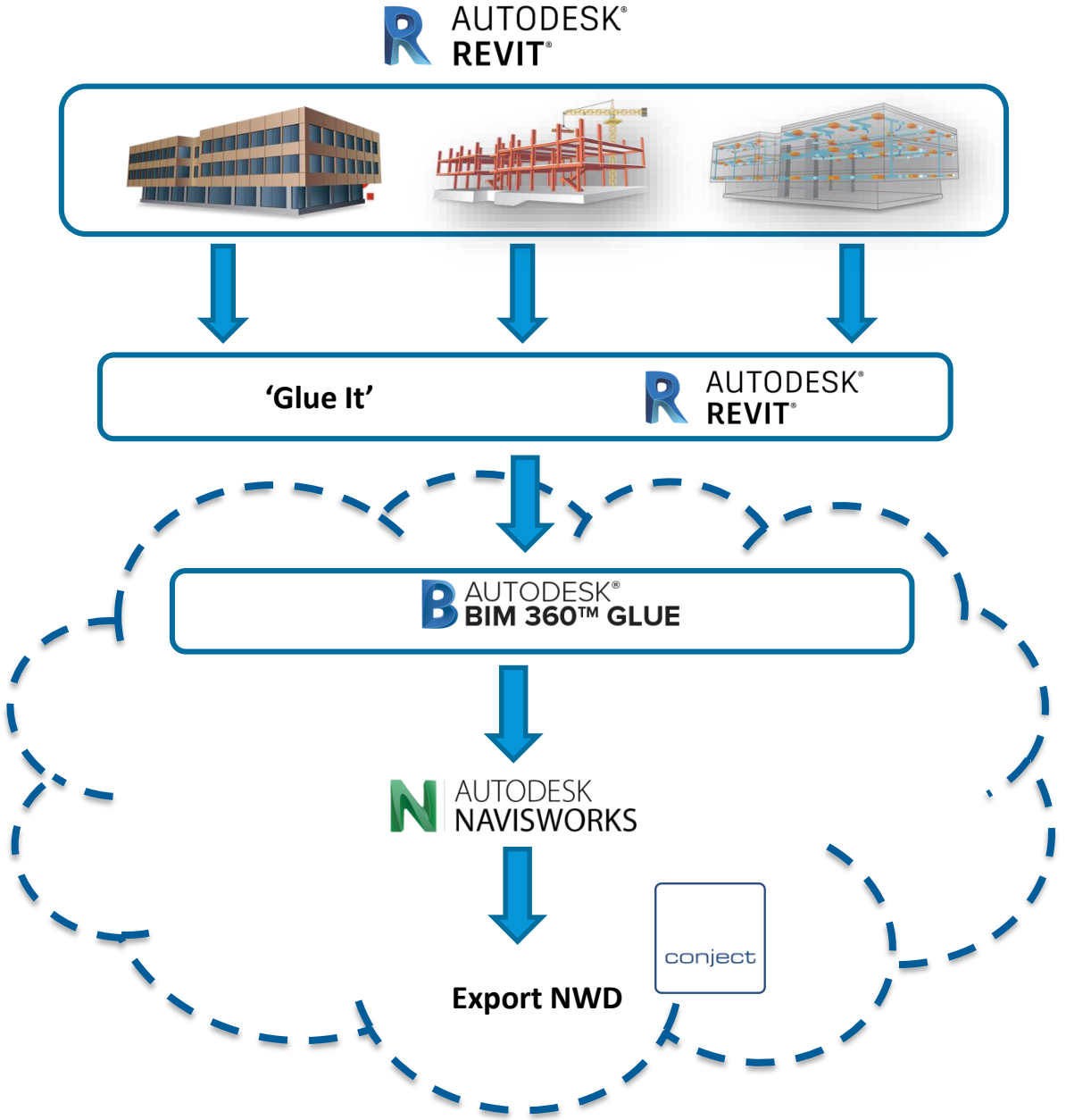
Workflow For Approved Model Issue



BIM 360 Glue – Navisworks 360

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Reducing Risk

Single source of truth

Saving:

15 hours a month – Model Federation

4 hours a month – Federating Comments

4 hours a month – Clash Reporting

276 Hours a year = around 36 days

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Reviewable Design Data (RDD) - Process

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Around 2000 Rooms

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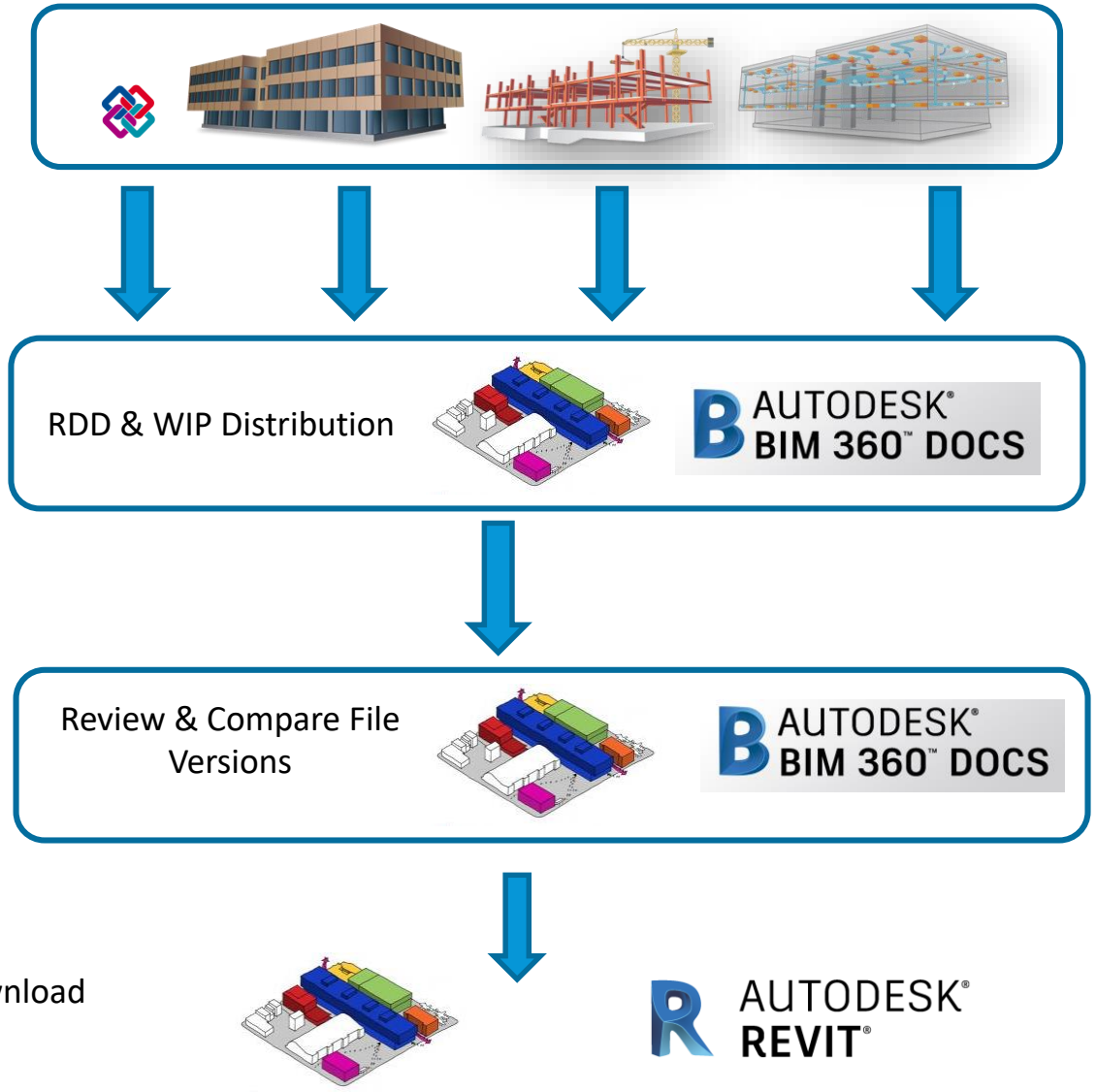
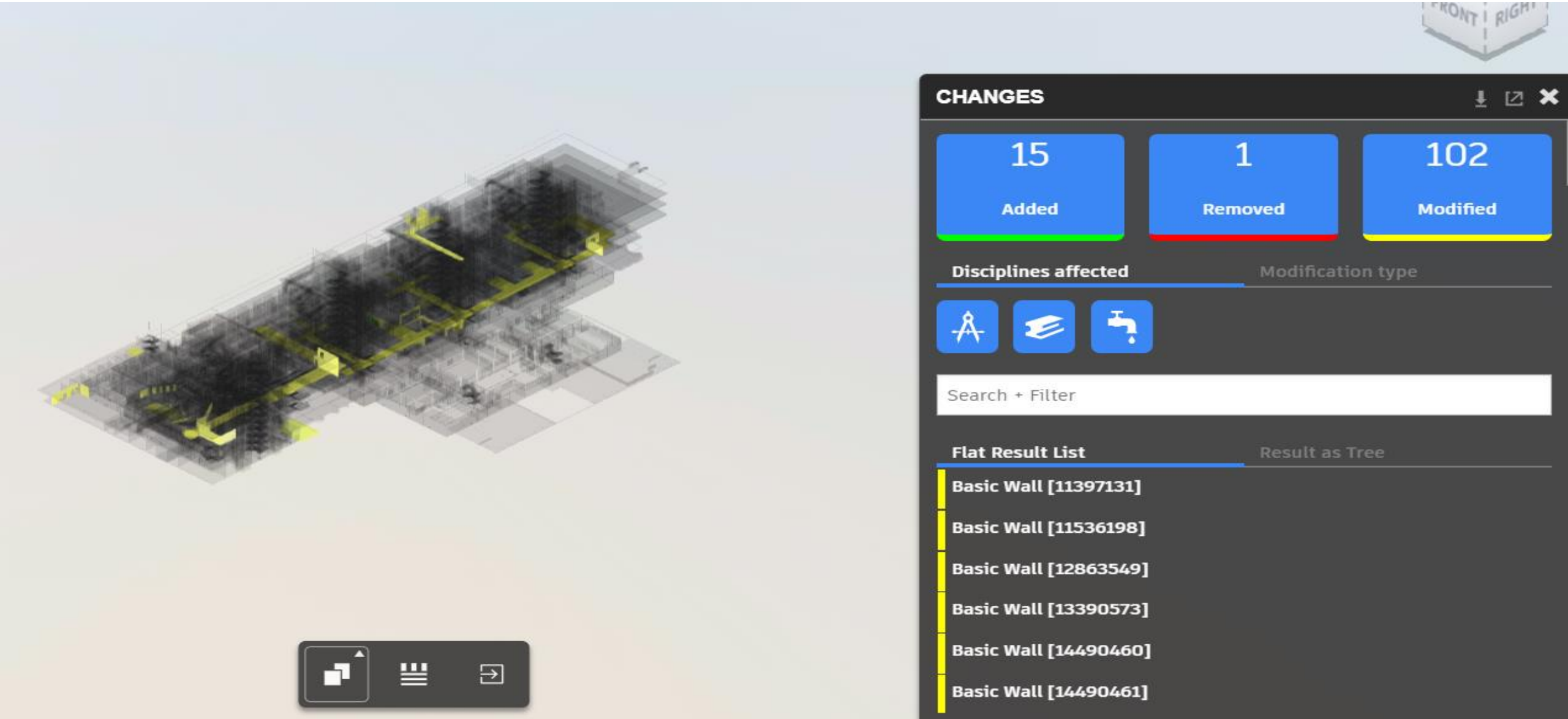
RDD & WIP Model Distribution



BIM 360 Document Manager



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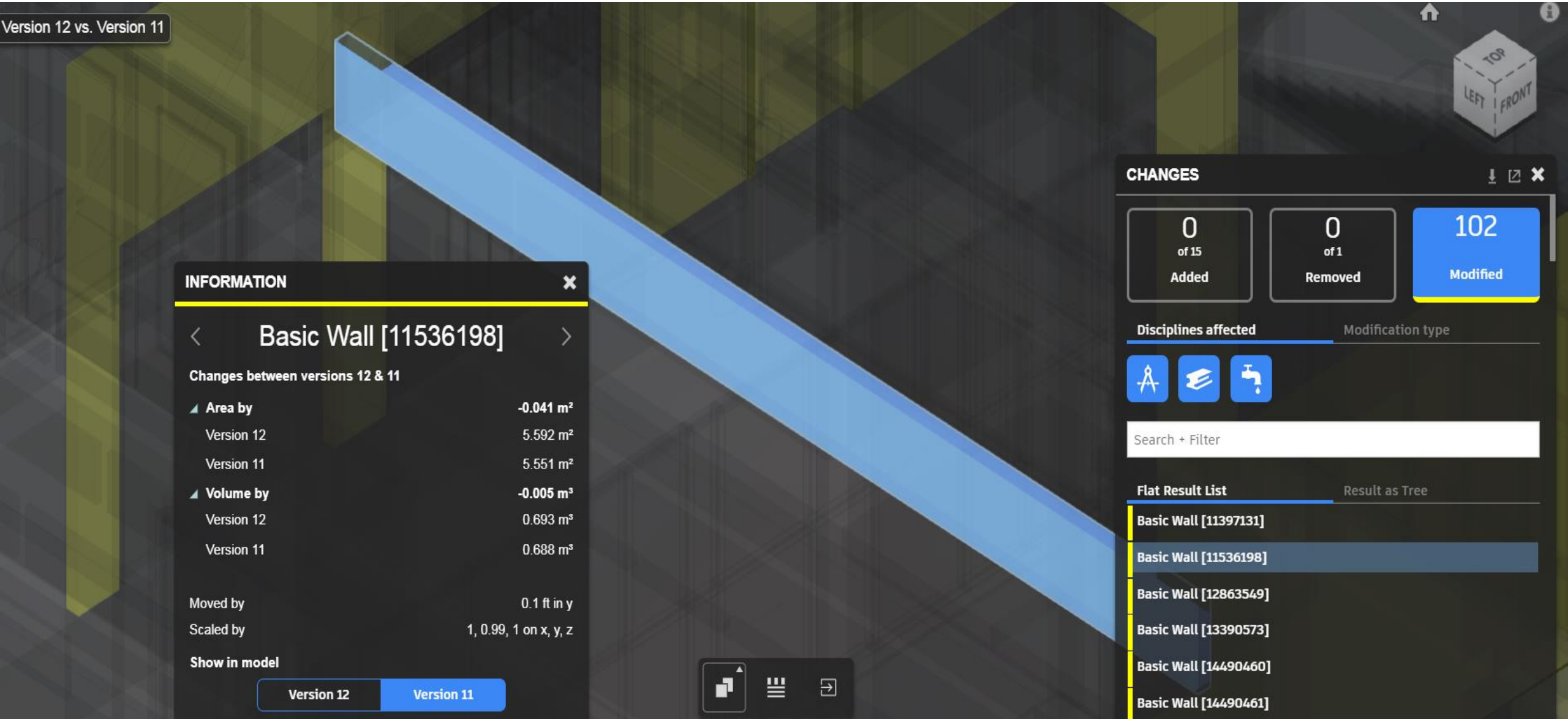
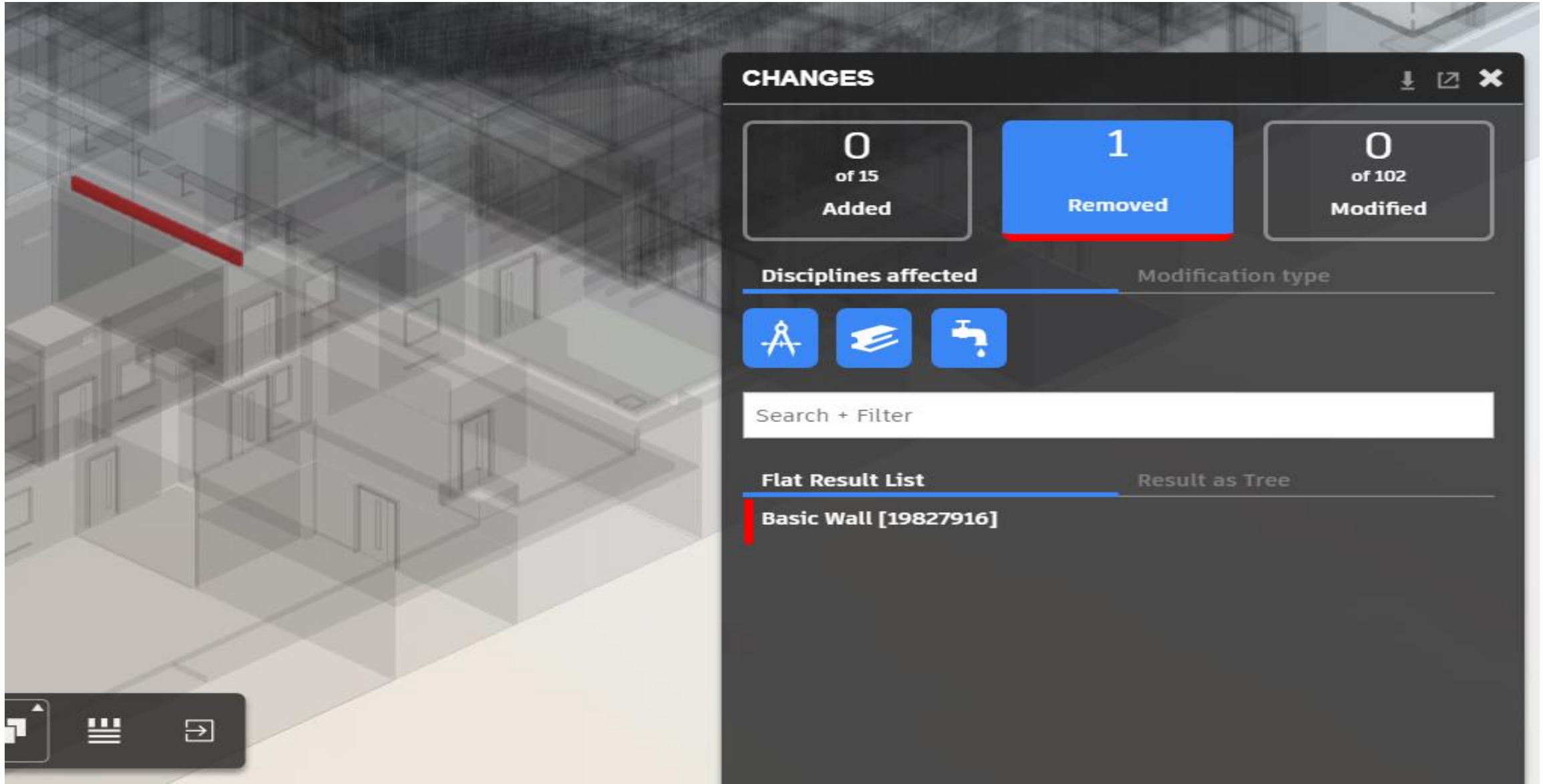
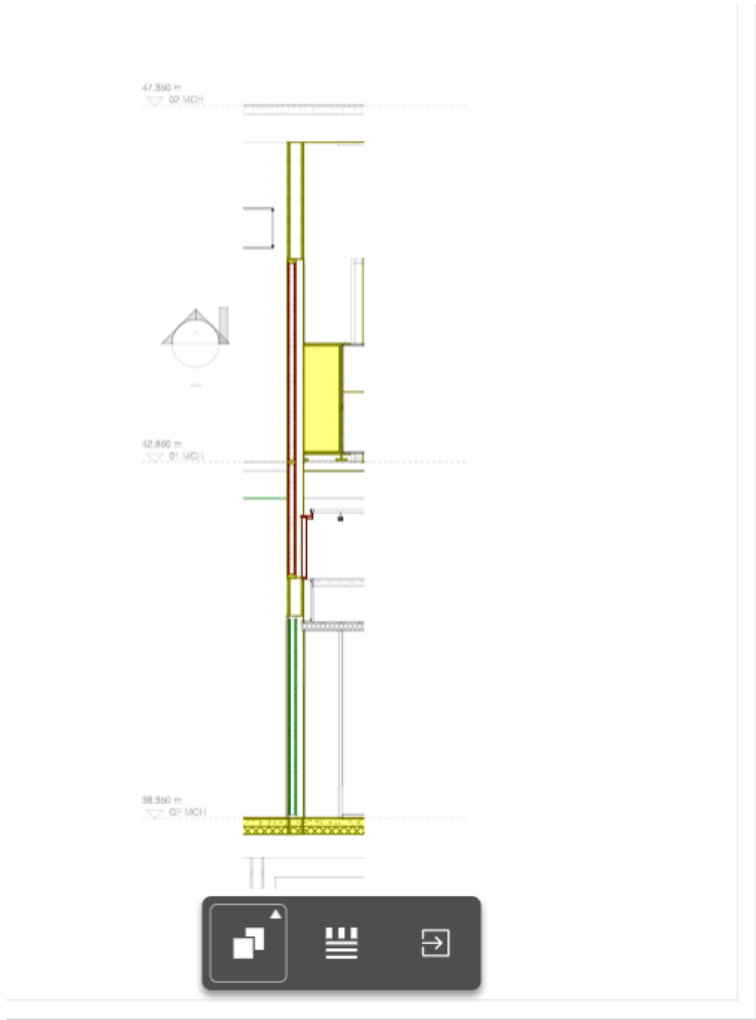


