A Era BIM

2º Seminário Internacional

sinaenco
SINDICATO DA ARQUITETURA E DA ENGENHARIA

BIM na Prática

Adequação da abordagem aos requisitos do cliente

@José Carlos Lino

CB

BIMMS BUILDING INFORMATION MODELING & MANAGEMENT SOLUTIONS

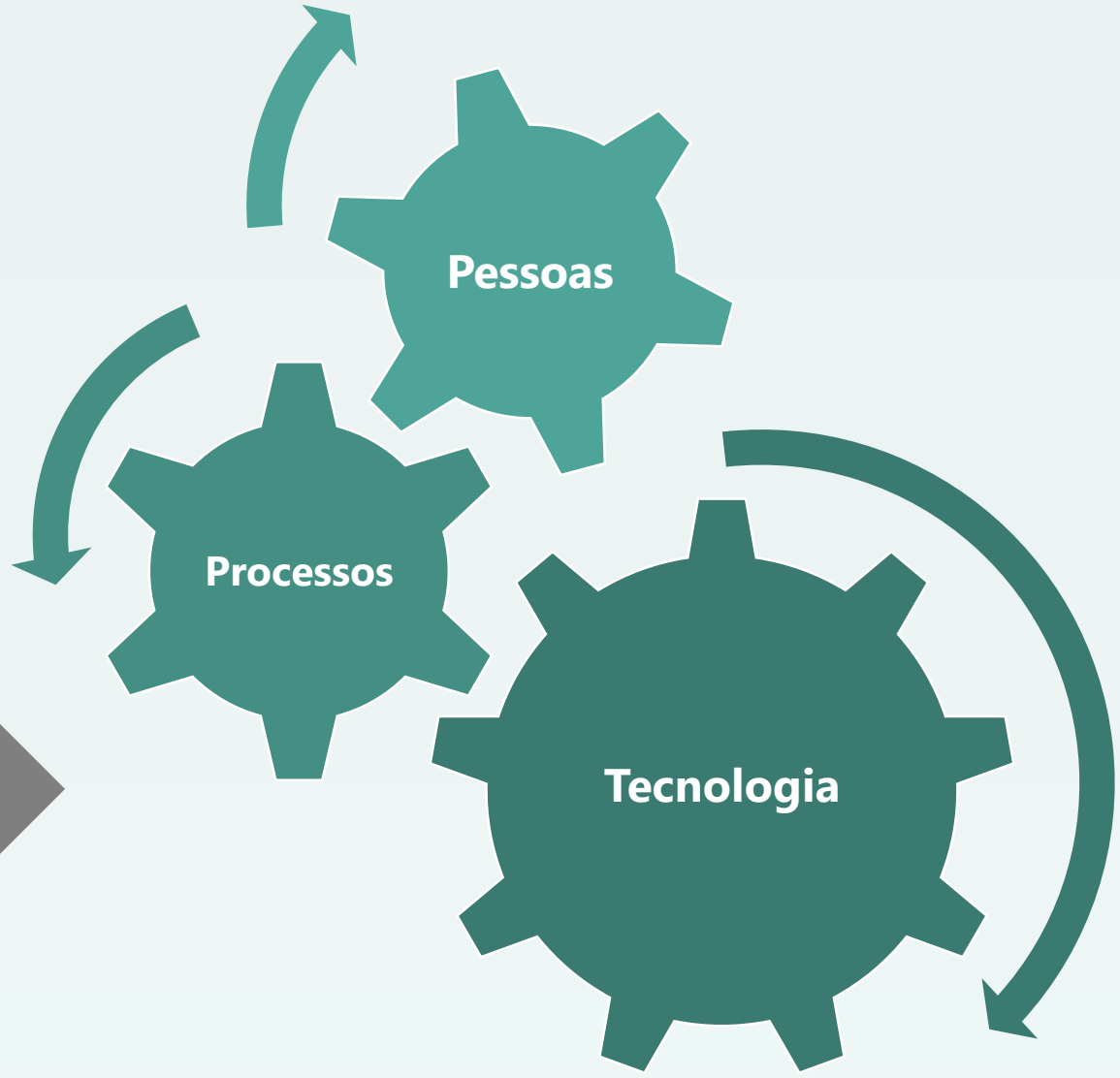
A mudança para o BIM obriga à alteração de:

- Procedimentos
- Organização de ficheiros
- Ambientes de trabalho
- Gestão do tempo
- Software
- Comunicação

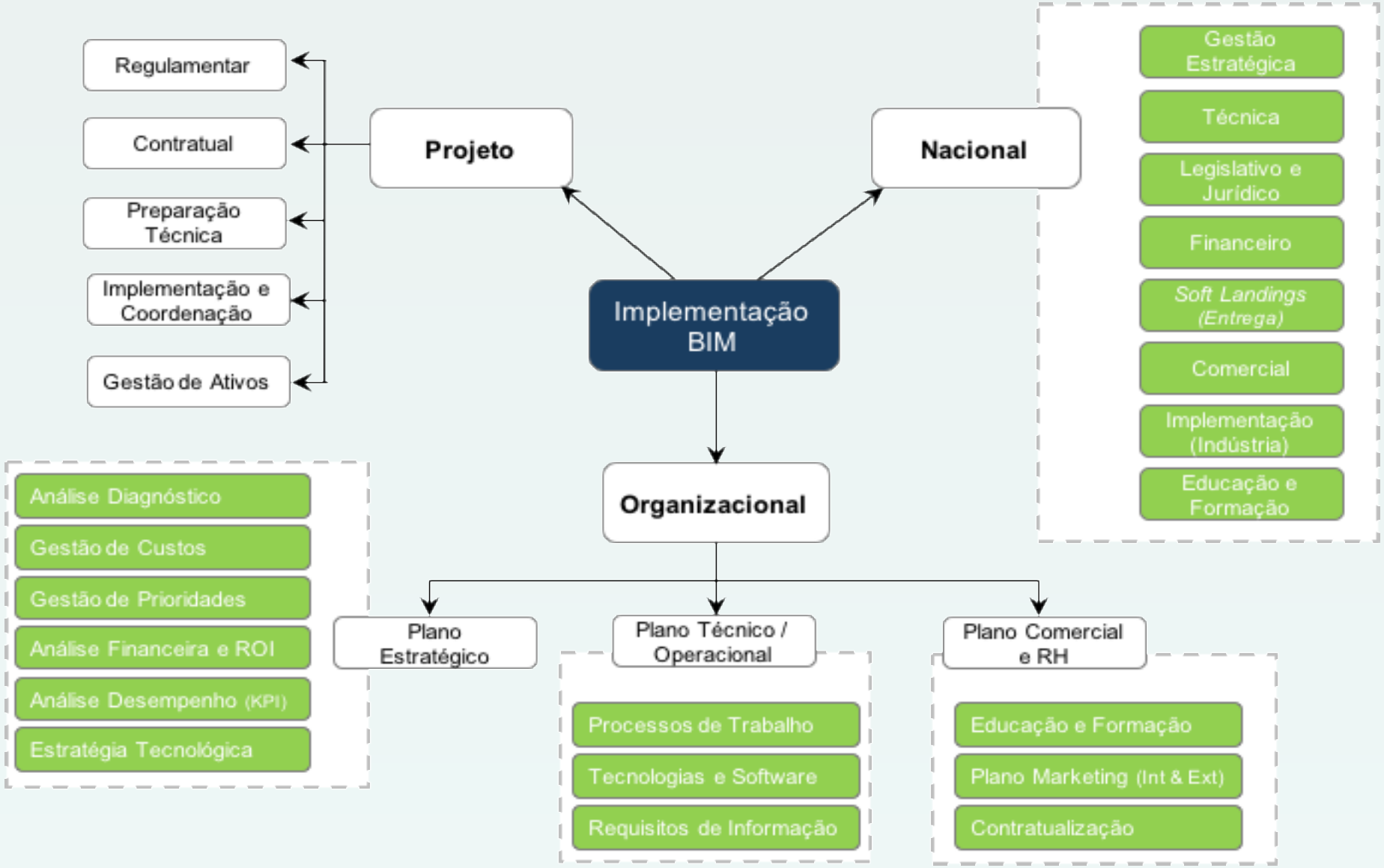
Building Information Modeling
(Management)

BIM

Políticas



Diferentes níveis de Implementação BIM



01.

Industrial Retrofit

Lisbon, Portugal | Offices |Laser scaning

Industrial Building Reabilitation

- Laser Scanning;
- BIM 3D modelling;
- Obtaining support drawings.

Station Location - Leica TruView

- Site work = 5 days;
- 180 stations.

Final result - Union and treatment of point clouds

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BIM na Prática

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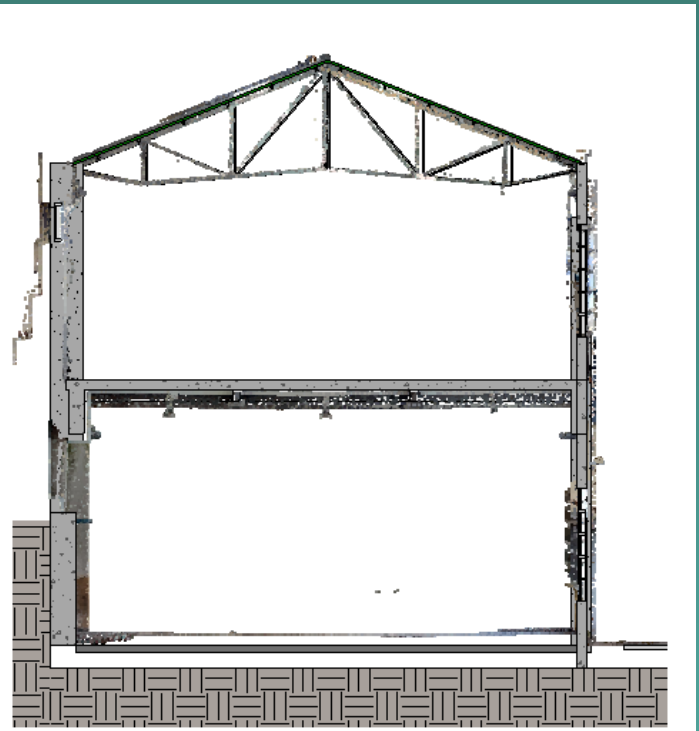
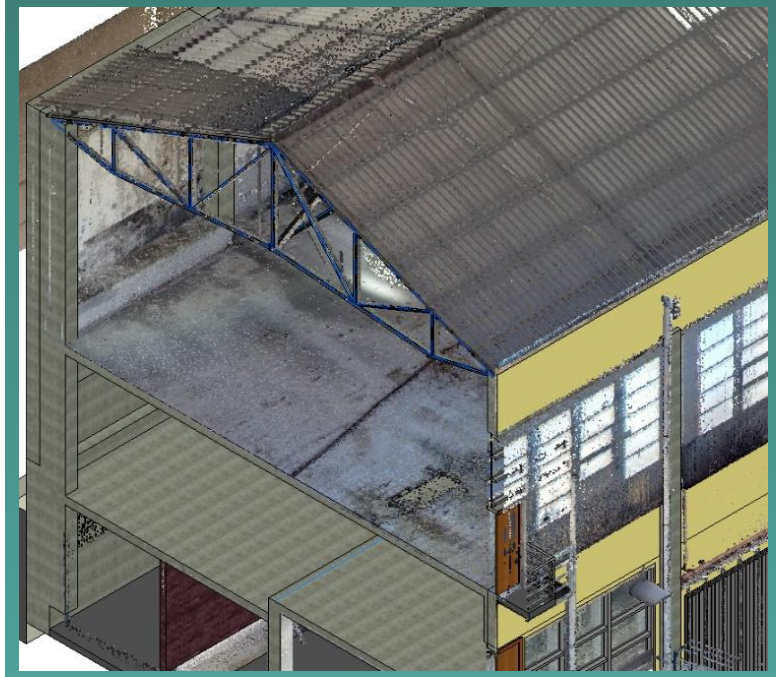
BIMMS BUILDING INFORMATION MODELING & MANAGEMENT SOLUTIONS