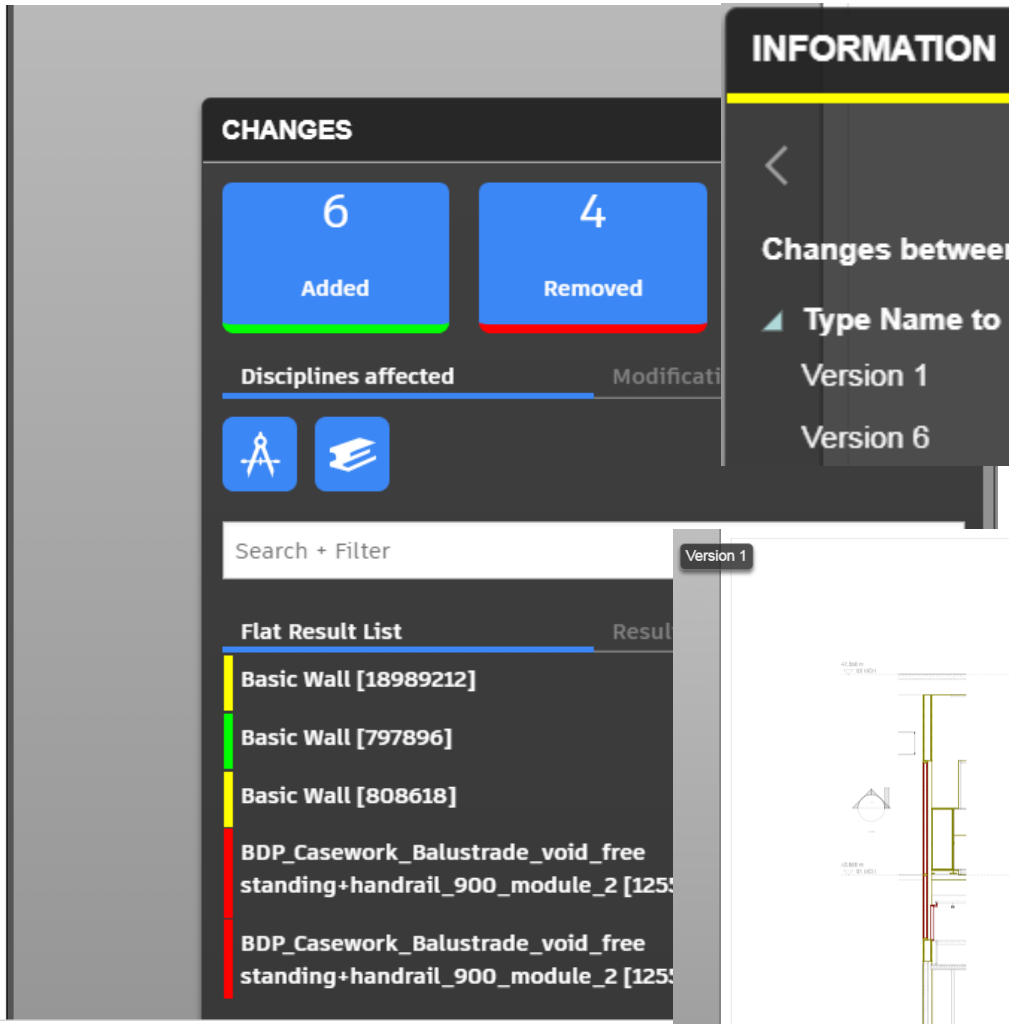
BIM 360 Document Manager

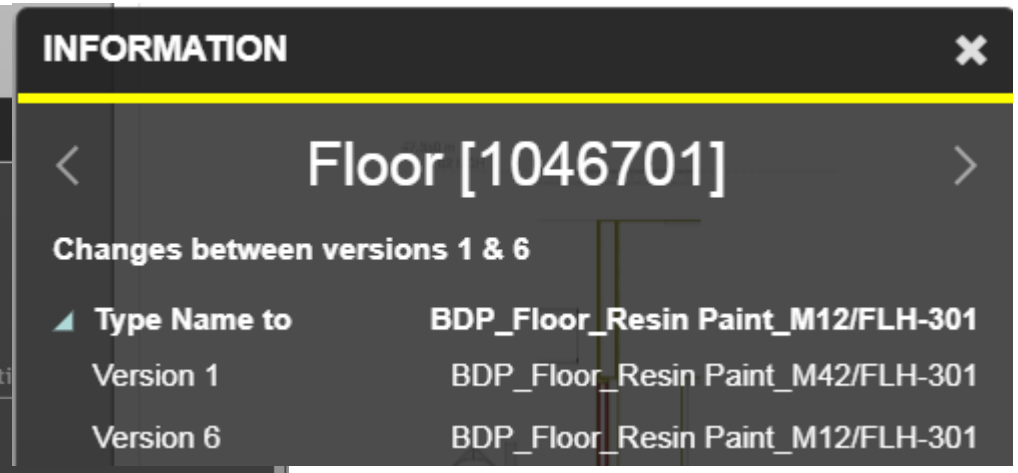
BIM 360 Document Manager

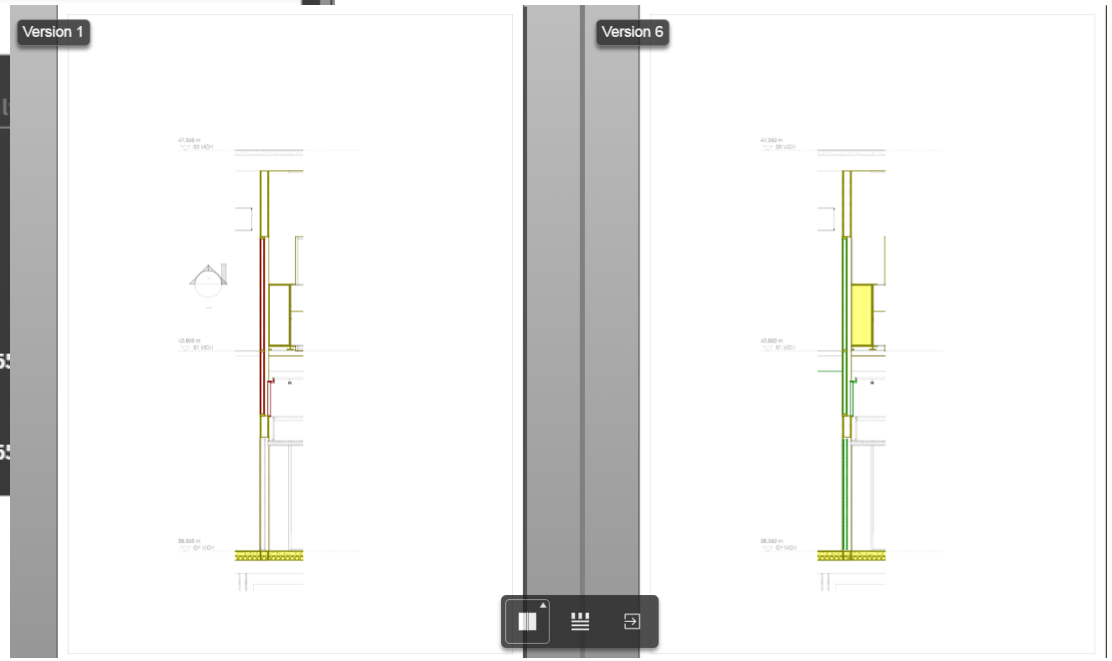


BIM 360 Document Manager

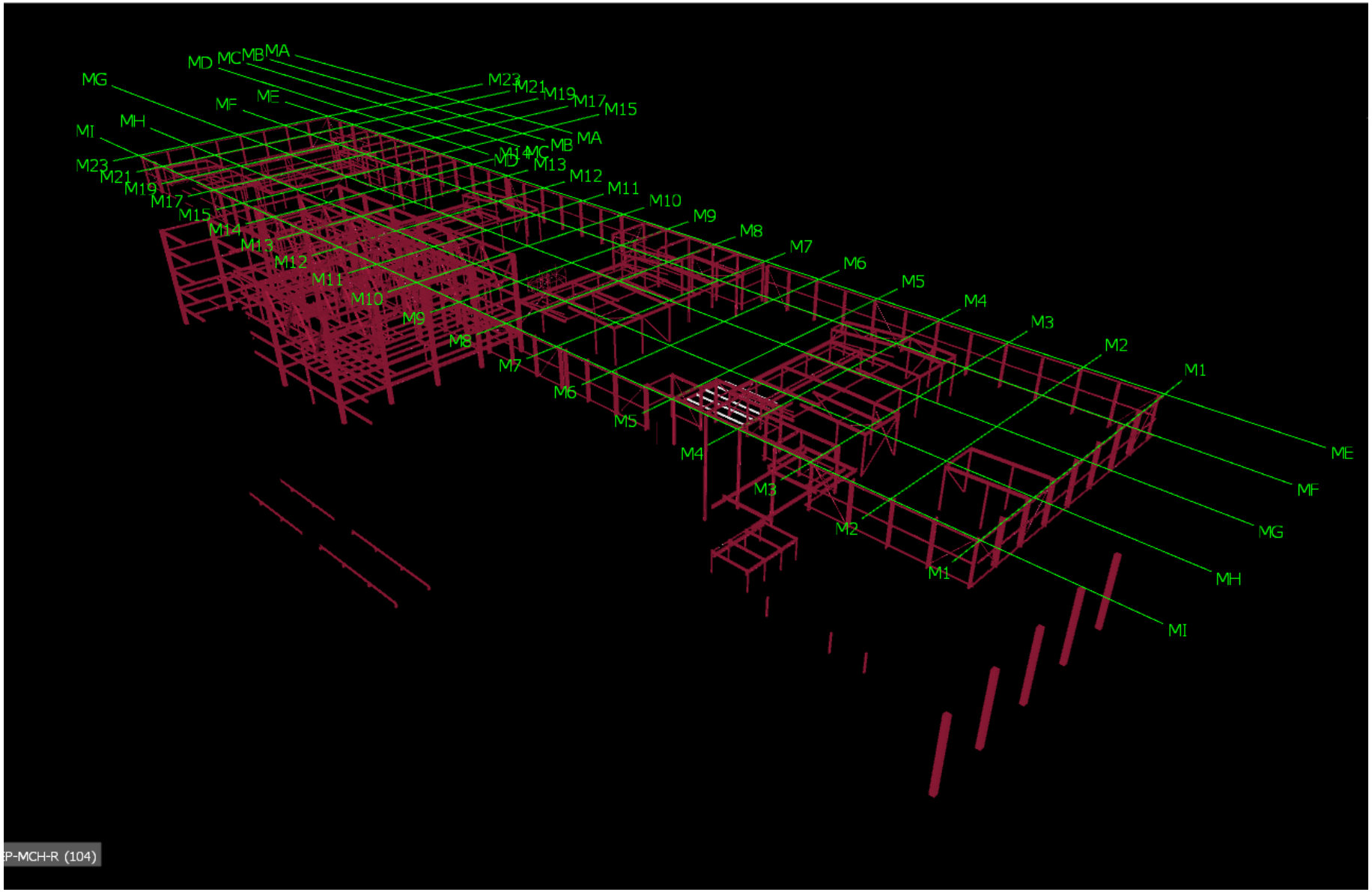




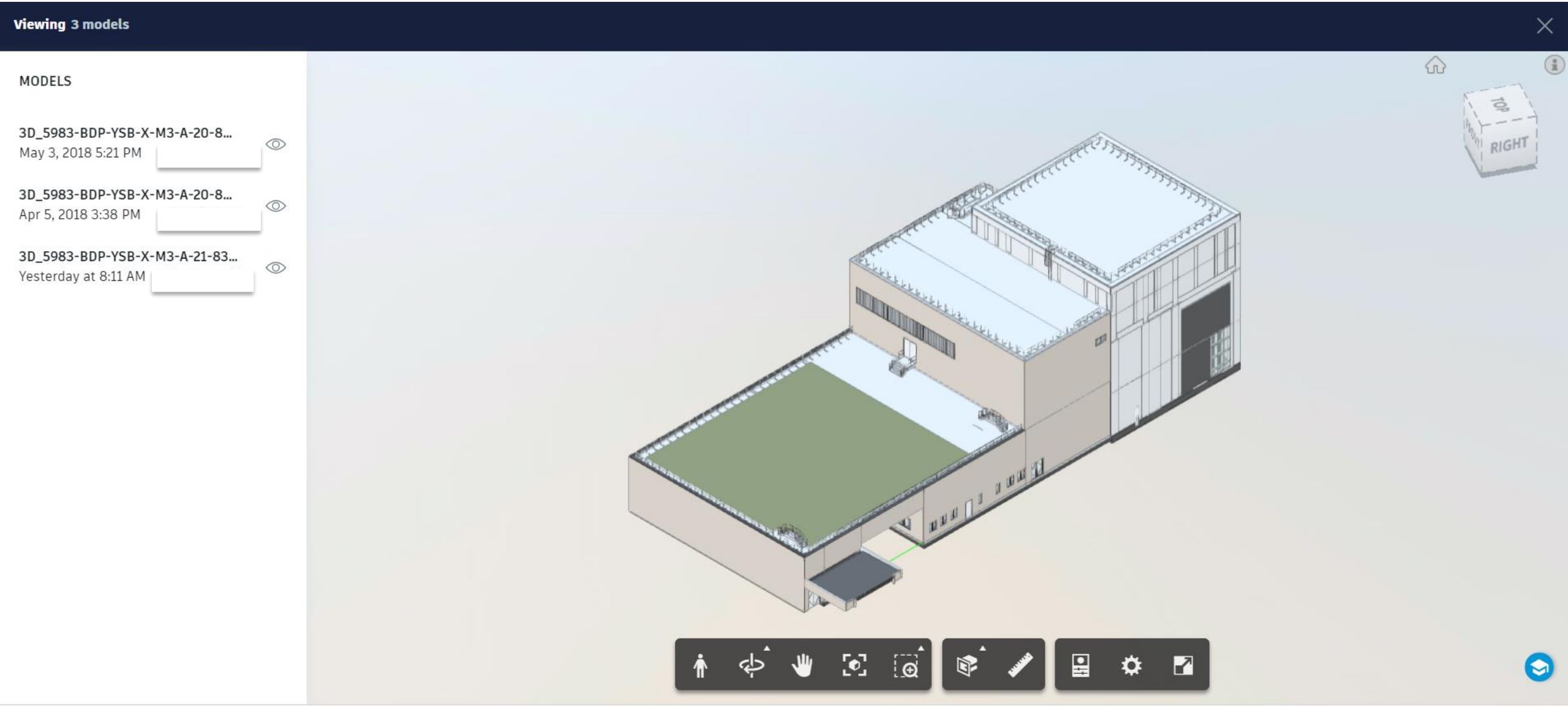




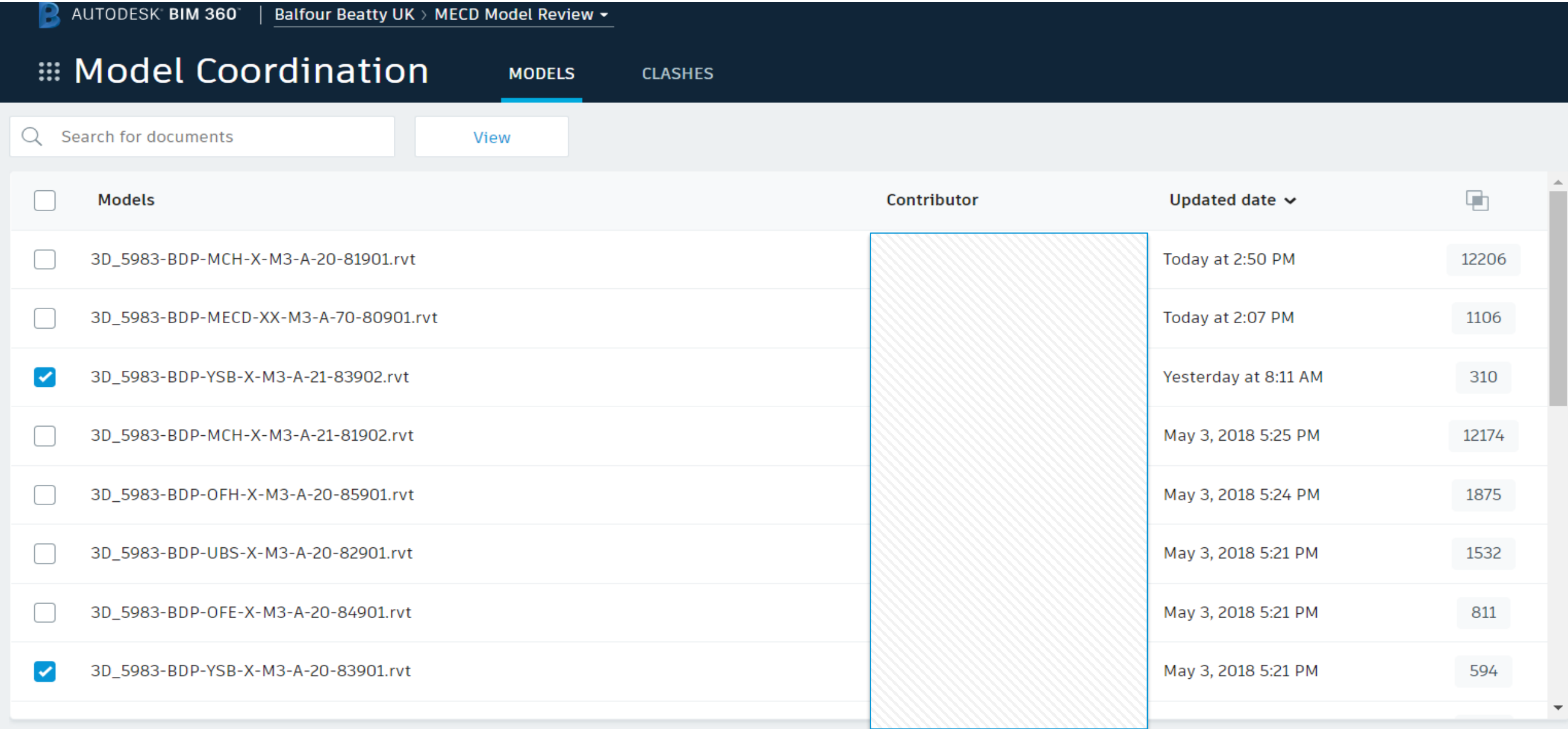
Not Just a Single Model



Next Gen – Model Coordination



Next Gen – Model Coordination



Next Gen – Model Coordination

AUTODESK BIM 360 | Balfour Beatty UK › MECD Model Review

Model Coordination

MODELS CLASHES

19 models (2 hidden)

Last updated **Today at 3:16**

	3D_5983-BDP-ATH...20-88901_P20.rvt	3D_5983-BDP-MC...3-A-20-81901.rvt	3D_5983-BDP-MC...3-A-21-81902.rvt	3D_5983-BDP-ME...99-89903_P03.rvt	3D_5983-BDP-ME...3-A-70-80901.rvt	3D_5983-BDP-MEC...70-80901_P15.rvt	3D_5983-BDP-MEC...70-80901_P17.rvt	3D_5983-BDP-OF...3-A-20-84901.rvt	3D_5983-BDP-OF...20-84901_P29.rvt	3D_5983-BDP-OF...3-A-20-85901.rvt	3D_5983-BDP-OFH...20-85901_P30.rvt	3D_5983-BDP-UB...3-A-20-82901.rvt	3D_5983-BDP-UBS...20-82901_P32.rvt	3D_5983-BDP-UB...3-A-21-82902.rvt	3D_5983-BDP-UB...21-82902_P32.rvt	3D_5983-BDP-YS...3-A-20-83901.rvt	3D_5983-BDP-YS...20-83901_p32.rvt	3D_5983-BDP-YS...3-A-21-83902.rvt	3D_5983-BDP-YSB...-21-83902_P31.rvt
3D_5983-BDP-ATH-X...-A-20-88901_P20.rvt 0 clash groups																			
3D_5983-BDP-MCH-X-M3-A-20-81901.rvt 275 clash groups			83	22	140	157	144					13	13	1	1				
3D_5983-BDP-MCH-X-M3-A-21-81902.rvt 312 clash groups		287		17										8	8			3	1
3D_5983-BDP-MECD-X...-A-99-89903_P03.rvt 37 clash groups		22	7		4	4	4	1	1	1	1	3	3	1	1	1	1		
3D_5983-BDP-MECD-XX-M3-A-70-80901.rvt 1106 clash groups		628		4		481	388					140	140	3	3	10	10		

Next Gen – Model Coordination

3D_5983-BDP-MCH-X-M3-A-20-81901.rvt and 3D_5983-BDP-MECD-XX-M3-A-70-80901_P17.rvt