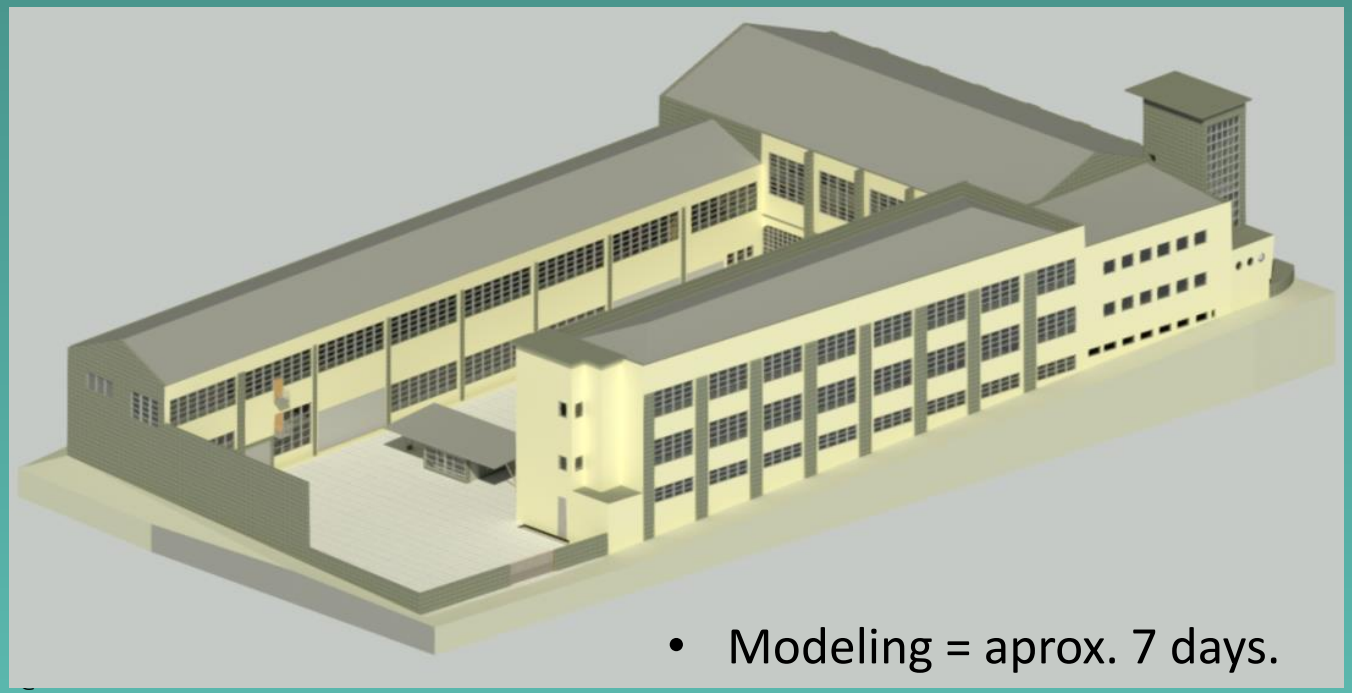
Modeling on the cloud point



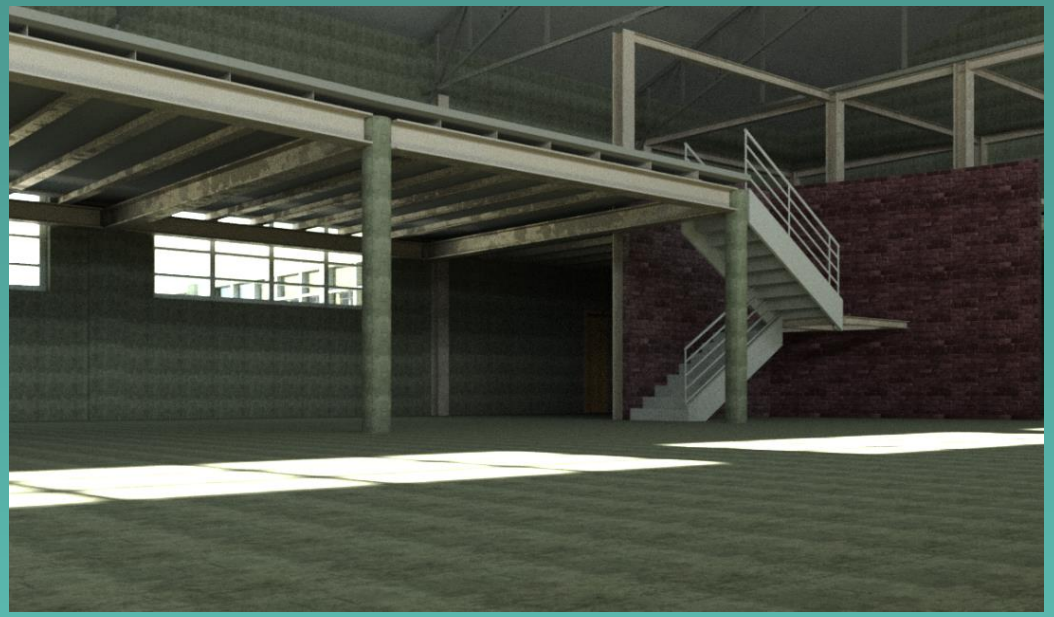


- Parametric families were produced to model trusses;
- For the current elements the native software families were used.

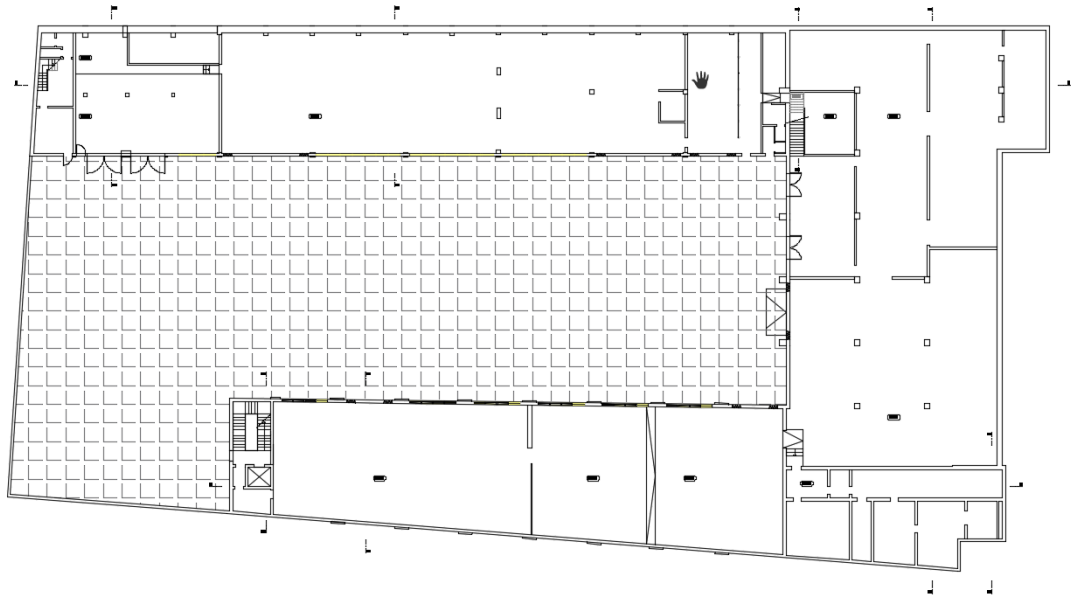
BIM na Prática

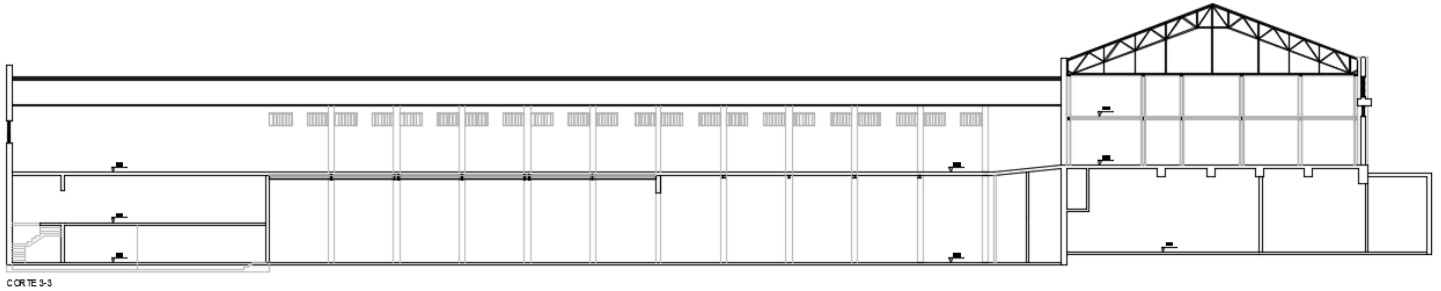


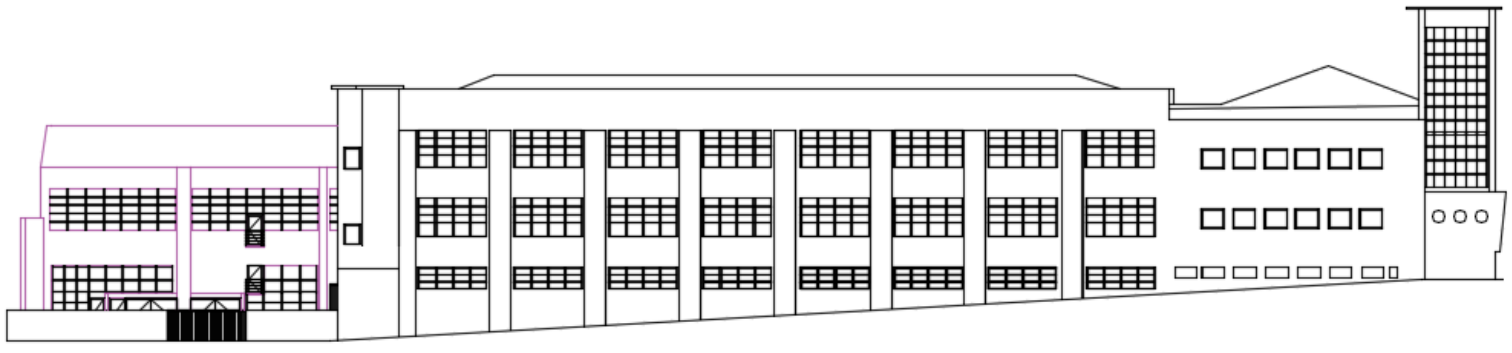
- Modeling = aprox. 7 days.

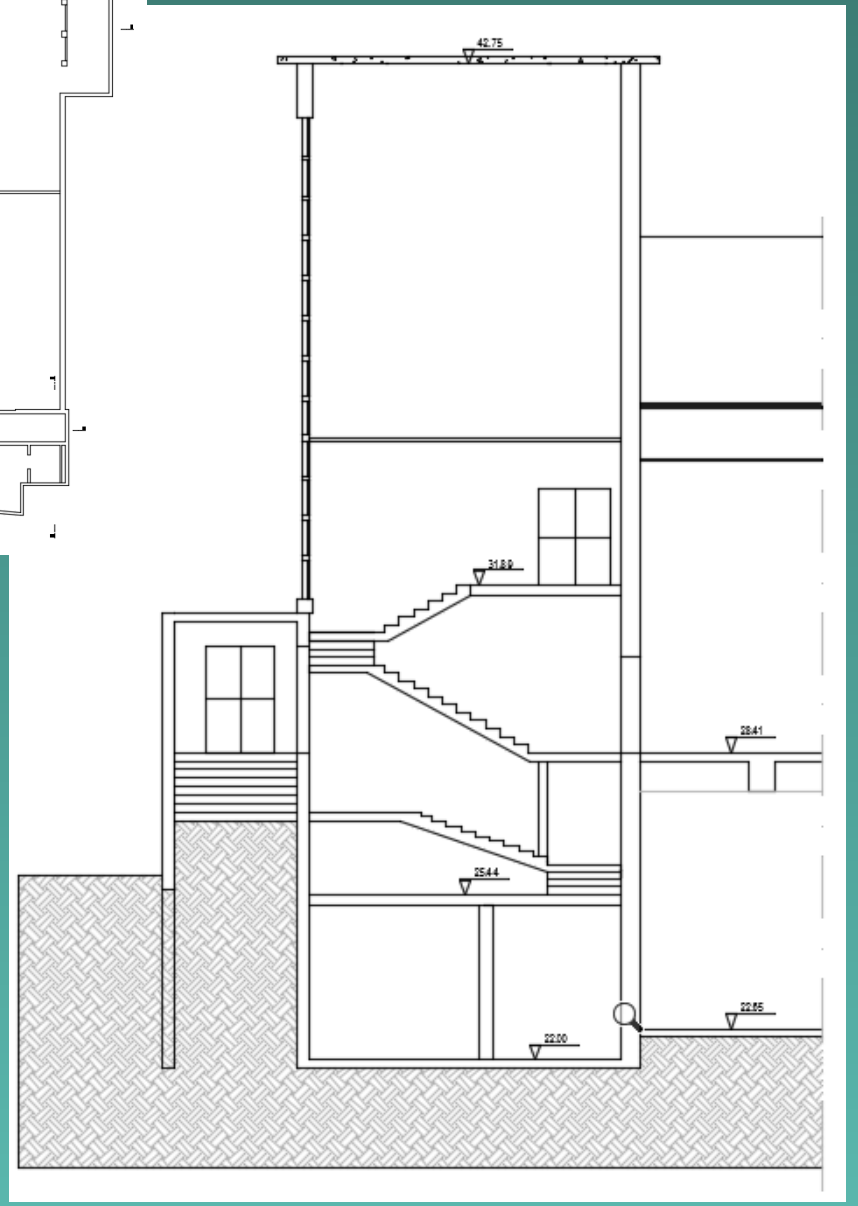


2D Exportation









CONCLUSIONS

- Laser scanning it´s not “laser vision”;
- Automatic modelling is still on early stages;
- Are drawings really the main goal?
- Learn to adress the right level of expectations;

02.

MAAT MUSEUM

Edp Foundation | Lisbon, Portugal | Art Museum | 6,400m^2

BIM Modelling

Architectural Model

Structural Model

Mechanical Model

Plumbing Model

Onsite Technical Support

Requests for design clarification

Technical Assistance Execution 3D preparation drawings

2D/ 3D support topographic project

Construction Planning (4D)

Cost Control (5D)