144 ELEMENTS WITH CLASHES

Floor [1045178]
15 clashes with 1 other model

Floor [6313139]
15 clashes with 1 other model

Compound Ceiling [1111436]
14 clashes with 1 other model

Compound Ceiling [1111353]
13 clashes with 1 other model

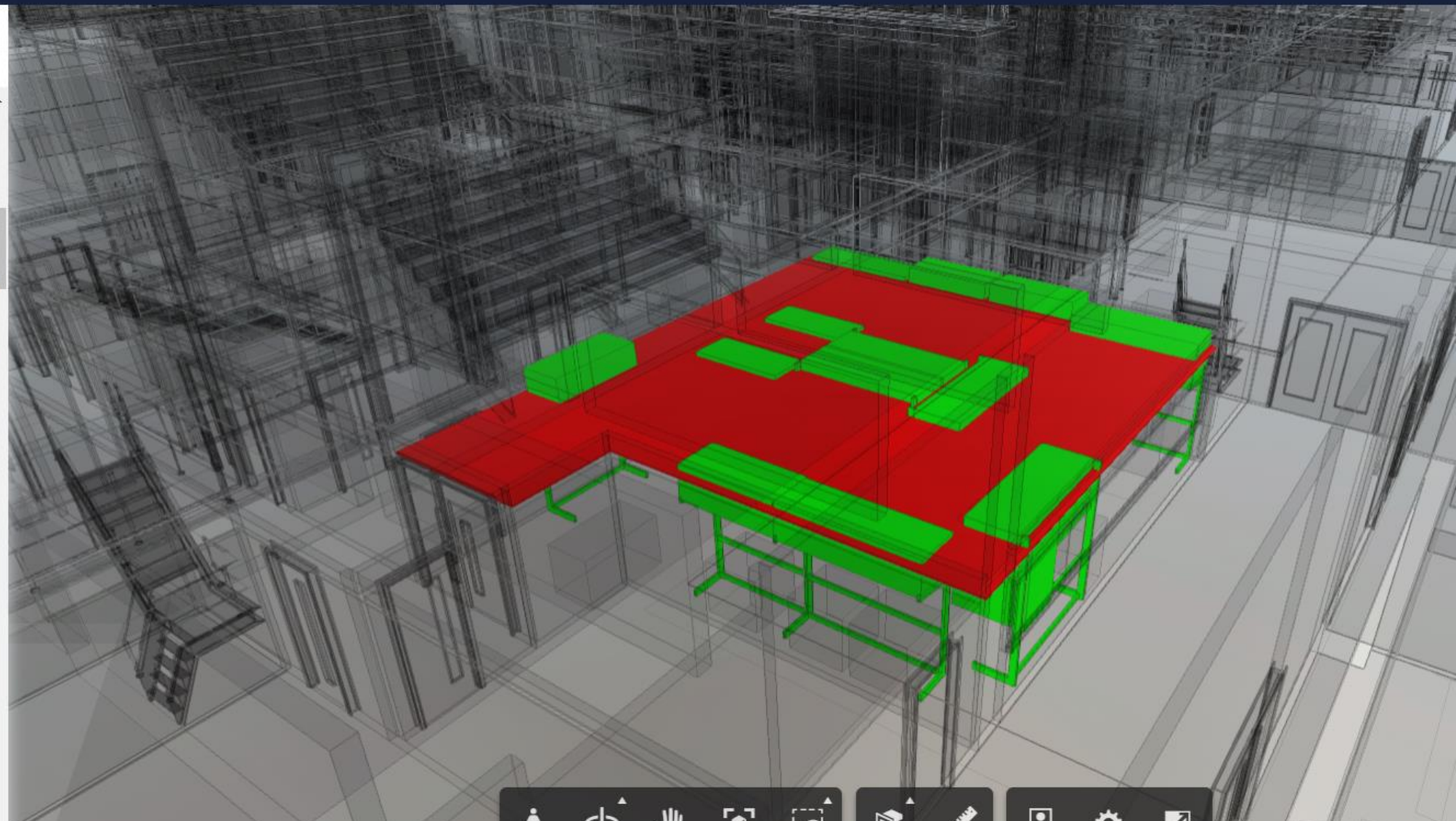
Floor [1043007]
10 clashes with 1 other model

Basic Wall [9311256]
8 clashes with 1 other model

Basic Wall [819894]
7 clashes with 1 other model

Floor [1045789]
7 clashes with 1 other model

Floor [1036800]



Field Management

Field Management

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- Live construction information available in the field
- Remove paper forms
- Improve QA/QC
- React to issues quickly
- Increase in productivity
- Central reports on performance

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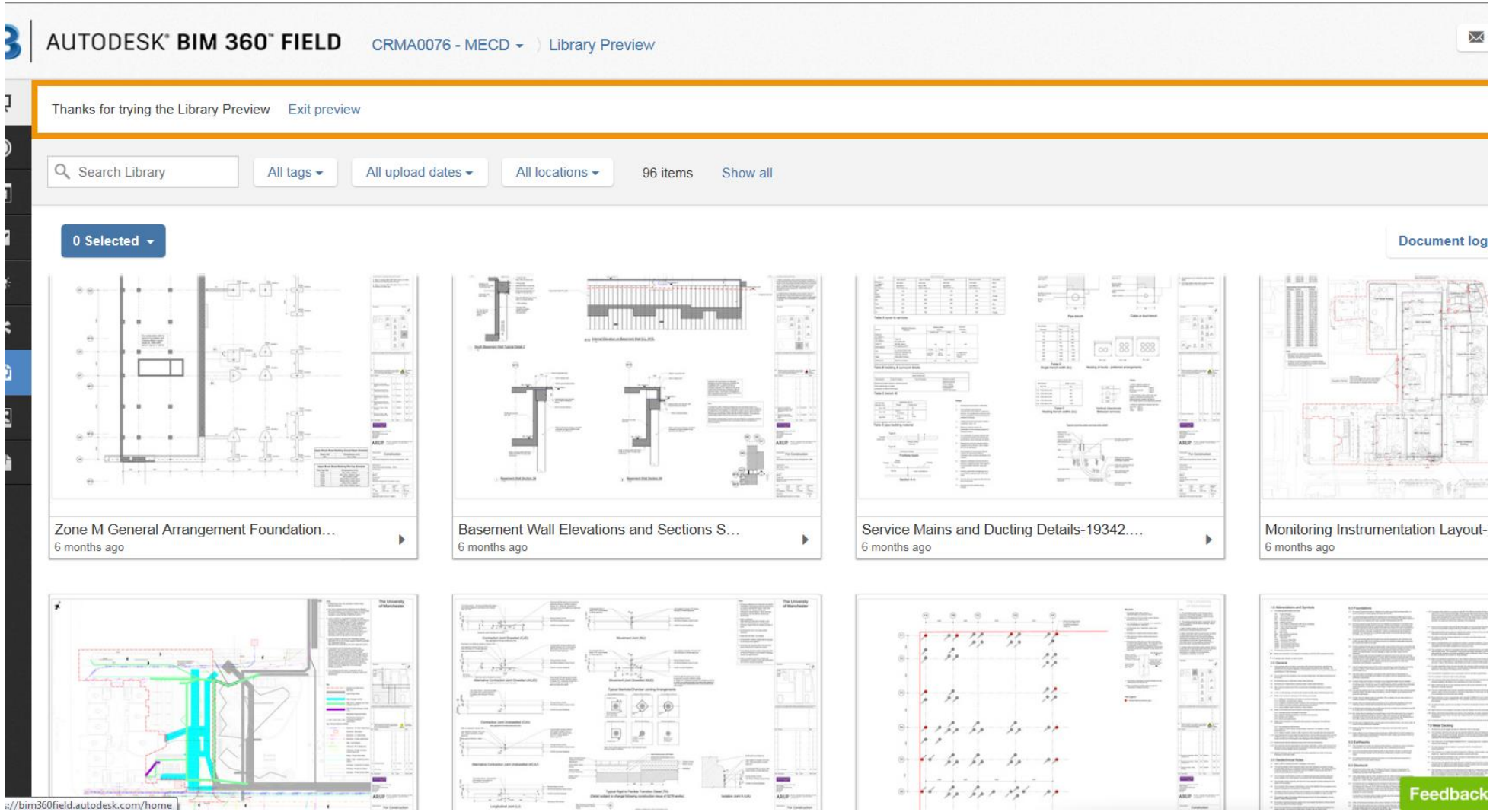
Problem – Conject Field

Balfour Beatty



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BIM 360 Field Library Workflow

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Information Extracted from Conject

File Name Breakdown 5983-ARP-MECD-EXG-SI-C-79-2XE01

Volume	Zones or Areas of the Build
Originator	Unique Identifier for each Organisation responsible for Creating Data
Element Code	Works in which the Information Relates to . Not all Element Codes to be Reflected. TBA

Information to be Pushed Through to BIM360 Field

Volume

ACC	Aquatic Centre Carpark
MCH	MEC Hall
UBS	Upper Brook Street
YSB	York Street Building
OFH	Oddfellows Hall
JCR	James Chadwick Existing Refurbish
OFE	Oddfellows Extension (Models Only)
MECD	All Areas

Originator

UOM	University of Manchester
BB	Balfour Beatty
MEC	Mecanoo
ARP	Arup
PP	Prenoyre Prasad
AEC	Aecom
SWE	Sweett
M_A	Mecanoo_Arup
EXC	Excitech
NGB	NG Bailey
EXP	Expanded
SPL	Sipral
SEV	Severfield