3D Coordination

Clash Detection

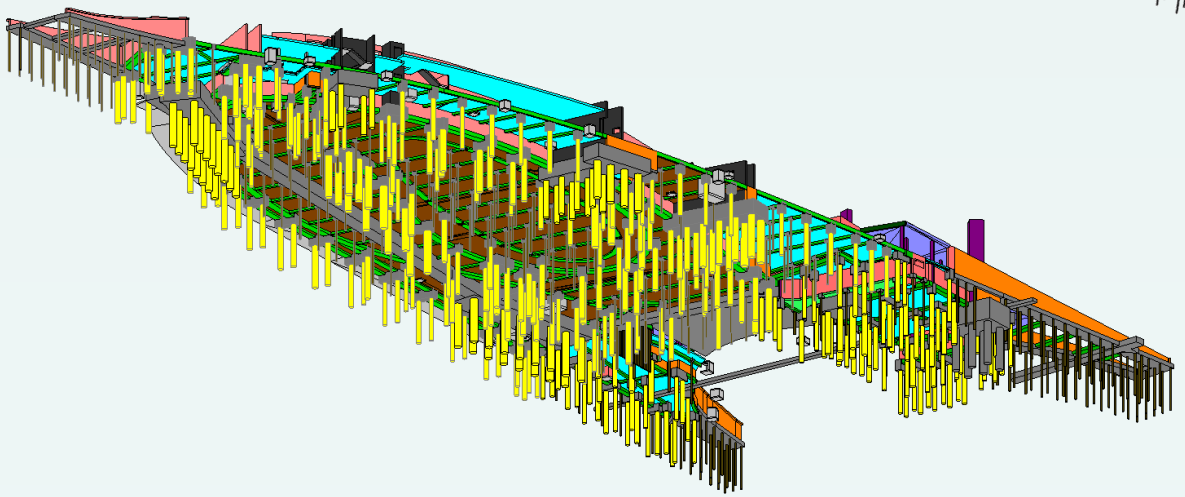
Coordinated Model

Quantities Take-off

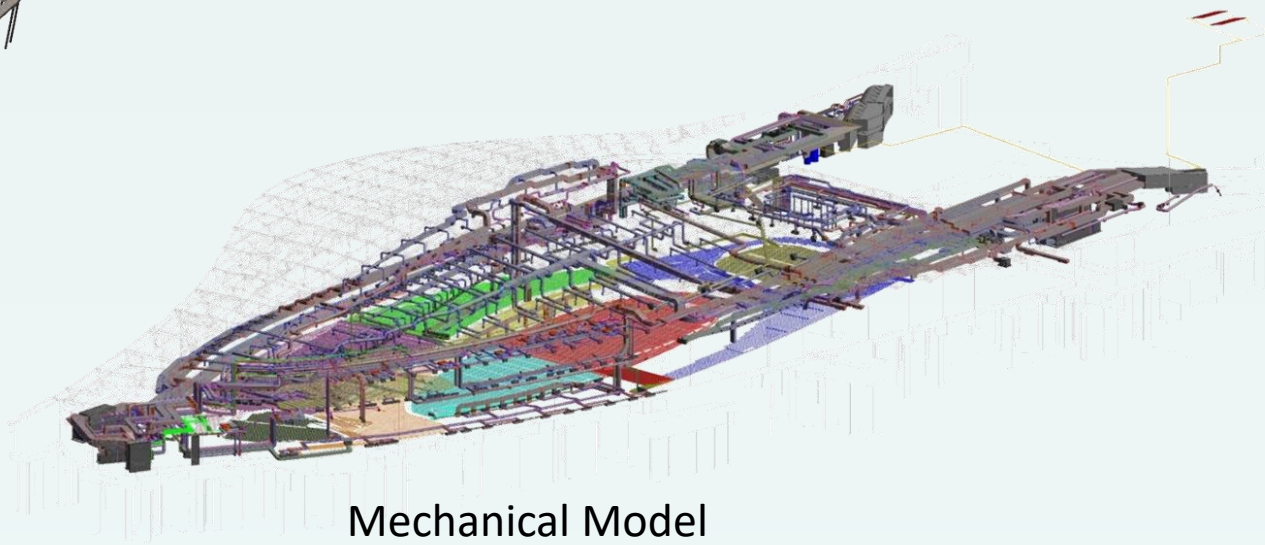
BIMMS

Modelling

Architectural Model



Structural Model

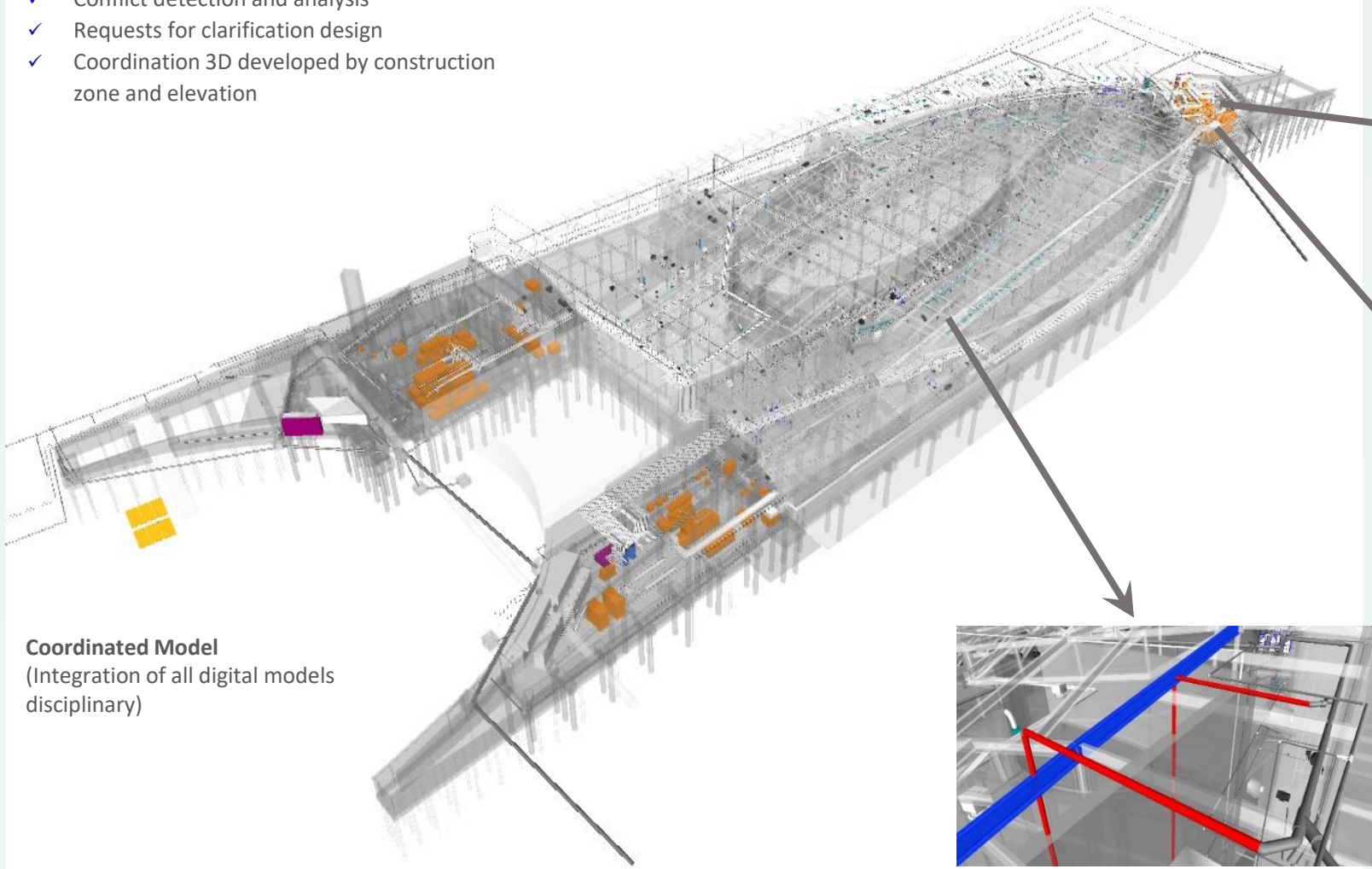


Mechanical Model

Somague Engenharia

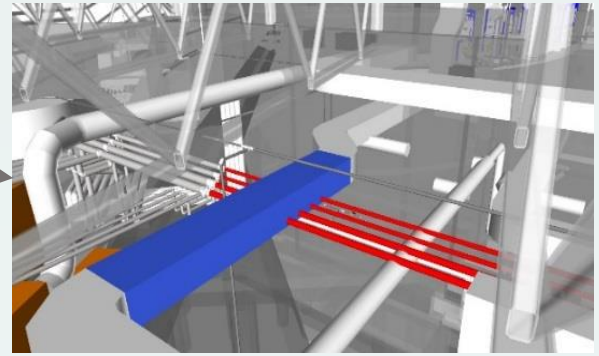
3D coordination

- ✓ Conflict detection and analysis
- ✓ Requests for clarification design
- ✓ Coordination 3D developed by construction zone and elevation

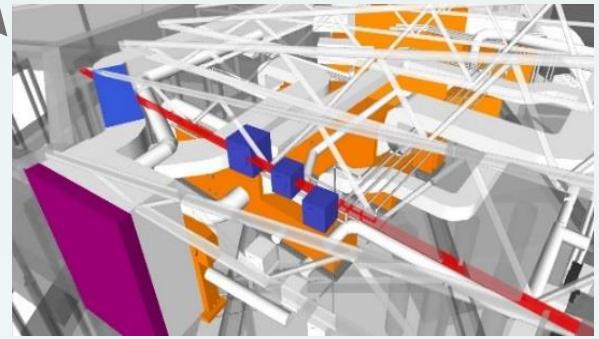


Coordinated Model
(Integration of all digital models disciplinary)

Structural vs Plumbing



Mechanical Plumbing vs

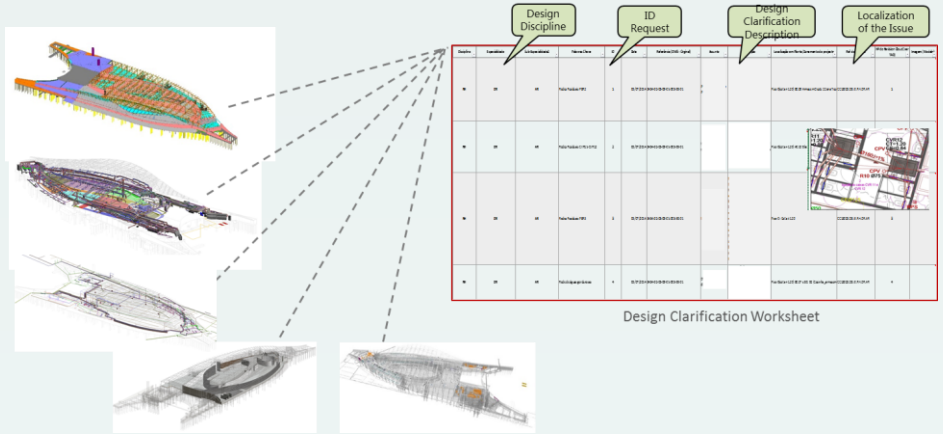


Structural Mechanical vs

Somague Engenharia

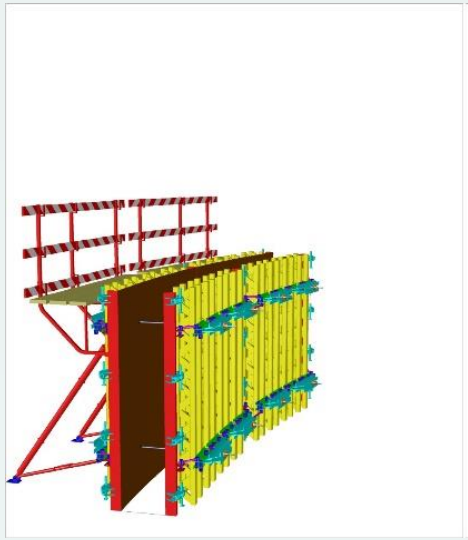
Planning and project management

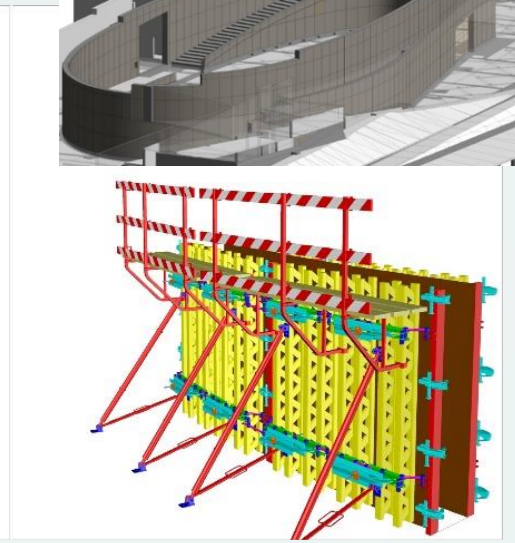
Request for Information



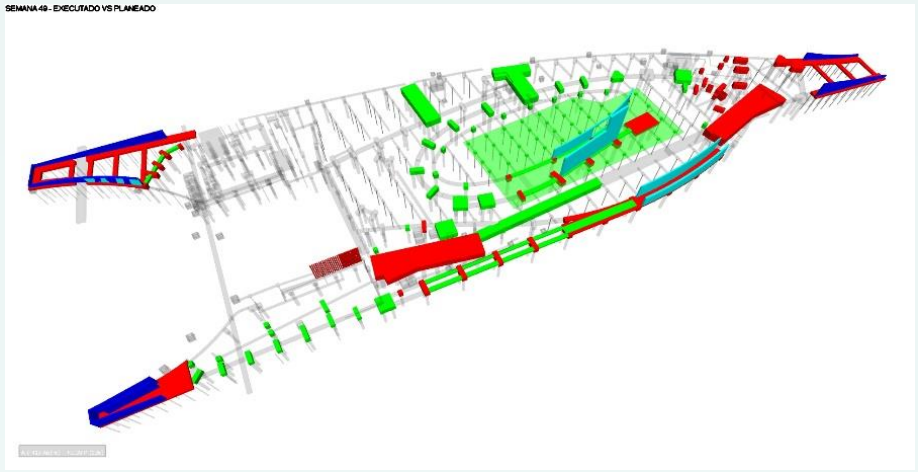
Design Clarification Worksheet

formwork planning

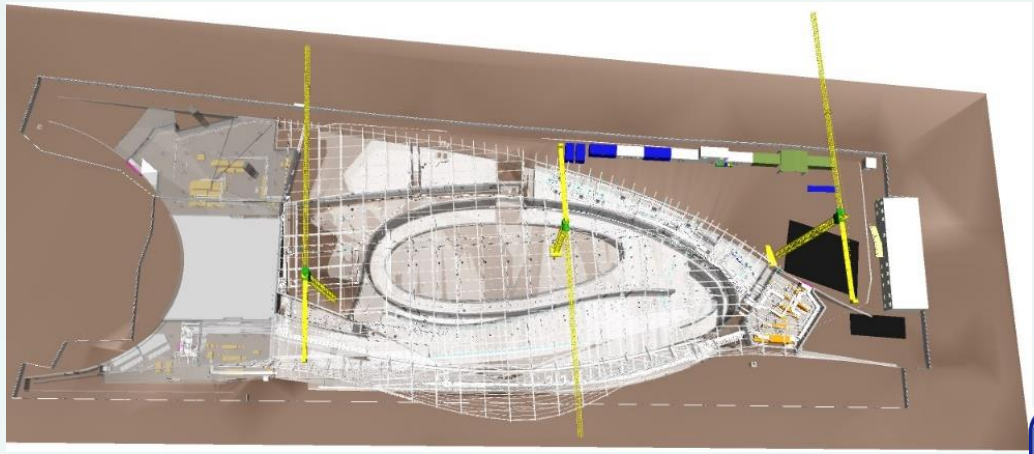




Internal Integration Team



Site Resource Management and Logistics Control



Somague Engenharia

CONCLUSIONS

- Proper BIM Contracting is almost everything;
- Firstly looks like a game, afterword it becomes “the game”;
- Construction management over the model;
- “Bim Hollywood” may be very useful in claim management;

03.