Element Code

00	Site Plan
10	Substructure
11	Ground Excavations
13	Ground Bearing Slabs
16	Retaining wall foundations
17	Pile Foundations
18	Other substructure elements
20	Primary Structure – General
21	External Walls
22	Internal Walls
23	Floors
24	Stairs & Ramps
25	Auditorium
26	Sanitary Layouts
27	Roofs
28	Structural Frames
31	External Elements – Cladding
32	Internal Elements – Joinery, Doors & Screens
33	Raised Floors
34	Balustrades & Metalwork
35	Suspended Ceilings
37	Roof lights
40	Details – General
42	Internal Wall Details
43	Floor finishes Details
45	Ceiling Finishes
46	Sanitary Details
50	Mechanical Services
51	Combined M&E
52	Drainage
53	Hot & Cold Water, Domestic Water Services
54	Gas & Compressed Air
55	Refrigeration
56	Space Heating
57	Ventilation & Air Conditioning
58	Other piped, ducted services
60	Electrical Services
61	Electrical Supply
62	Power
63	Lighting
64	Communications
66	Transportation
67	Fire Systems
68	Security and Control Systems
69	Lightening Protection/Earthing
70	Fixed Furniture – General
71	Signage Details
72	Fixed Furniture Details
73	Kitchen Fitting Details
75	Cleaning Fittings Details
76	Storage & Shelving Details
77	Bar Fixture Details
78	Aquatic Centre Carpark
80	Loose Equipment – General
81	Circulation Loose Equipment
82	General Loose Equipment
83	Kitchen Loose Equipment
84	Sanitary Loose Equipment
85	Cleaning Loose Equipment
86	Storage Loose Equipment
87	Bar Loose Equipment
90	External Works – General
91	Ground Preparation
92	Hard Landscaping
93	Soft Landscaping
94	Services
95	Furniture & Fittings
96	External Works – Service/Utilities General
97	Schedules

Information Reflected on BIM360 Field

Folder Structure Example

Volume

MCH –MEC Hall

Originator (TBA)

- ARP - Arup
- MEC - Mecanoo
- NGB - NG Bailey
- EXP - Expanded
- SPL - Sipral

Element Code (TBA)

- 10 - Substructure
- 20 – Primary Structure - General
- 21 – External Walls
- 50 – Mechanical Services
- 52 - Drainage
- 60 – Electrical Services
- 62 - Power
- 63 - Lighting
- 67 – Fire Systems

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Problem – Monitor & Check Site Plant

Balfour Beatty

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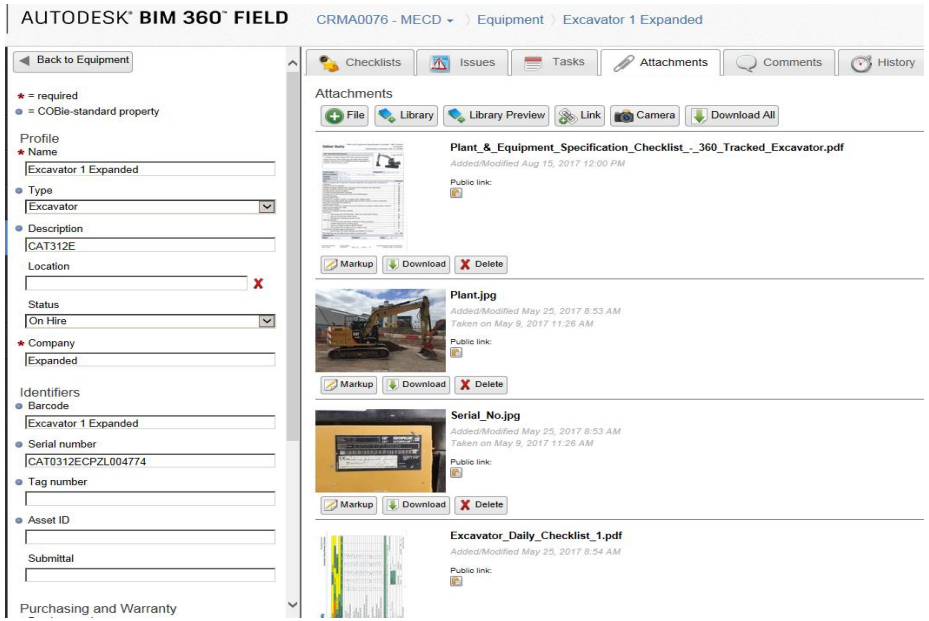
Equipment Barcodes

	Excavator 1 Maher	Excavator 1 Maher	Excavator	CAT329EL		Off Hired
	Excavator 4 Maher	Excavator 4 Maher	Excavator	Hitachi 2AXIS ZX470		Off Hired
	Excavator 1 UDP	Excavator 1 UDP	Excavator	Hitachi ZX135US-5		Off Hired
	Excavator 1 Expanc	Excavator 1 Expanc	Excavator	CAT312E		On Hire
	Excavator 2 Balfour	Excavator 2 Balfour	Excavator	Excavator 2 Balfour Beatty		Off Hired
	Excavator 2 Cummi	Excavator 2 Cummi	Excavator	Hitachi ZX135US-5		Off Hired
	Excavator 2 Maher	Excavator 2 Maher	Excavator	Hitachi ZR330LC-5G		Off Hired
	Excavator 6 Cummi	Excavator 6 Cummi	Excavator	Hitachi ZX225US-5		Off Hired
	Excavator 10 Expar	Excavator 10 Expar	Excavator	Zaxis 5SU 5tne Excavator		On Hire
	Excavator 1 Cummi	Excavator 1 Cummi	Excavator	Komatsu PC210LC-8		Off Hired
	Excavator 4 Cummi	Excavator 4 Cummi	Excavator	Hitachi ZAXIS 225USLC-5B		Off Hired
	Excavator 5 Expanc	Excavator 5 Expanc	Excavator	CAT 312E		Off Hired
	Excavator 6 Expanc	Excavator 6 Expanc	Excavator	ZAXIS 52U		Off Hired
	Excavator 7 Expanc	Excavator 7 Expanc	Excavator	Excavator 7 Expanded		Off Hired
	Excavator 2 Expanc	Excavator 2 Expanc	Excavator	CAT320E		On Hire
	Excavator 1 Balfour	Excavator 1 Balfour	Excavator	JCB - JS220LC		Off Hired
	Excavator 3 Cummi	Excavator 3 Cummi	Excavator	Volvo ECR48C 5T		On Hire
	Excavator 9 Expanc	Excavator 9 Expanc	Excavator	Excavator 9 Expanded - Long Reach		Off Hired
	Excavator 4 Expanc	Excavator 4 Expanc	Excavator	Hitachi ZX225USL		Off Hired
	Excavator 5 Cummi	Excavator 5 Cummi	Excavator	Komatsu PC170LC-10		On Hire



- All mobile & fixed plant items to be allocated an Individual barcode.
- Managing Hired Equipment and Plant
- Monitor plant duration and avoid missing plant items.
- Predefined report to identify the status of all the plant on site.

Permits Issued on Site

- Waterproof permit on a high visibility armband in order to recognise who the permit has been issued to onsite/space.
- Provides a clear identification of who has been issued the permit on site.
- A manager can carry out a spot check using the QR Code Scanner to ensure the permit is in date and is being used in the correct location.
- Check anyone issued a permit has received adequate training and is considered competent to carry out operation.
- All related check sheets and photos are appended to a particular permit on a daily basis.

Permits Issued on Site

Problem – Supply Chain

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(Ops/Const. & HSEQ) temporary works

Deck Control Sheet

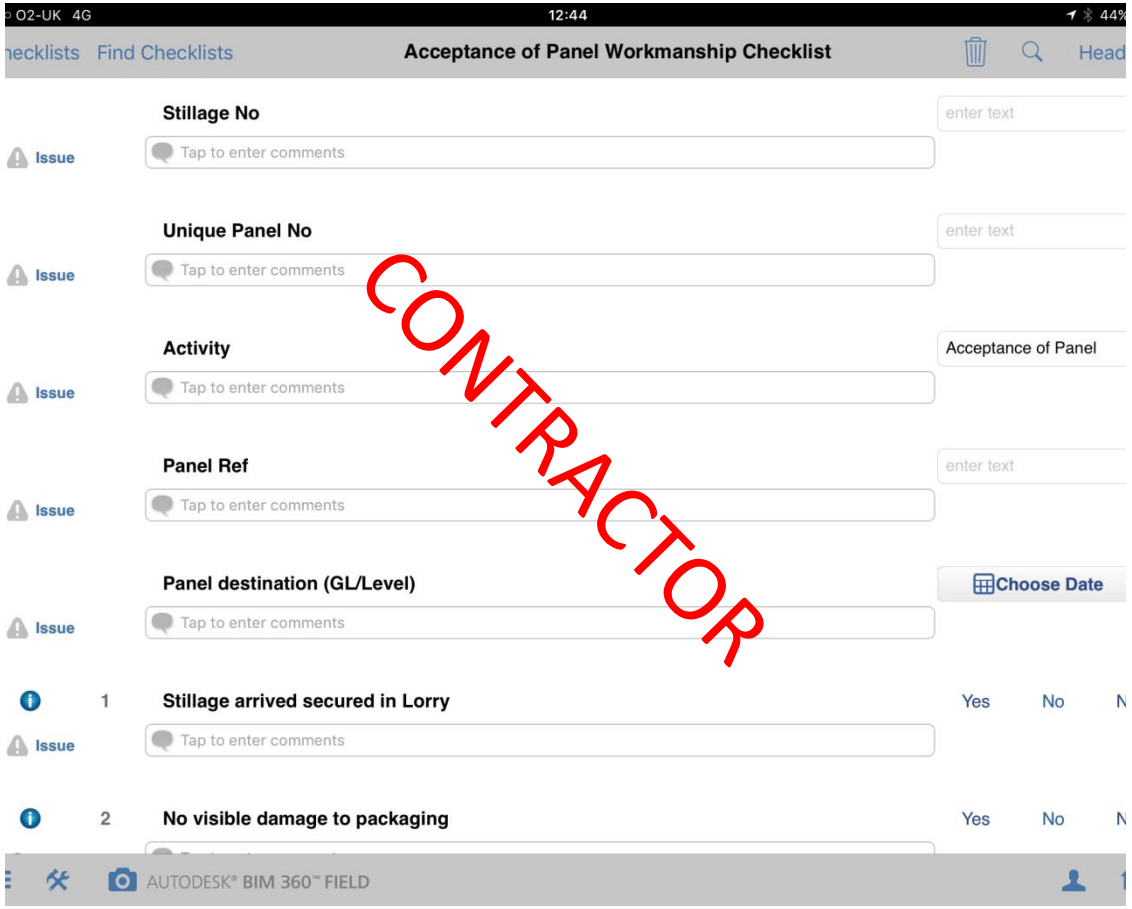
Slab Construction Control Sheet for Falsework

No activity is to be executed out of sequence
No activity to be commenced prior to sign off by responsible person of the previous activity

Block: South Basement Level: _Ground flPour: _____

Item	Activity	Responsible	Action Complete	
1	**Drawing issued** Consultation Temporary works coordinator (TWC)/Charge Hand (CH) joiner. Review and discuss scheme, raise issues prior to commencing work. Drawings to be amended and signed off	Temporary Works Co-ordinator (TWC)/CM & Foreman		
2	**Deck Erection Plan** Decking erection plan is developed, discussed, agreed, & understood by Foreman responsible for works.	CM/TWC & Foreman		
3	**Fall Restraint/Arrest Protection Systems** Fall restraint layouts established. Infill and leading edges clearly identified ***DECK CONSTRUCTION MAY COMMENCE***	Foreman		
4	**Deck construction is complete** (If part of the deck is completed sign-off as required)	Foreman	1	2
			3	4
5	**Complete any missing Edge protection** Inspection of working platfor	Foreman Scaffolder		
6	**Deck and Working Platforms are safe for the following trades:** e.g. Installation of stopends, rebar, PT, etc. *Leading edge works fully complete* ***TRADES MAY COMMENCE WORK***	CM/TWC		
7	**Issue permit to load** ***CONCRETE MAY BE PLACED***	TWC		
8	**Slab Edge protection is complete** Install temporary handrail system to slab edges	TWC		
9	**Issue permit to unload** (If part of the deck is to be unloaded sign-off as required)	TWC	1.	2.

SUBCONTRACTOR



CONTRACTOR

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Expanded Concrete Elements

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- Engaged with Expanded to develop check sheets
- Concrete Elements listed as a piece of equipment
- Relevant check sheet appended to relevant concrete equipment
- Progress Mark Ups

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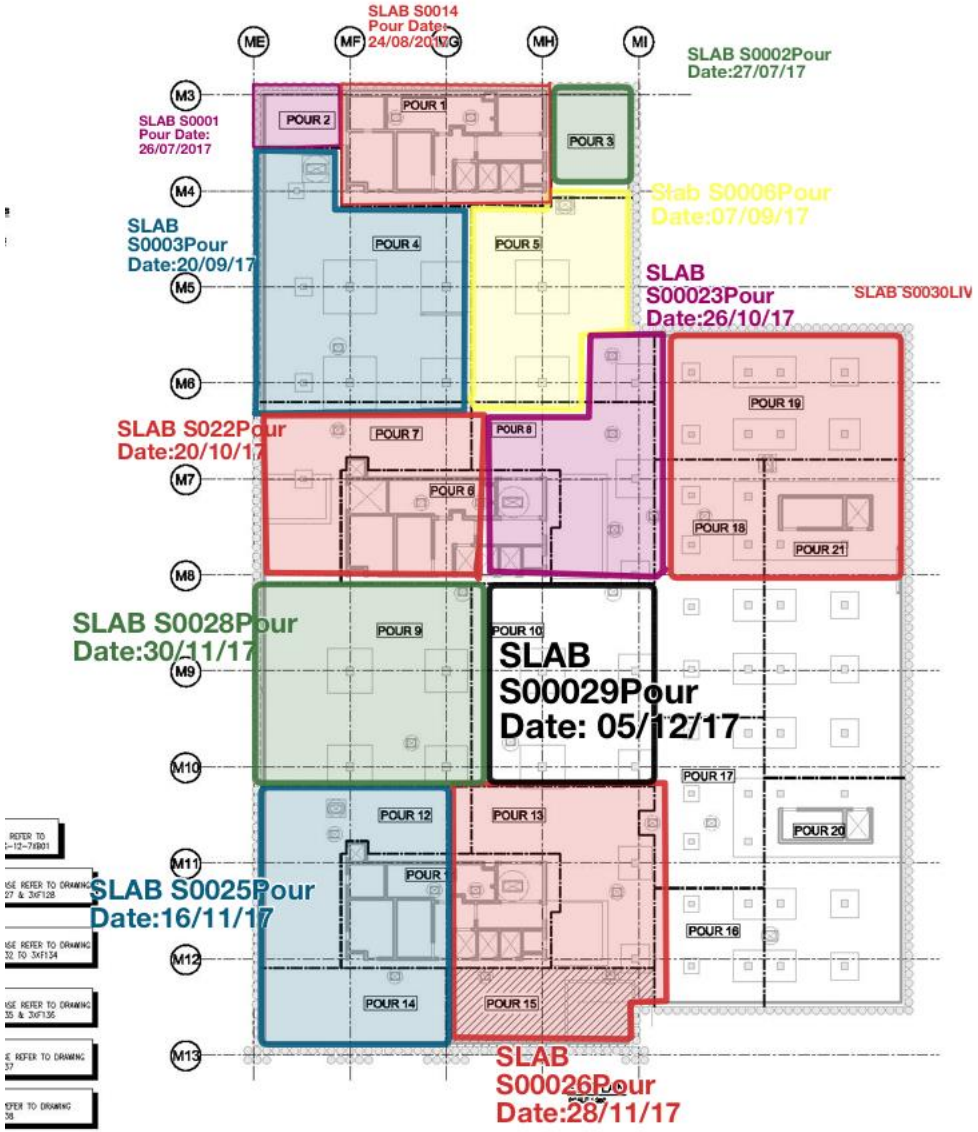

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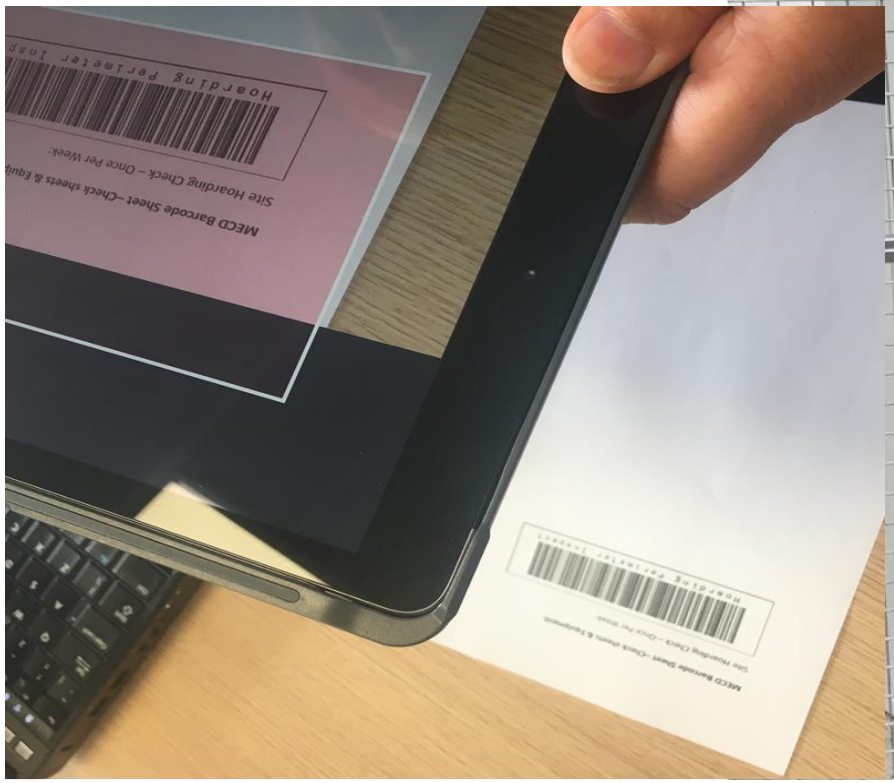
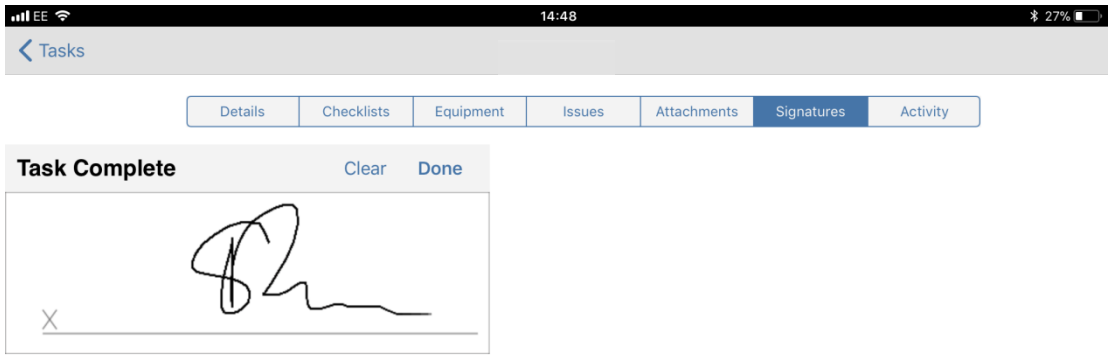
Equipment Barcodes – Check Sheets

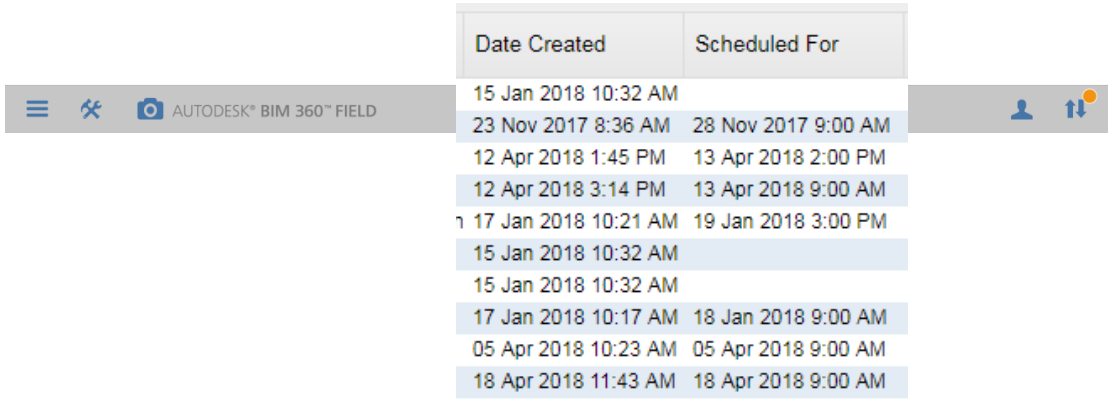


Sipral – Façade

- Track & Trace
- Barcode Utilisation – Panel Ref & Type
- Logistics Status of Panel and Stillage
- Associated Check Sheets
- Generic & Bespoke Panel Location
- Location Allocation
- Appearance Profile – Utilising Status Code Allocation

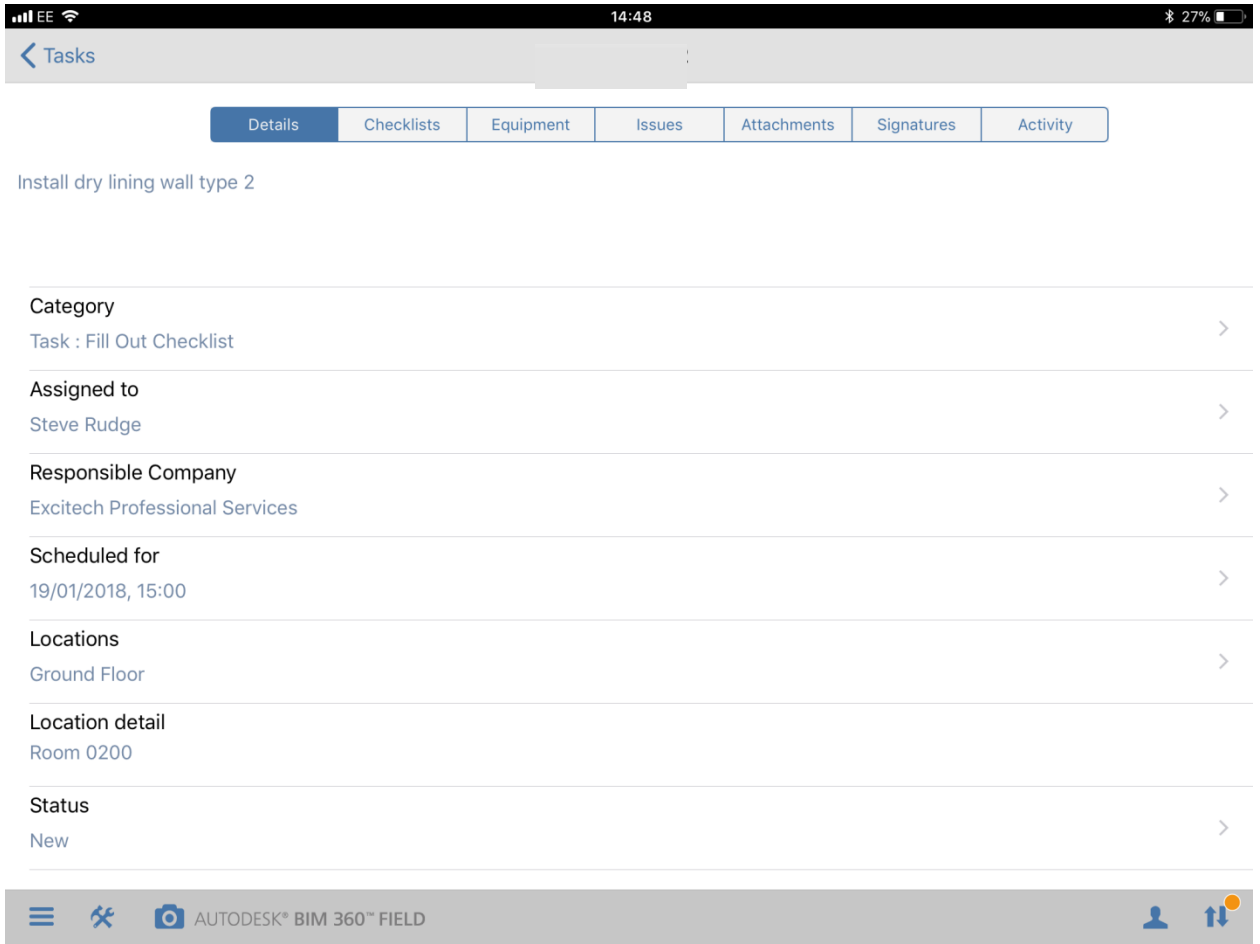
BIM 360 Field – Progress Tracking



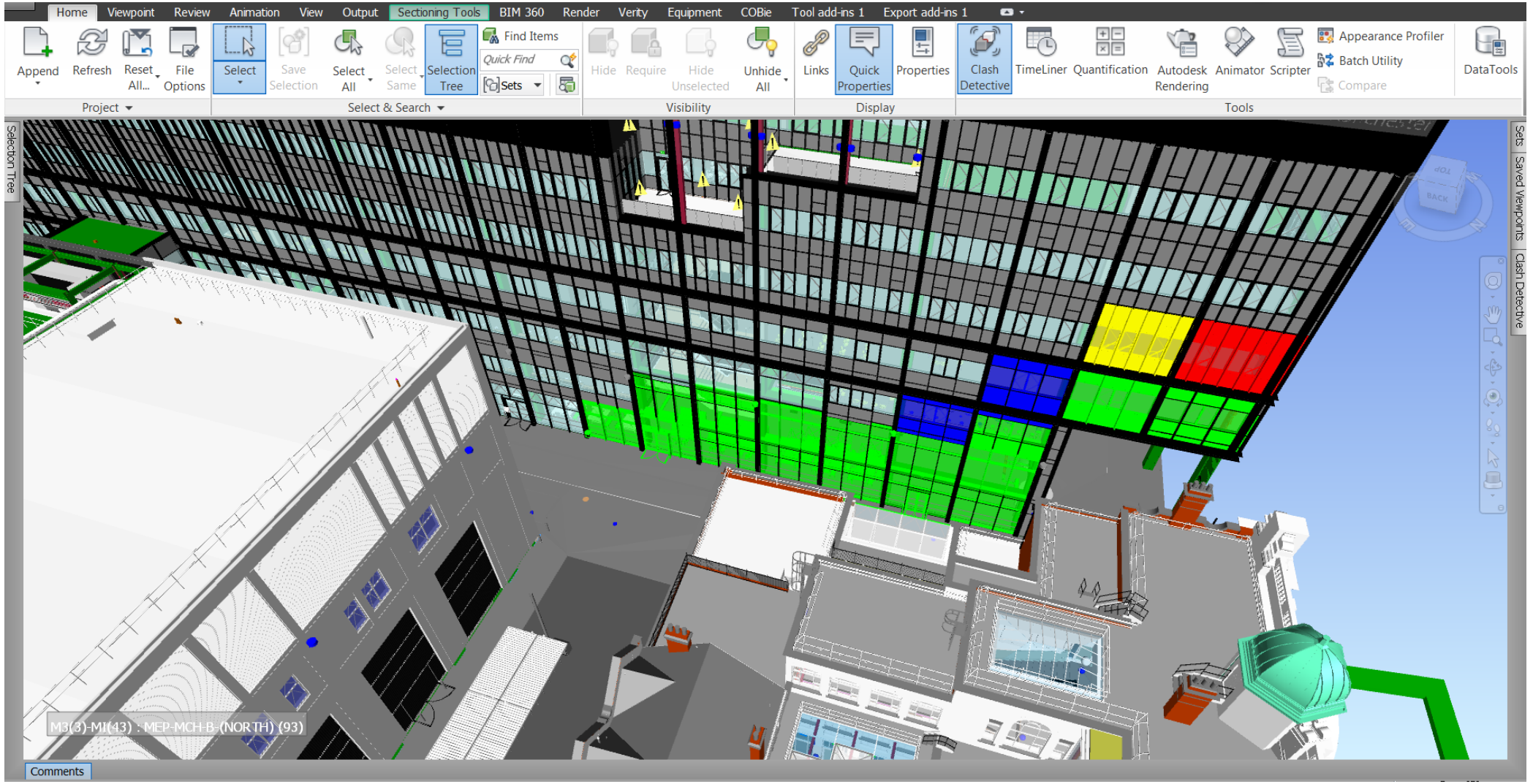


Date Created	Scheduled For
15 Jan 2018 10:32 AM	
23 Nov 2017 8:36 AM	28 Nov 2017 9:00 AM
12 Apr 2018 1:45 PM	13 Apr 2018 2:00 PM
12 Apr 2018 3:14 PM	13 Apr 2018 9:00 AM
17 Jan 2018 10:21 AM	19 Jan 2018 3:00 PM
15 Jan 2018 10:32 AM	
15 Jan 2018 10:32 AM	
17 Jan 2018 10:17 AM	18 Jan 2018 9:00 AM
05 Apr 2018 10:23 AM	05 Apr 2018 9:00 AM
18 Apr 2018 11:43 AM	18 Apr 2018 9:00 AM

EQUIPMENT



Appearance Profile



Navigation View Points

- Providing viewpoints within the model around the MECD site

- Barcode Mapped into BIM 360 Field as Equipment

Site Navigation Points

Dynamo Script – Within Revit

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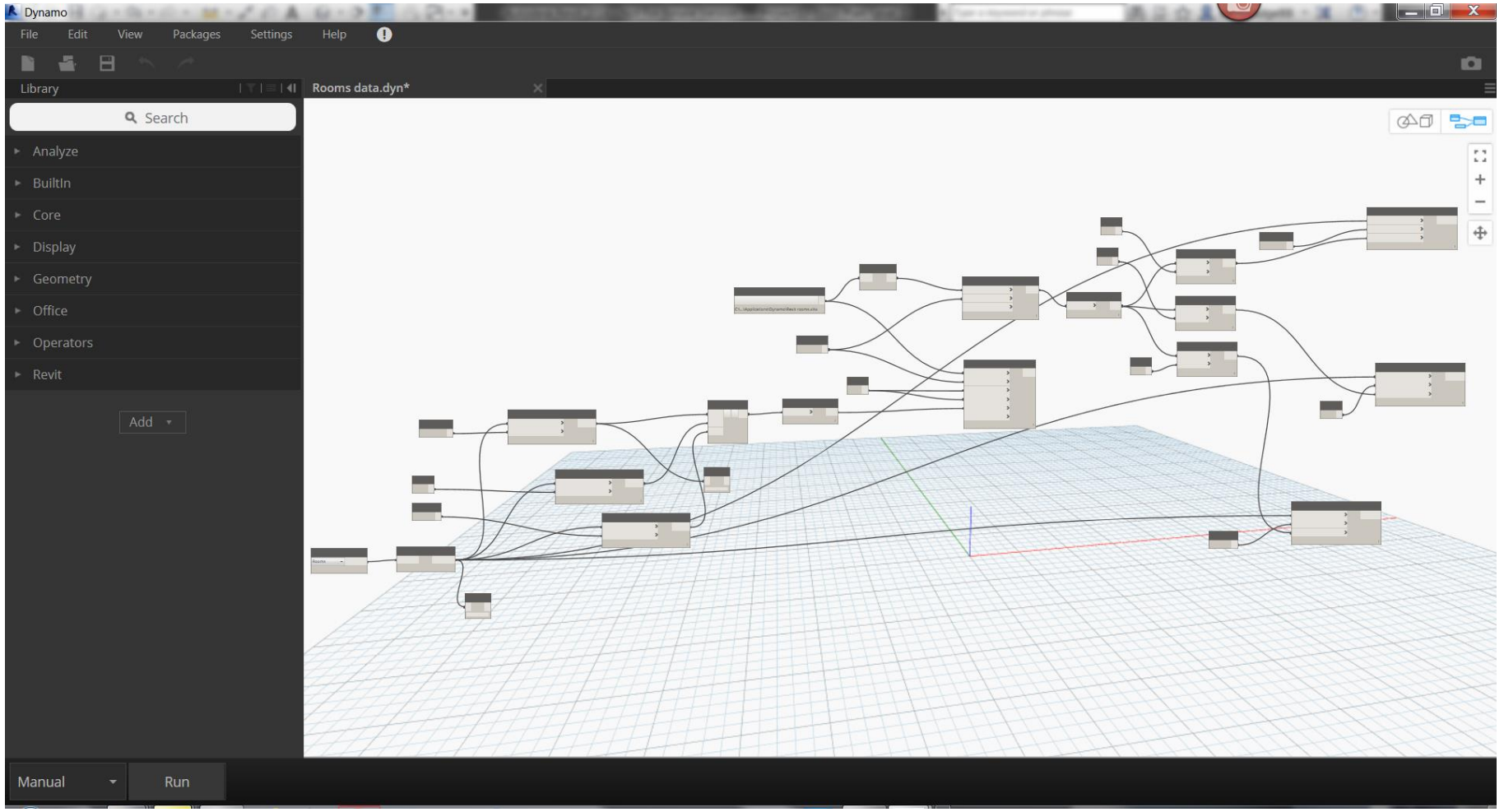

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Dynamo Script – Within Revit

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Information Centre

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- Provide Site Team Access to Live Design Information
- 2D & 3D Data
- Printing Facilities
- Information Hub for Site Briefings

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Information Requirements

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Information Requirements

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Building Fabric																
Element	Sub Element	UoM Barcode Required	Asset Group	Ref Revit File	Asset No.	Building	Floor	Room name	Room number	Estates Asset or User Asset	Supplier name	Component	Model No	Manufacturer	Maintenance Frequency	Warranty
Responsibility		UOM	UOM		Design team	Design team/ UOM	Design team	Design team	Design team	UOM	Contractor	Contractor	Contractor	Contractor	Contractor	Contractor
Stage			4		4	4	4	4	4	5	5	5	5	5	5	5
Safety Systems																
Safety Systems	Window Cleaning Access System		BWCS	Excel												
Safety Systems	Roof Anchorage Points		BRAP													
Safety Systems	Abseil rings		BABS													
Safety Systems	EyeBolts		BEYE													
Safety Systems	Cable and Trackrail Based Safety Systems		BCTR													
Safety Systems	Connectors		BCON	NOT MODELLED												
Safety Systems	Energy Absorbing Lanyards		BEAL	NOT MODELLED												
Safety Systems	Eyebolts used for Personal Fall Protection		BEYF													
Safety Systems	Mobile Man Anchors		BMMA													
Safety Systems	Retractable Fall Arrester		BRFA	NOT MODELLED												
Doors																
Doors	Fire Door		BFDR													
Doors	Roller Shutter		BRLS													
Doors	Swing Door (non-fire rated)		BSDR													

Space Management

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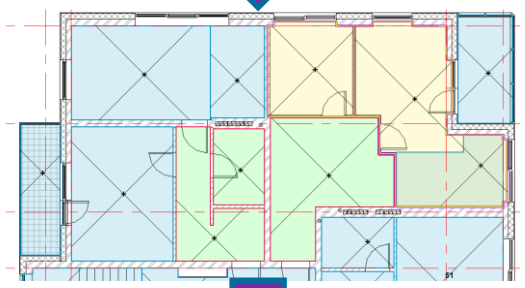

ARCHIBUS

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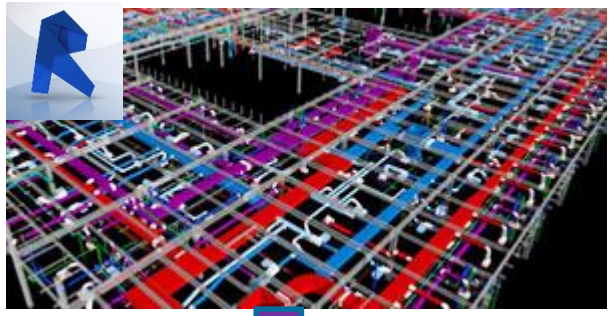
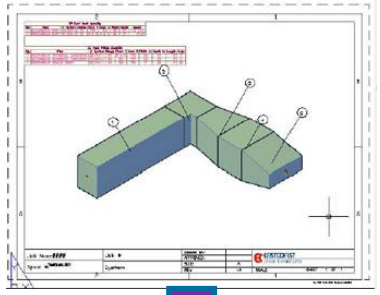
Asset management





Commissioning Data!!!