WATERFRONT HOTEL

Colombo, Sri Lanka | 800 Room Luxury Hotel and Retail | 200,000m^2

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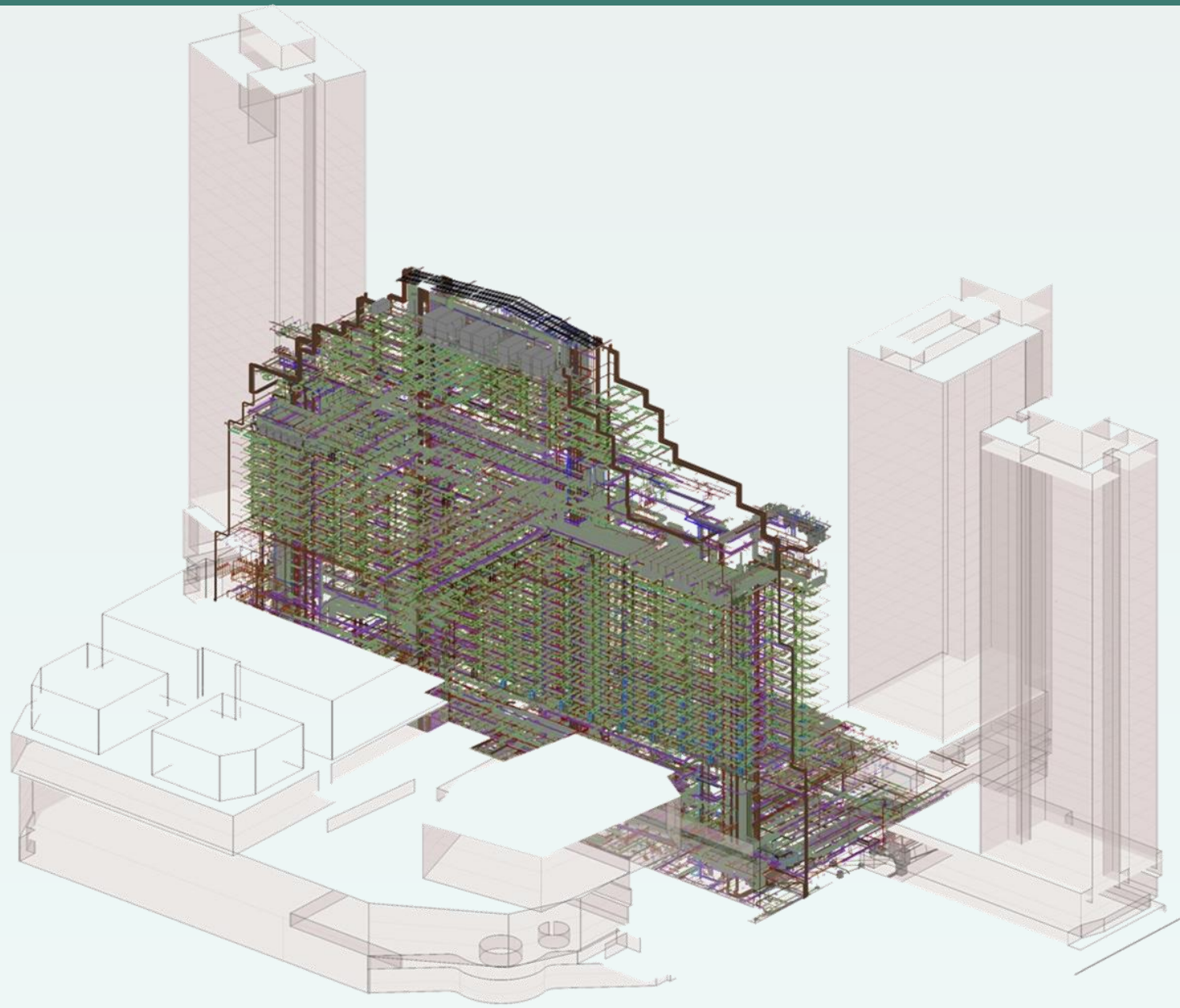
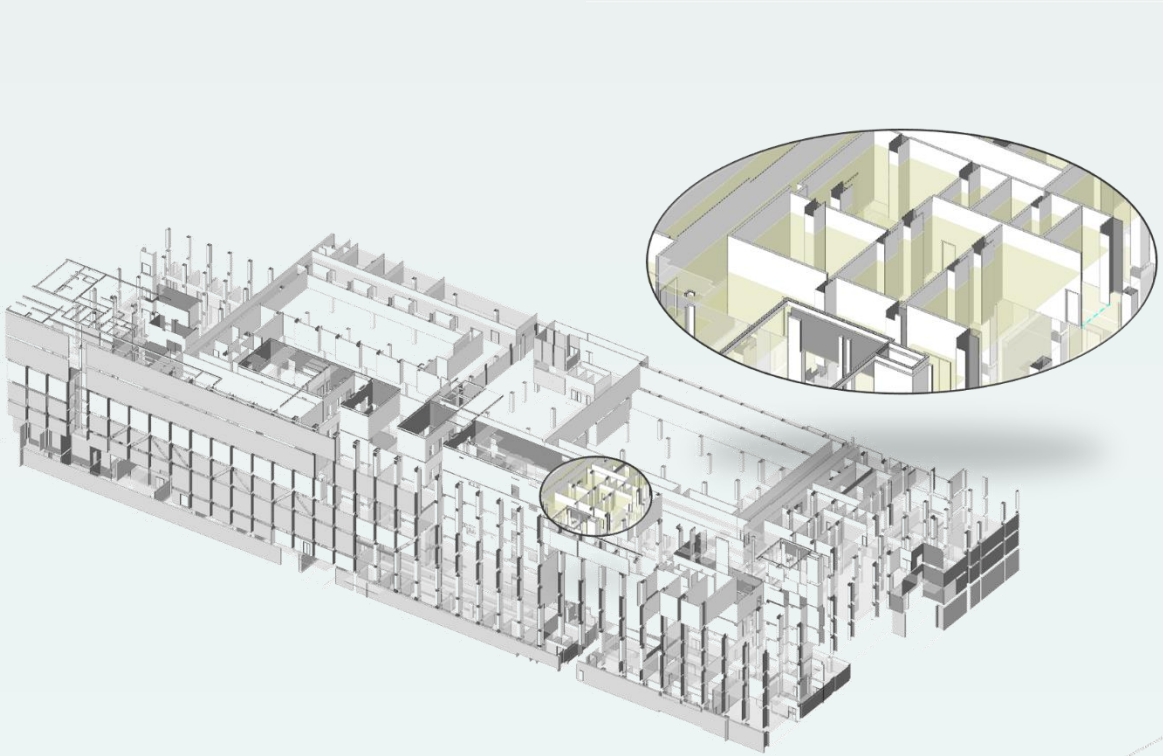
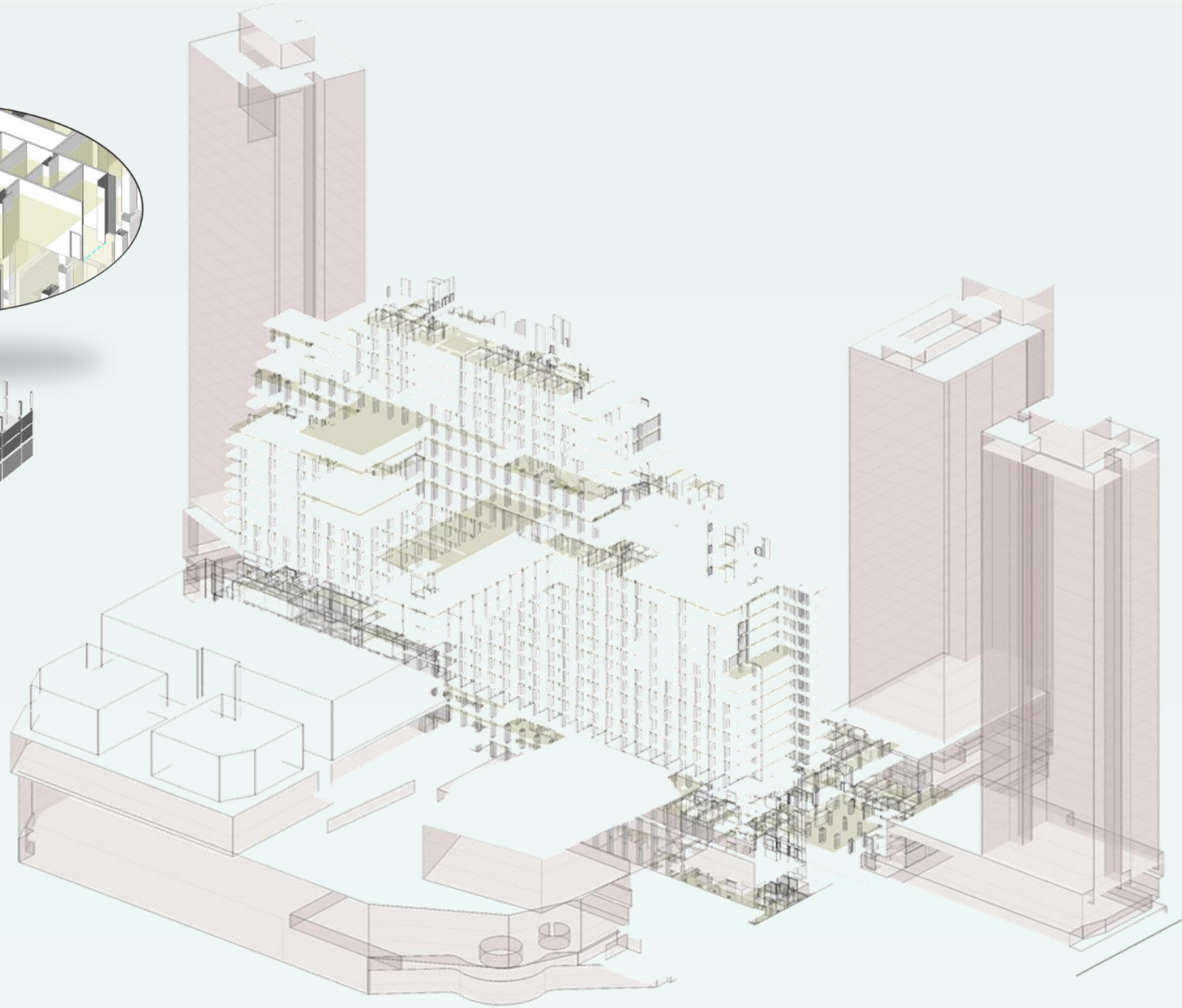
KEY NUMBERS

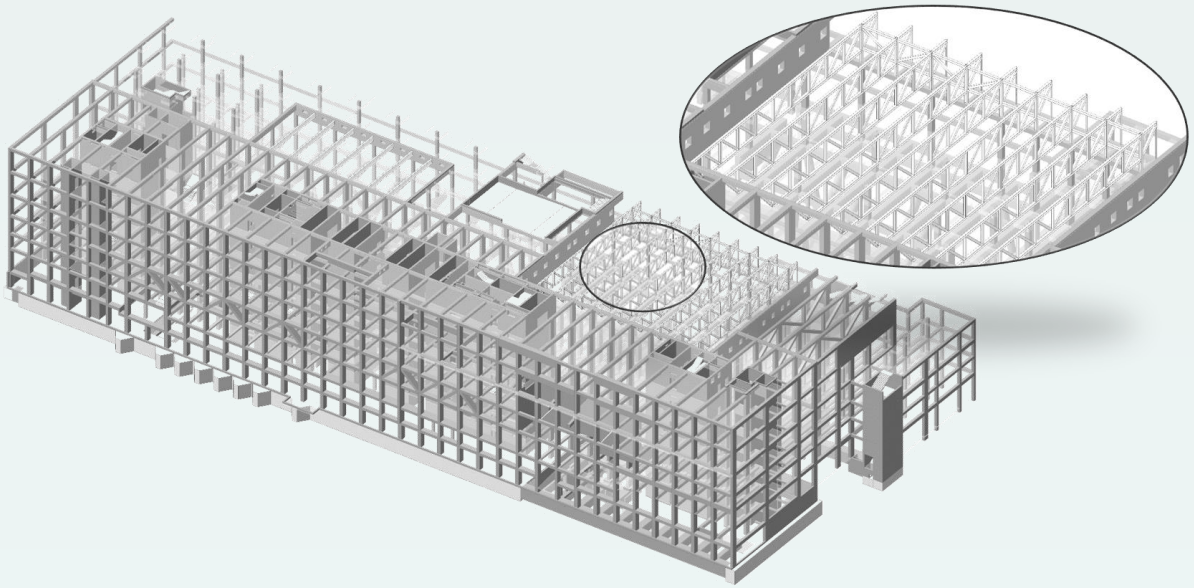
DUCTS	43 km
PIPES	170.5 km
AIR TERMINALS	4401 uni
MECHANICAL EQUIPMENT	1423 km
LIGHTING FIXTURES	3984 uni
CABLE TRAYS	36.3 km
SPRINKLERS	16591 uni