ORACLE

Information Requirements

Pr_65_57	**65**	**57**				**Filter products**			
Pr_65_57_02	65	57	02			**Air filters**	-	-	-
Pr_65_57_02_02	65	57	02	02	AFI	Activated carbon air filters	NO	-	-
Pr_65_57_02_07	65	57	02	07	AFI	Bag air filters	NO	-	-
Pr_65_57_02_29	65	57	02	29	AFI	Fabric filters	NO	-	-
Pr_65_57_02_37	65	57	02	37	AFI	High efficiency particle arrestor (HEPA) air filters	NO	-	-
Pr_65_57_02_52	65	57	02	52	AFI	Mesh air filters	NO	-	-
Pr_65_57_02_66	65	57	02	66	AFI	Panel air filters	NO	-	-
Pr_65_57_33	65	57	33			**Gas and air filters**	-	-	-
Pr_65_57_33_02	65	57	33	02	AFI	Activated carbon compressed air filters	NO	-	-
Pr_65_57_33_15	65	57	33	15	AFI	Coalescing compressed air filters	NO	-	-
Pr_65_57_33_25	65	57	33	25	AFI	Dust compressed air filters	NO	-	-
Pr_65_57_33_33	65	57	33	33	GFI	Gas filters	NO	-	-
Pr_65_57_96	65	57	96			**Water filters and strainers**	-	-	-
Pr_65_57_96_08	65	57	96	08	STR	Basket water strainers	YES	300/350	YES
Pr_65_57_96_13	65	57	96	13	WFI	Chlorine dioxide biological water filters	YES	300/350	YES
Pr_65_57_96_77	65	57	96	77	WFI	Side stream water filters	YES	300/350	YES
Pr_65_57_96_99	65	57	96	99	STR	Y-type water strainers	YES	300/350	YES
Pr_65_65	**65**	**65**				**Ductwork products**			
Pr_65_65_23	65	65	23			**Ductwork accessories**	-	-	-
Pr_65_65_23_01	65	65	23	01	DAP	Access panels	YES	100	NO

Information Capture

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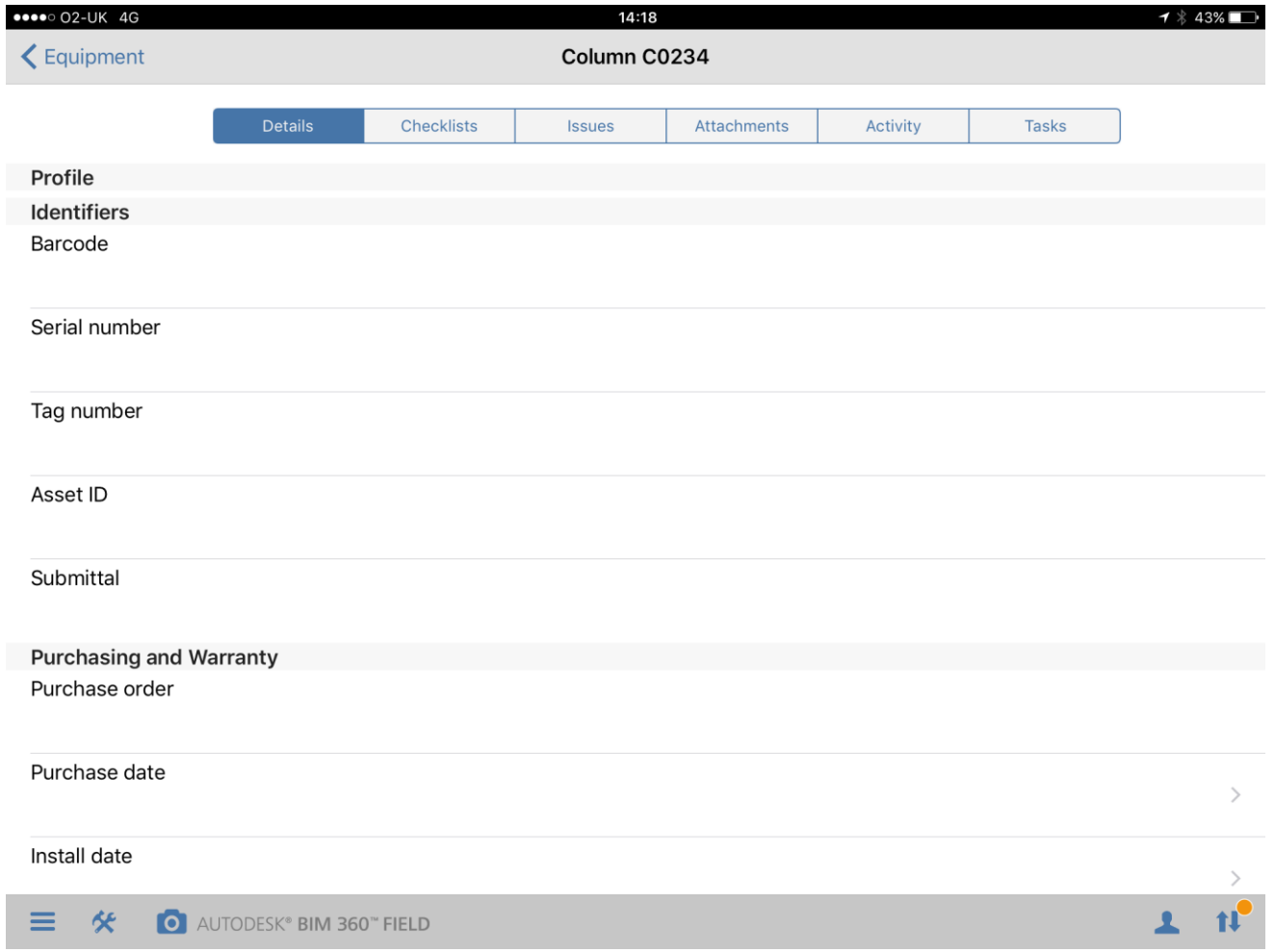
(00)123456789101112133



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BIM 360 Field – Asset Information

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- Information Captured at Source
- Information direct to asset
- Links back to the model
- Single source of truth
- Aid the O&M data capture

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Information Verification

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Geometry

Information

Building Fabric																	
Element	Sub Element	UoM Barcode Required	Asset Group	Ref Revit File						or User Asset					Frequency		
Responsibility		UOM	UOM		Design team	Design team/ UOM	Design team	Design team	Design team	UOM	Contrsctor	Contrsctor	Contrsctor	Contrsctor	Contrsctor	Contrsctor	
Stage			4		4	4	4	4	4	5	5	5	5	5	5	5	
Safety Systems																	
Safety Systems	Window Cleaning Access System		BWCS	Excel													
Safety Systems	Roof Anchorage Points		BRAP														
Safety Systems	Abseil rings		BABS														
Safety Systems	Eyebolts		BEYE														
Safety Systems	Cable and Trackwise based safety		BCTR														
Safety Systems	Connectors		BCON	NOT MODELLED													
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Doors																	
Doors	Fire Door		BFDR														
Doors	Roller Shutter		BRLS														
Doors	Swing Door(non-fire rated)		BSDR														

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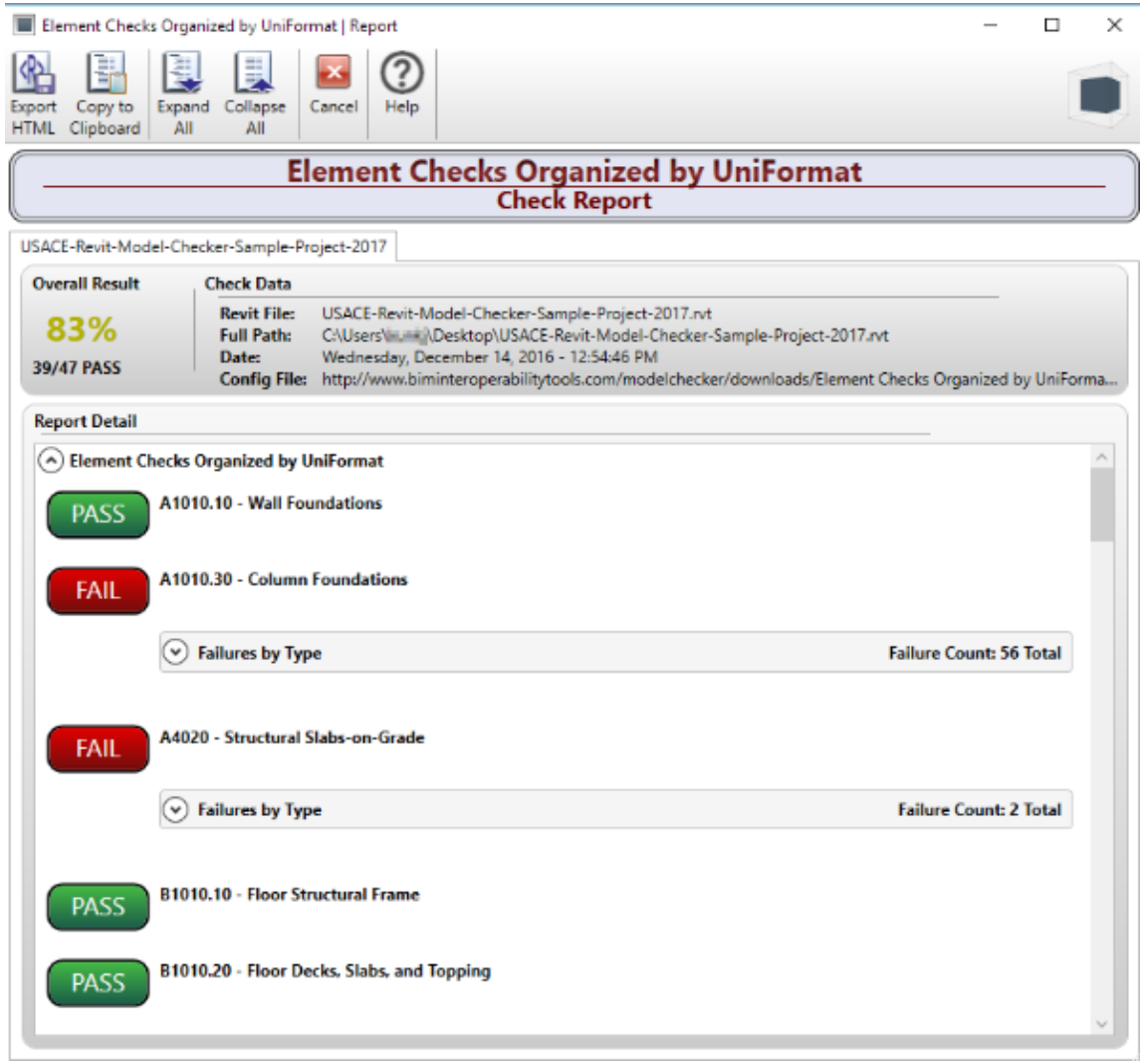
Model Audit

BIM Interoperability Tools – Model Checker



Virtual Build Meeting

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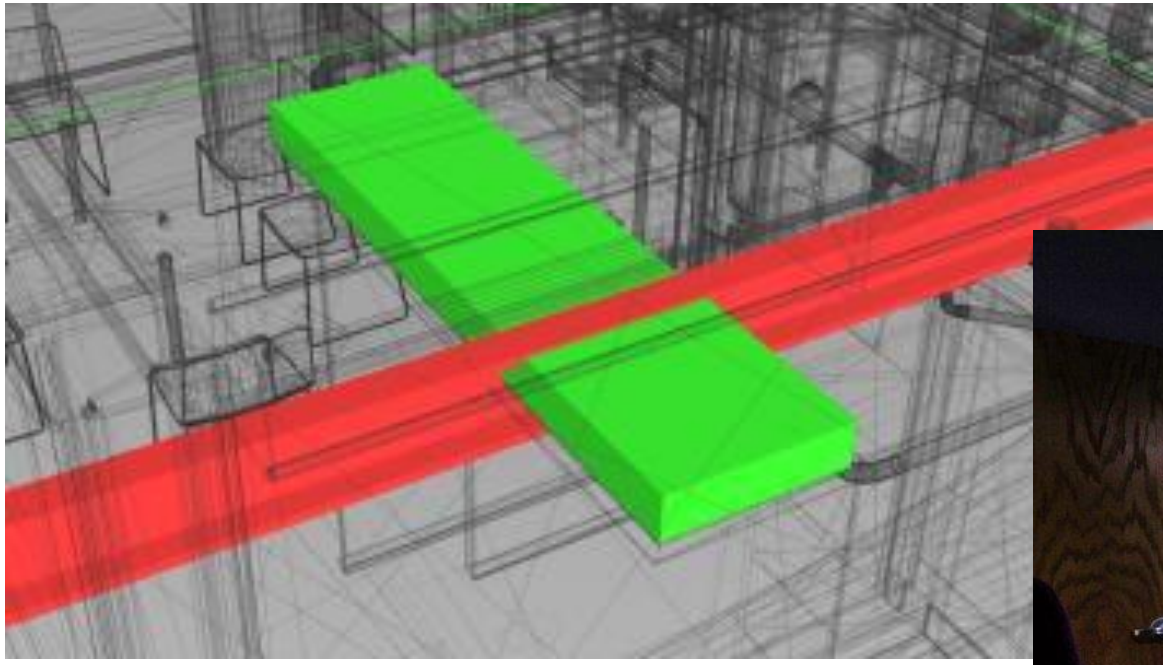

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Construction Fails

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Change! Not first come, first served

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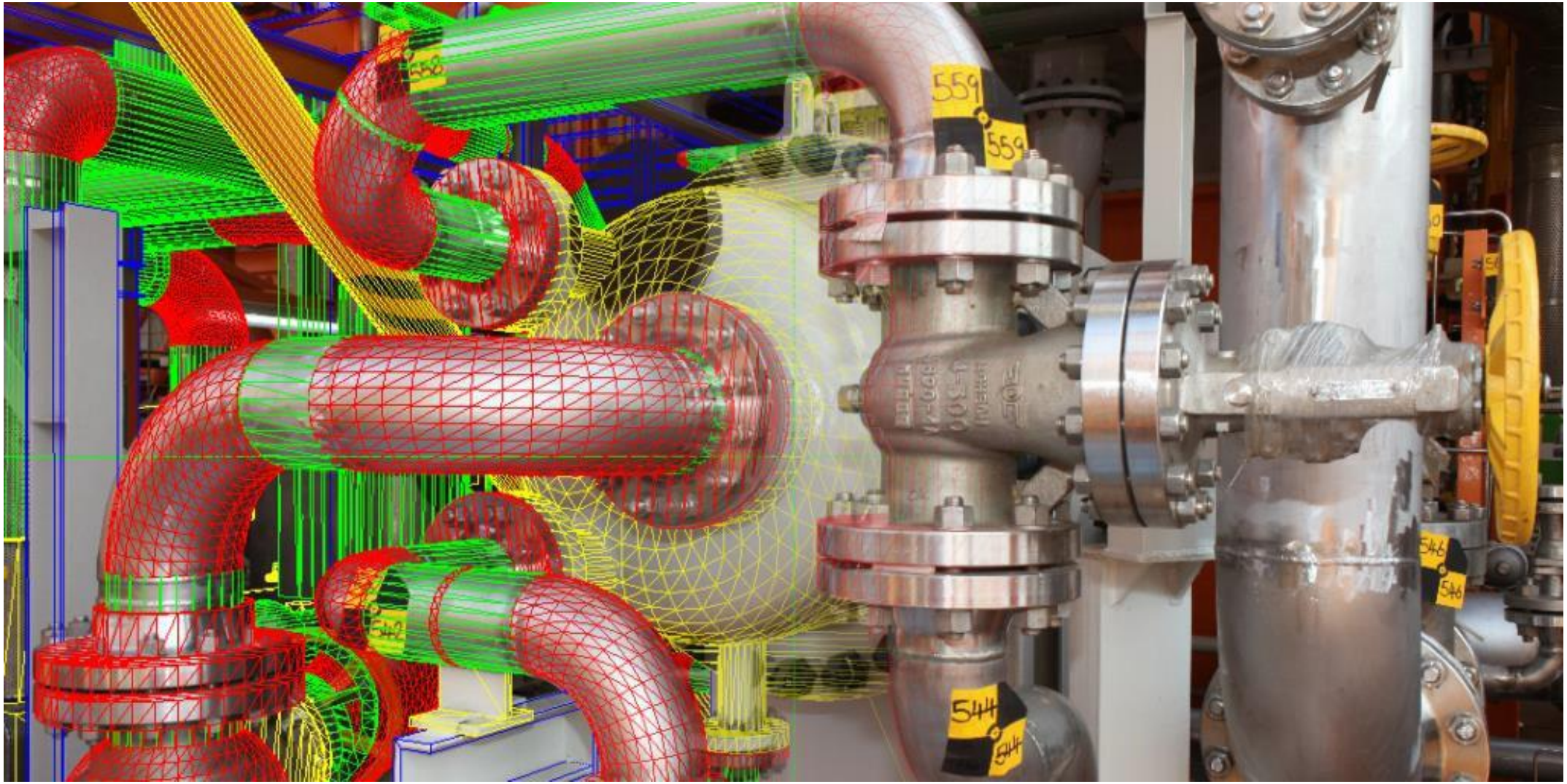
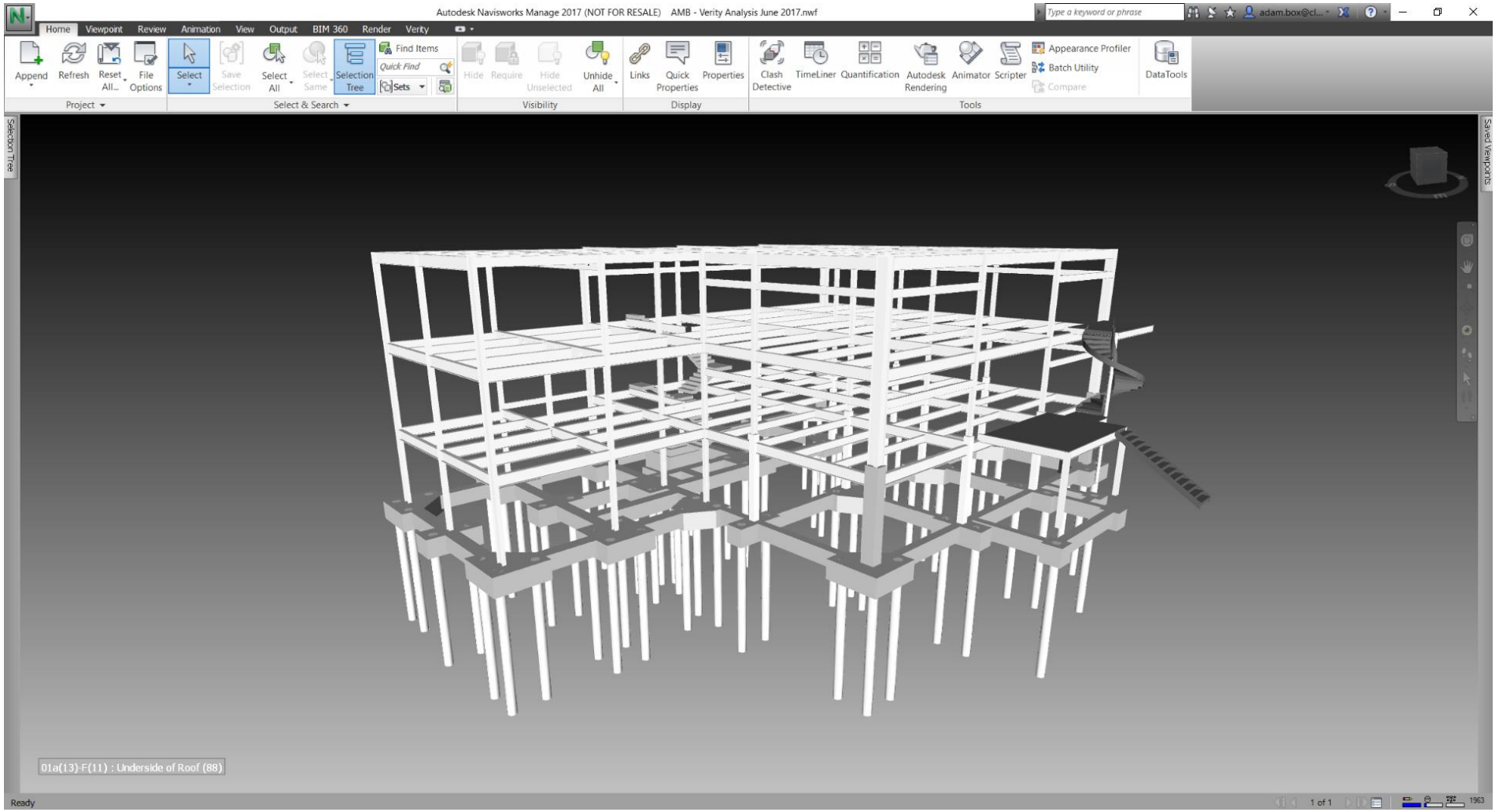
Accuracy – More and More Important

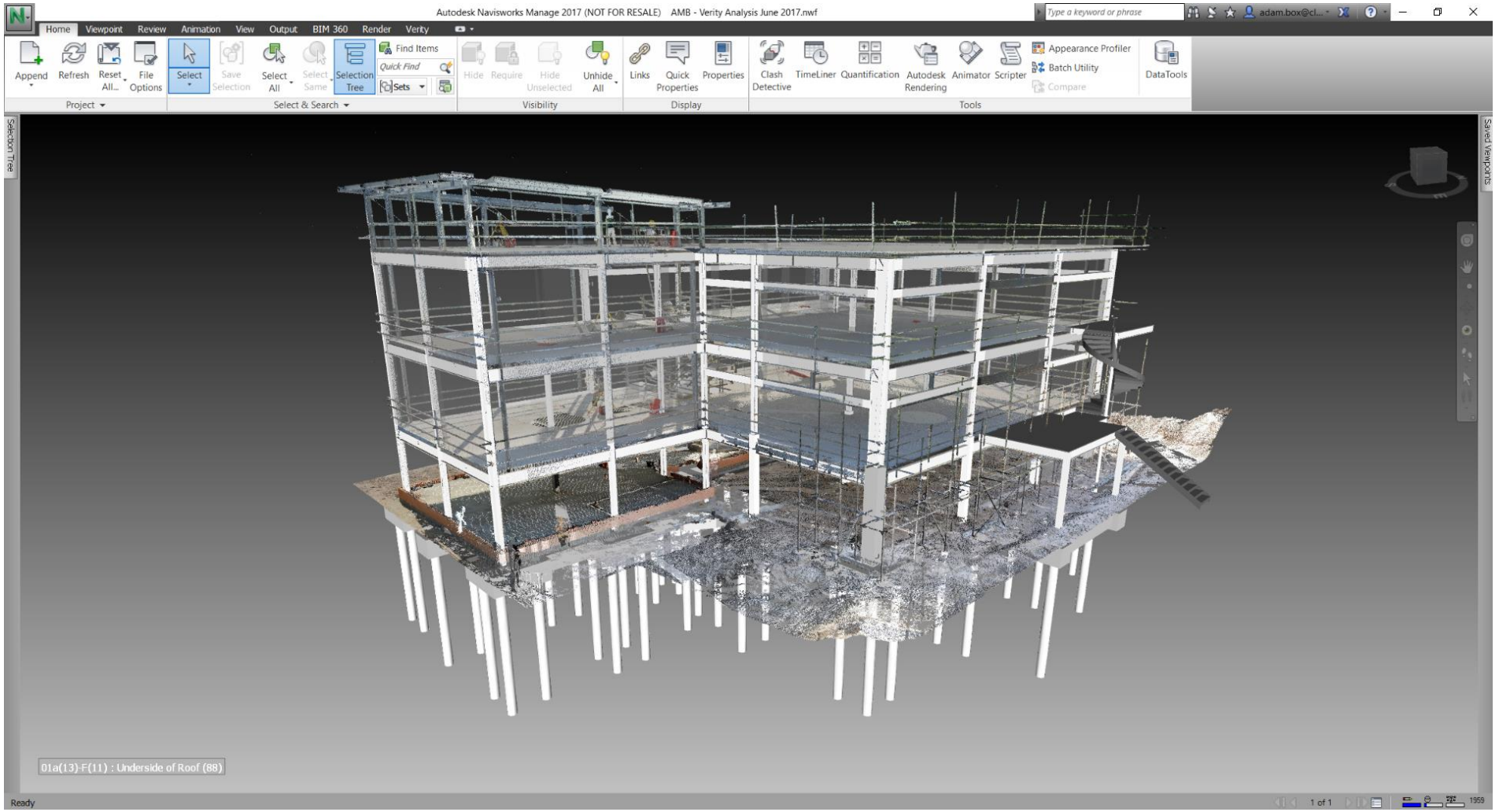


Change! Not first come, first served

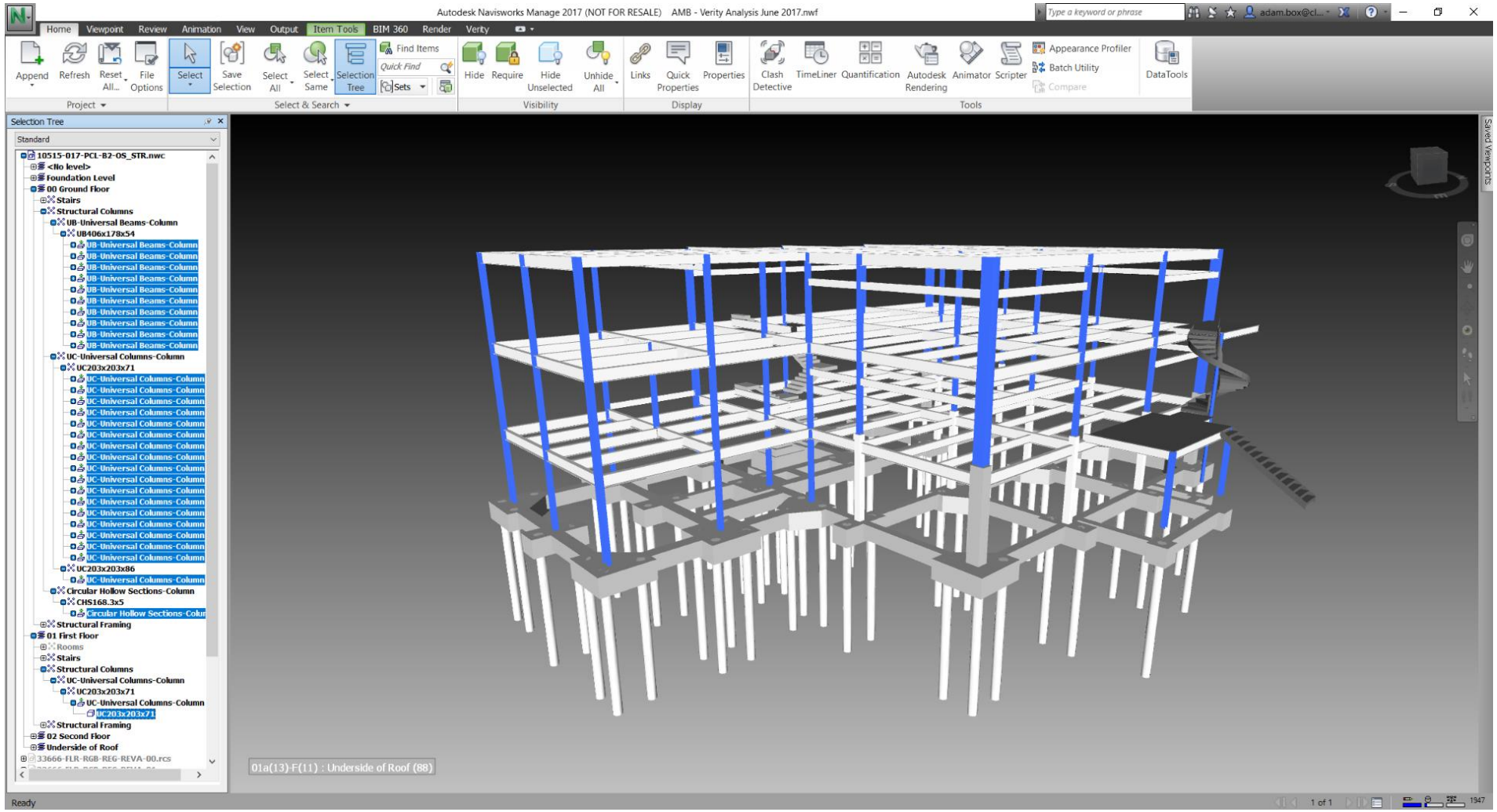
Step 1: Load The Design Model into Navisworks



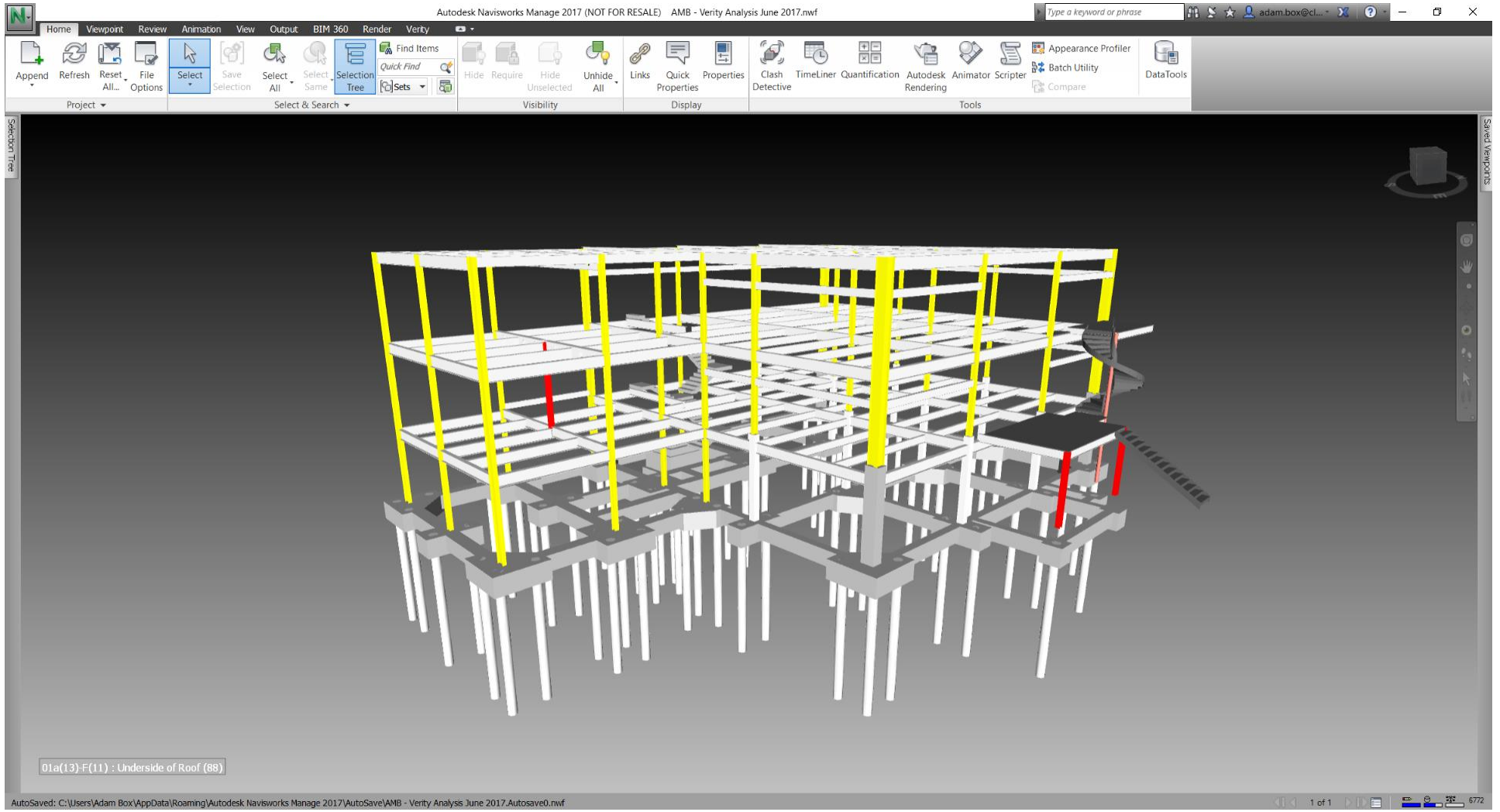
Step 1: Align The Point Cloud To The Model