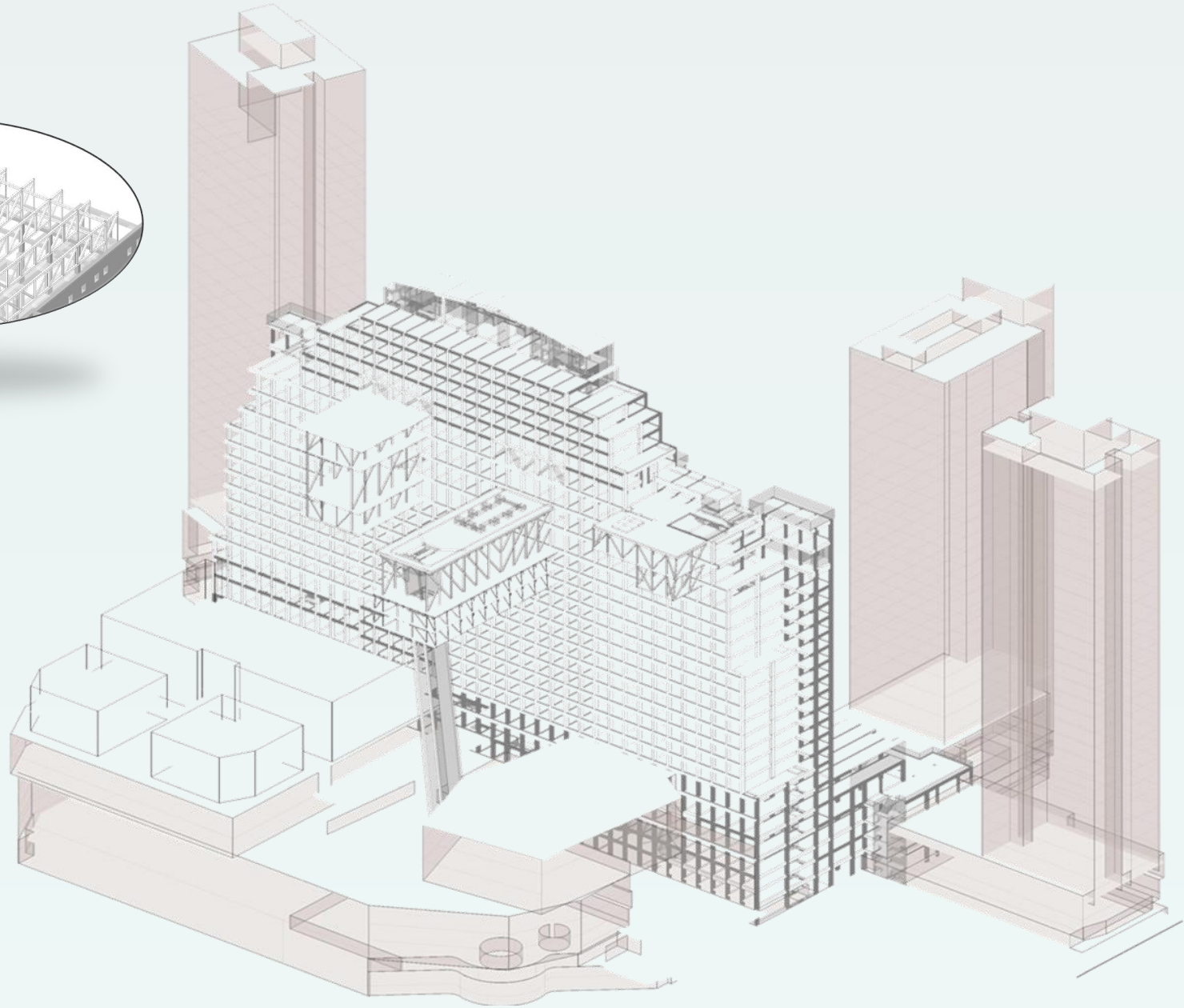




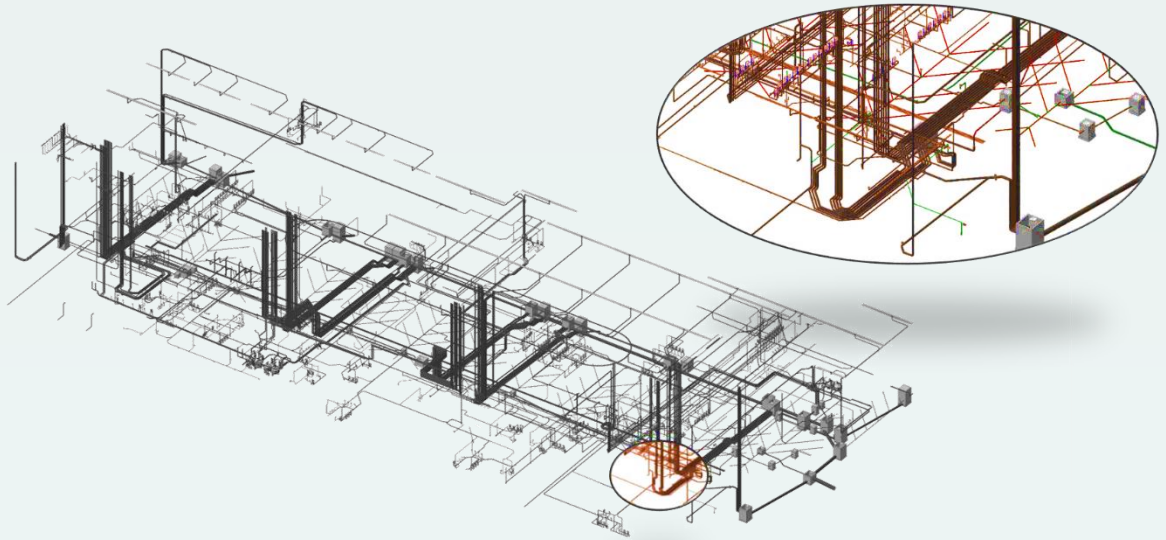


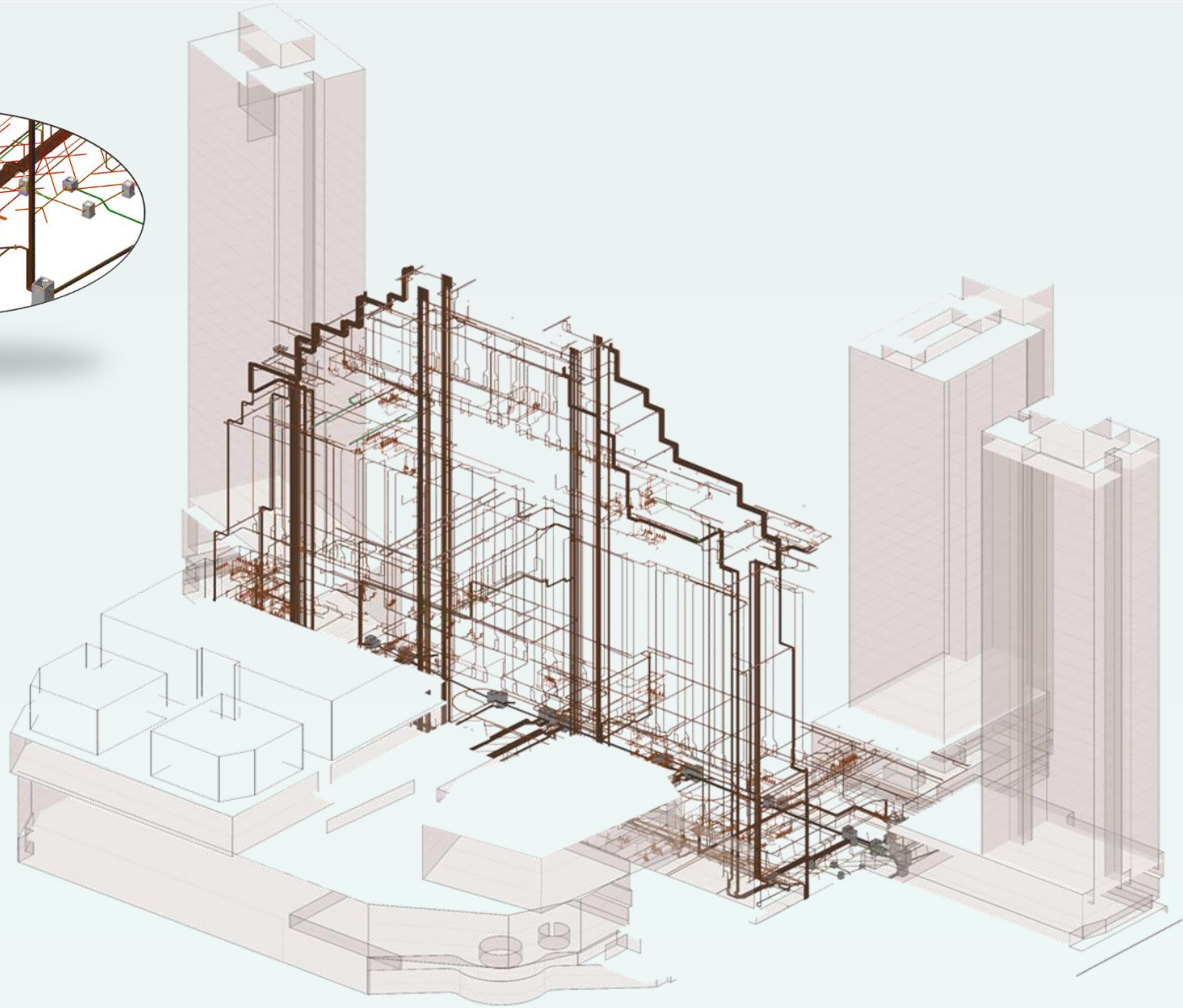
ARCHITECTURAL



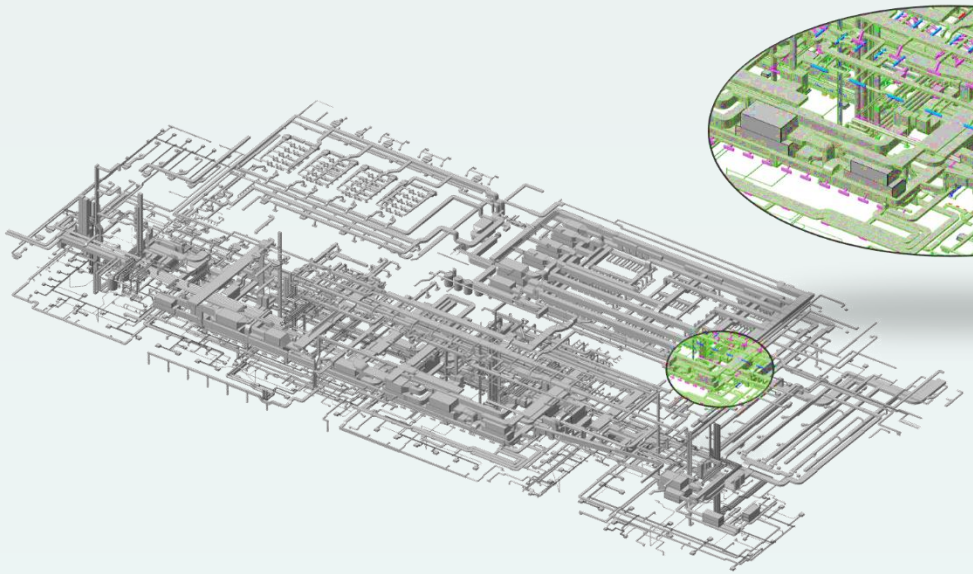


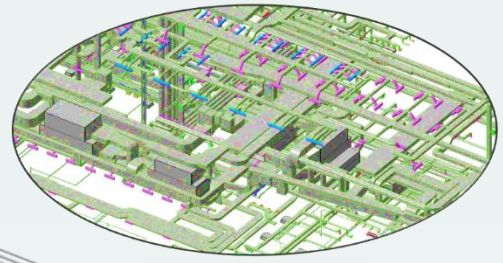
STRUCTURAL



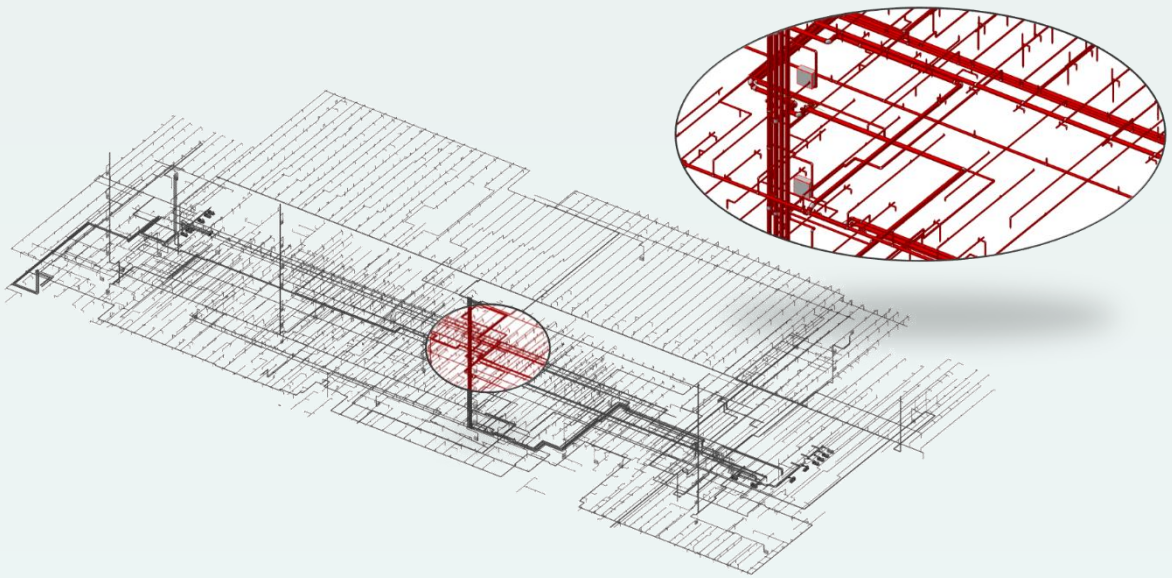