Step 1: Select The Objects To Be Analysed



Step 2: Analyse in Verity



Capture Issues Early

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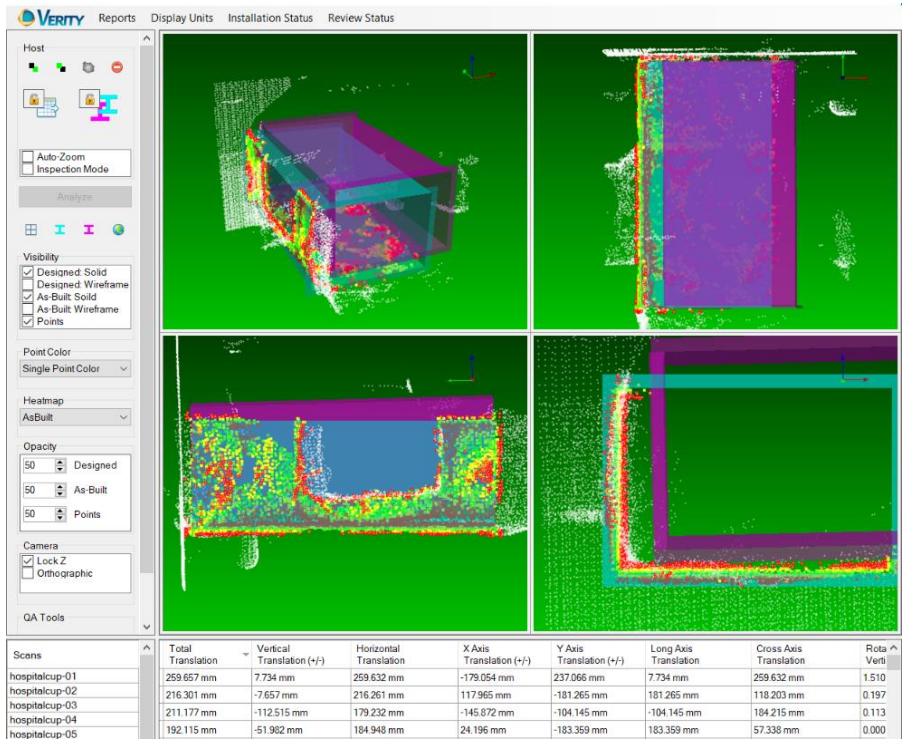

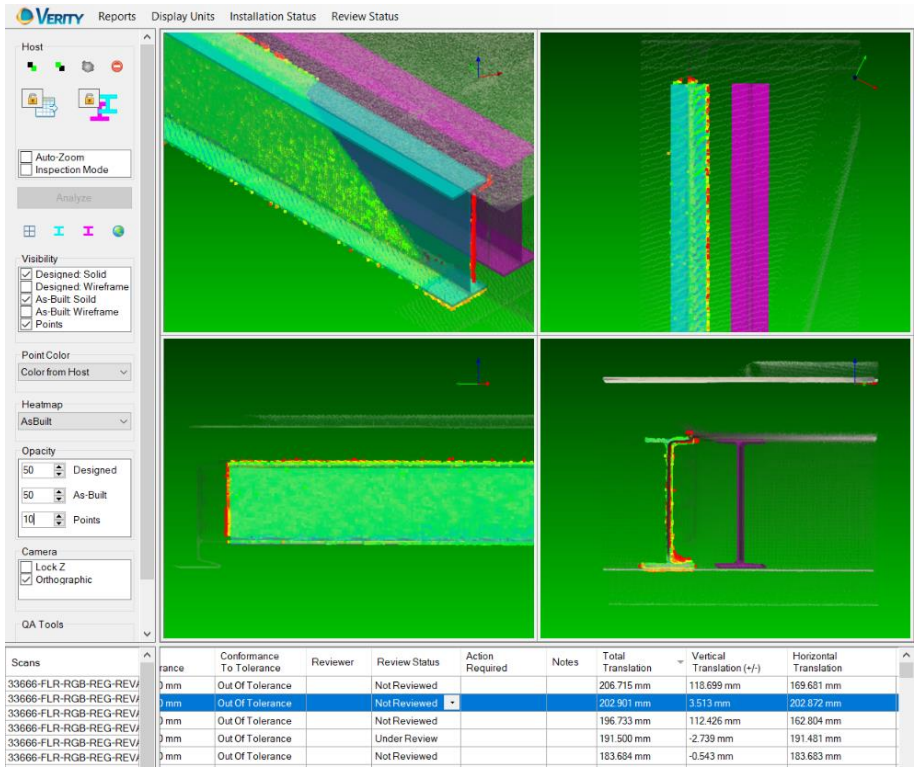

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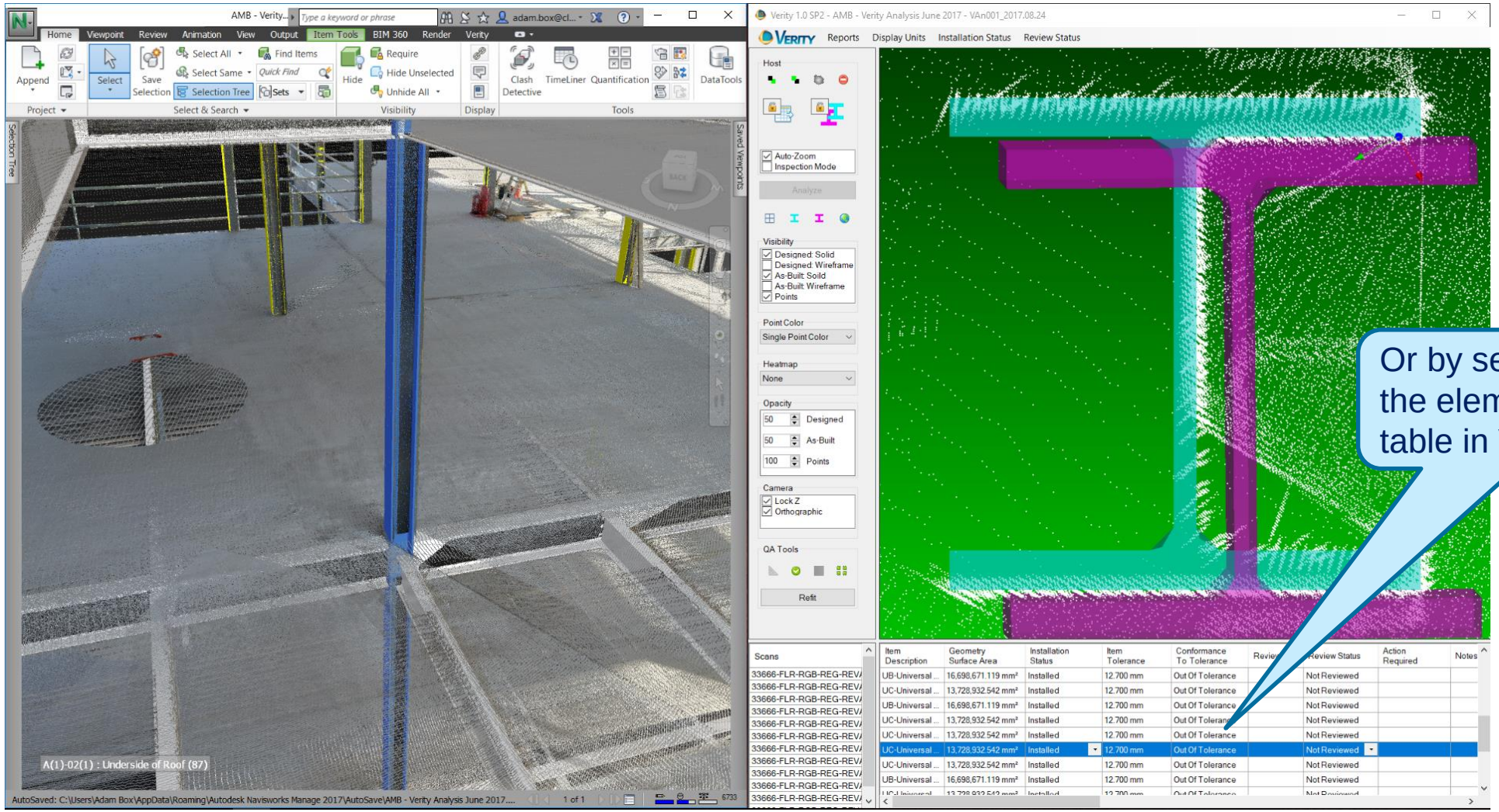
Step 3: QA/QC Objects in Verity



BIM 360 Field – Field Verification

It isn’t possible to laser scan everywhere

- Time
- Cost
- Access

Verification

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Benefits

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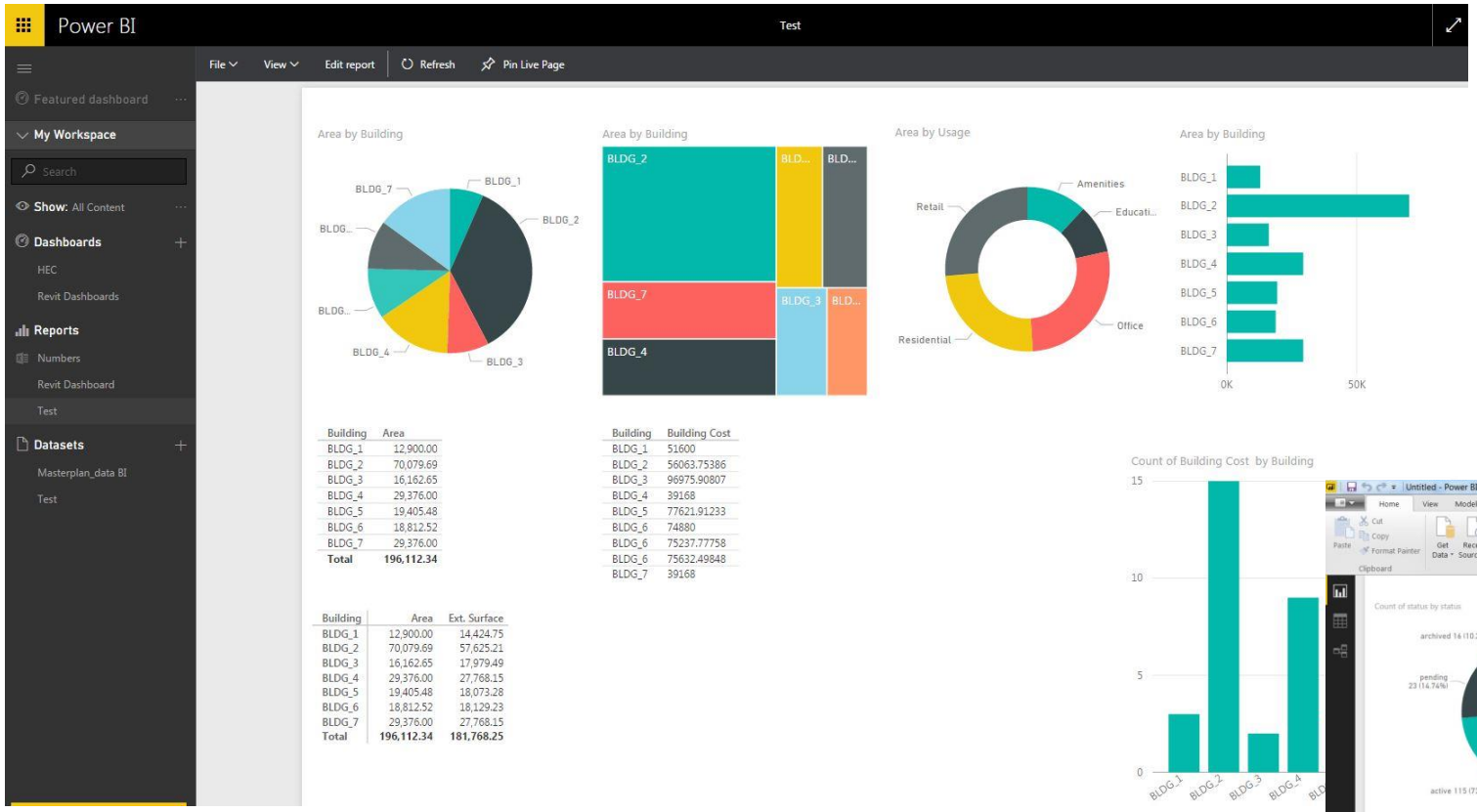
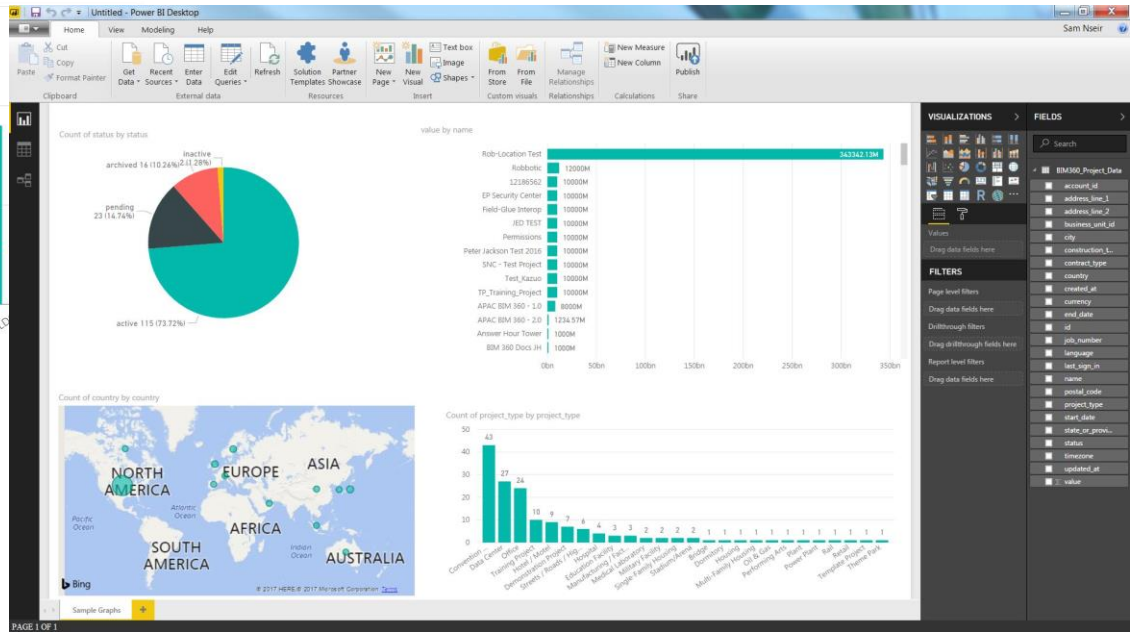
Analytics - Dashboards



Building	Area
BLDG_1	12,900.00
BLDG_2	70,079.69
BLDG_3	16,162.65
BLDG_4	29,376.00
BLDG_5	19,405.48
BLDG_6	18,812.52
BLDG_7	29,376.00
Total	**196,112.34**

Building	Building Cost
BLDG_1	51600
BLDG_2	56063.75386
BLDG_3	96975.90807
BLDG_4	39168
BLDG_5	77621.91233
BLDG_6	74880
BLDG_6	75237.77758
BLDG_6	75632.49848
BLDG_7	39168

Building	Area	Ext. Surface
BLDG_1	12,900.00	14,424.75
BLDG_2	70,079.69	57,625.21
BLDG_3	16,162.65	17,979.49
BLDG_4	29,376.00	27,768.15
BLDG_5	19,405.48	18,073.28
BLDG_6	18,812.52	18,129.23
BLDG_7	29,376.00	27,768.15
Total	**196,112.34**	**181,768.25**



Key Points

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- Get the Project team buy in
- Work as a team
- Listen to the problems and look for solutions
- Don’t be afraid of change
- Define and document the procedures

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Statements

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Alex Wyman – Section Engineer

BIM Field has enabled me to **proactively manage QA on site**. With the ability to **access all of the check sheets**, specifications and drawings, and also take photographs as part of pre pours and post pours to provide evidence of compliance for the client and link them to it has streamlined the process and enabled us to **provide a much higher standard of Quality Assurance** to the client than I have been able to provide in the past.

Naran Vekaria – Quality Manager

Initial I was optimistic about using BIM 360 Field, thought it was a another tool and was a hindrance.
But more I got to use the BIM 360 Field I found it to be more part of me as **handy information reference** and easier to **raise observations** while on site.

Andrew Tunley – Section Engineer

I think the key is to having the system **set up right in the beginning** and having the support of someone running with it to maintain and **keep up the quality.**
As you may tell if done right then this **can save a vast amount of time** and also on the environment it **reduces the amount of paper** used just as a check.
Also with pictures tagged to correct locations and none missed this also helps as a **quality check** as well.
Last words…. **Stress reduced**, **more time to concentrate on site safety** and looking after others as part of my Mental Health First Aid.

Stephen Gilcrest - Trainee Site Manager

BIM 360 field in my opinion has many benefits overall that not only provides assistance on site but keeps records of all documents carried out, **minimising paper copies** that can be well controlled, organised and **improve the quality assurance** for every aspect throughout this project.
I believe this will help towards improving management professionalism on site **reducing time spent in the office** having information to access and manage in the field when needed, that could **potentially save on cost overall**. While using this system many other programmes on the main Autodesk website can be filtered down to assist managers on site, checking outstanding items which help me personally to keep track and close items I have raised. I would **provide reports** based on items/issues that need resolving emailing subcontractors making them aware to resolve/close out. I think this is improving project performance on MECD and will **help achieve minimal defects/snags** towards handover date making Balfour Beatty more efficient.

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Summary

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AUTODESK® BIM 360™ DOCS

- To Replace the Arup FTP Site
- To Share WIP Models
- Compare File Versions

AUTODESK® BIM 360™ GLUE

- To view and navigate around project models on site with an iPad
- Raise Comments and Mark Ups directed at the BB design team
- Host Navis File
- Link Equipment Sets to BIM 360 Field
- Link Room Barcodes to BIM 360 Field
- Verification For As Constructed Model

AUTODESK® BIM 360™ FIELD

- Daily Diaries
- Construction Approved Document & Drawing Library
- QA Check Sheets
- H&S Check Sheets
- Observations; Supervisor, Site Operatives, Consultant
- Plant Tagging & Register
- Site Permits; Hot Works Permit, Permit to Dig
- Location Barcodes to collate information against a location
- Verification For As Constructed Model

AUTODESK NAVISWORKS

- BB Clash Management
- Viewing the BIM 360 Glue Model (BIM 360 Tab)

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AUTODESK®

Make anything.