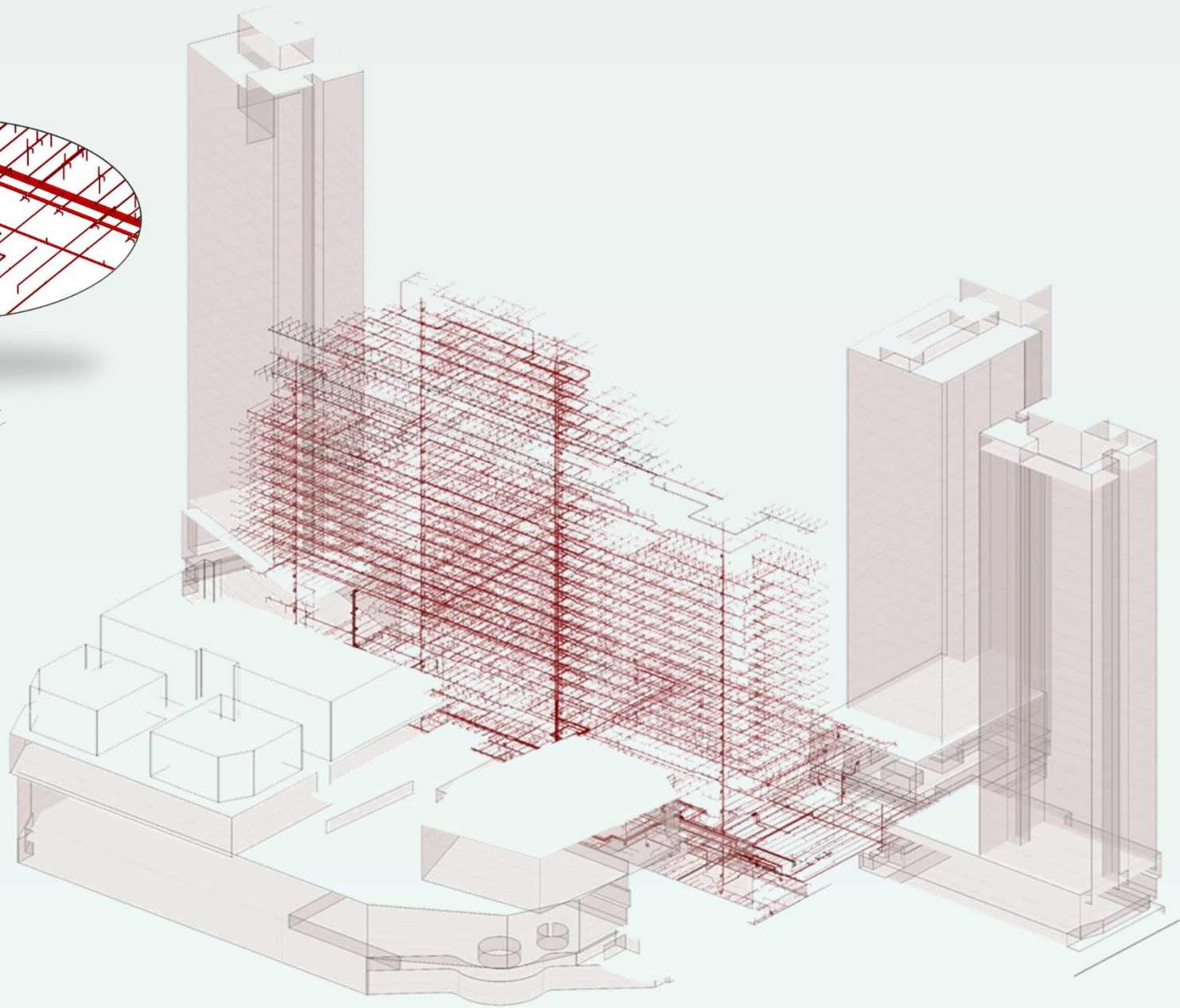
DRAINAGE



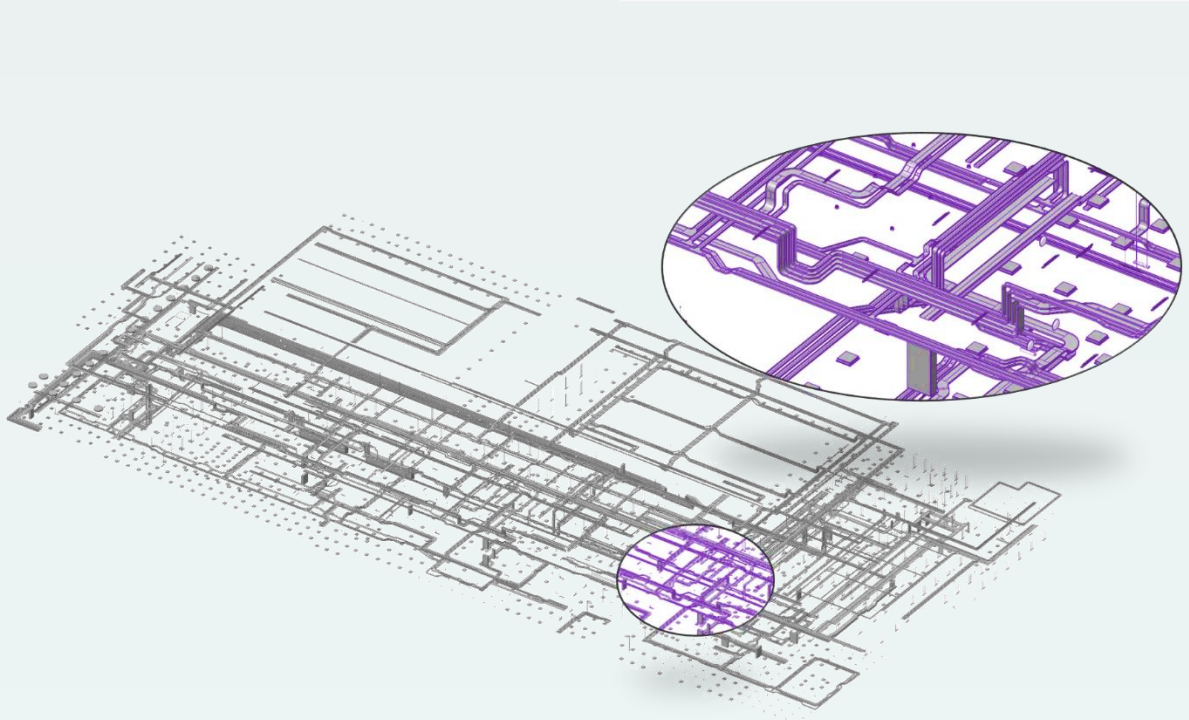


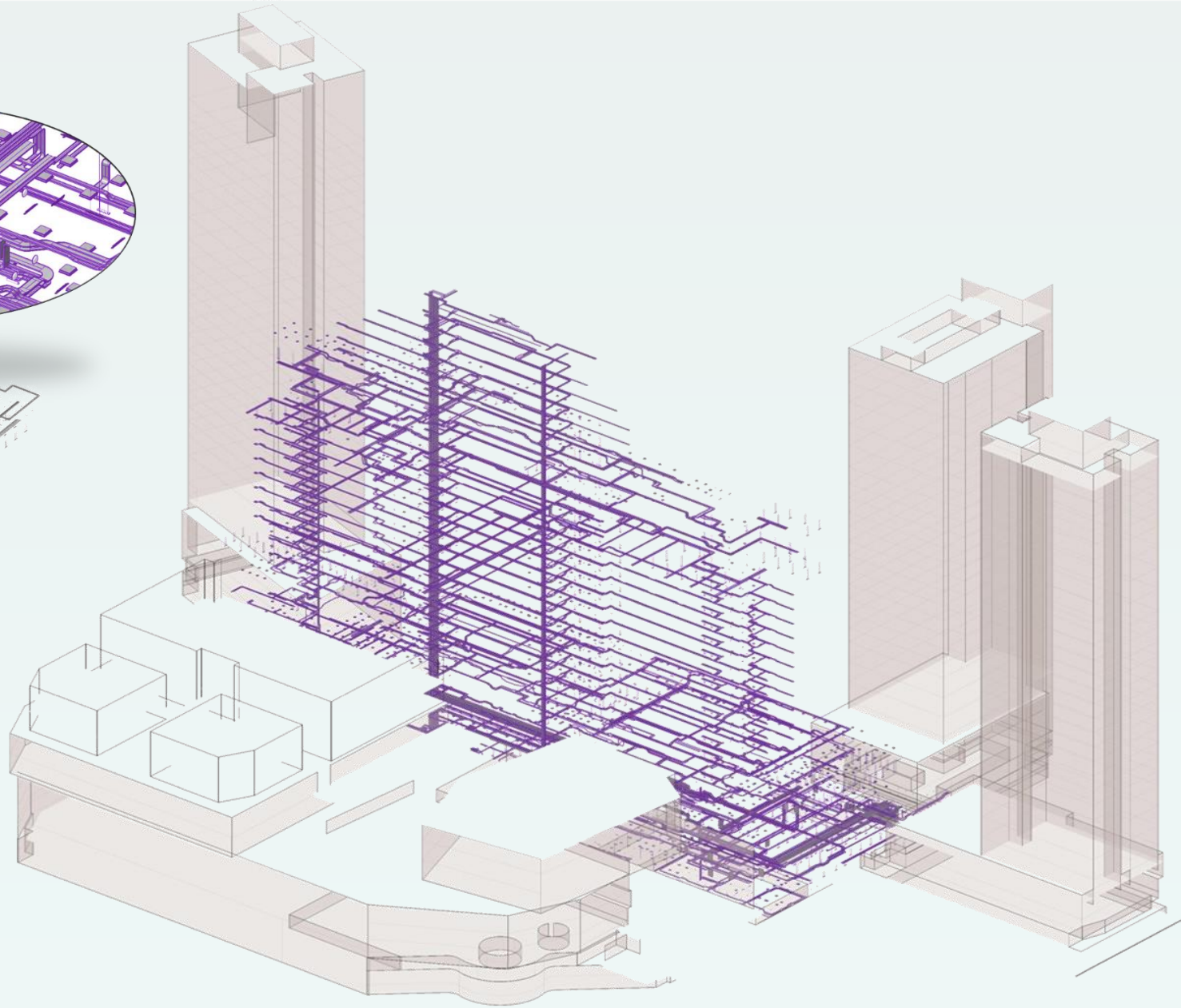
MECHANICAL



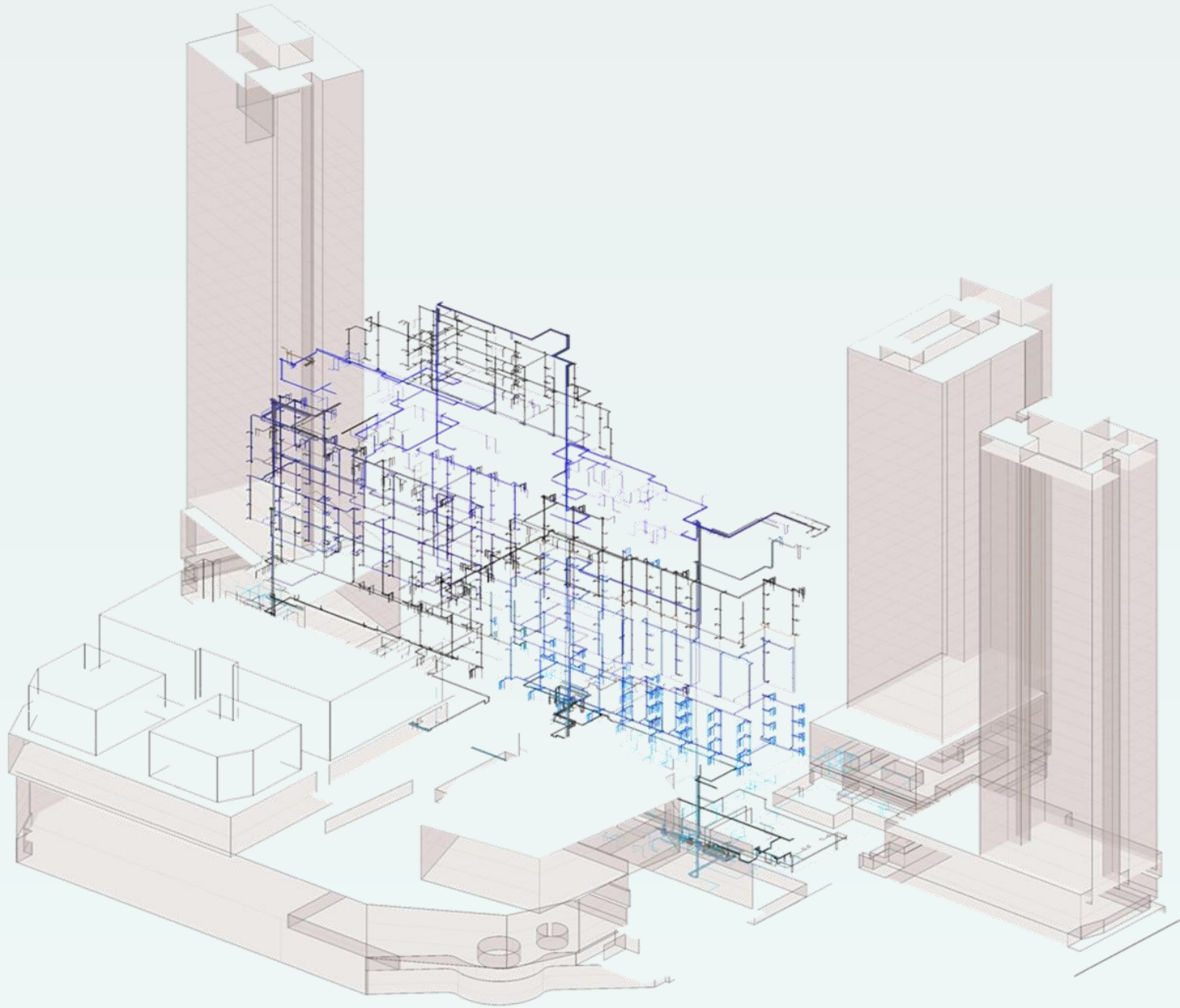


FIRE SYSTEM





ELECTRICAL



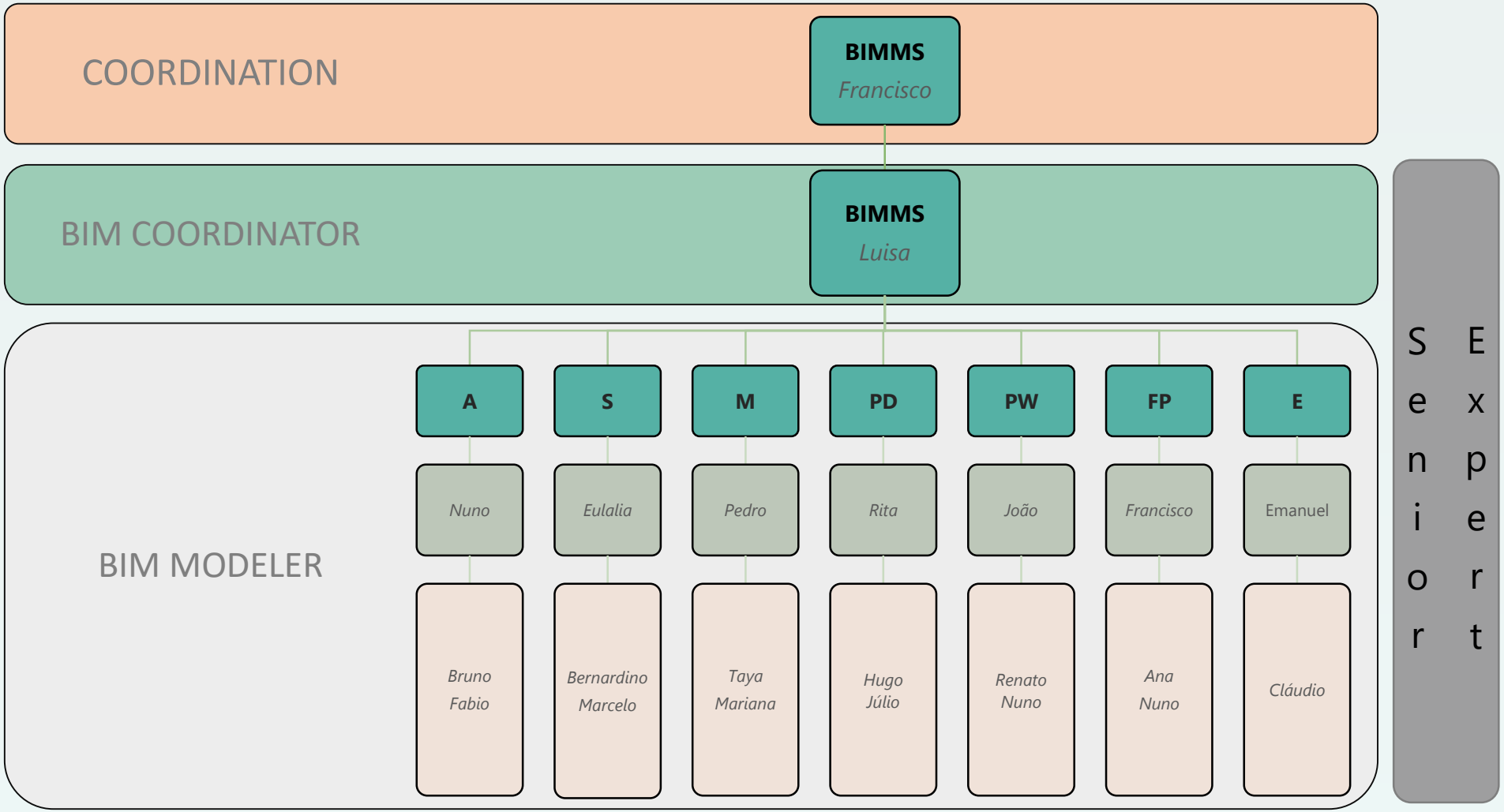
WATER SUPPLY

@JCLino et al. 2019

COMMUNICATIONS

FORMS TO RELATED FREQUENCY			
PHONE	CONSULTANTS	MINOR ISSUES	SEVERAL TIMES A DAY
SKYPE MEETING	CONSULTANTS	SMALL ISSUES THAT NEED A VISUALIZATION SUPPORT	WHEN REQUESTED
PERSONAL MEETING	MVCC	COORDINATION PROCESS	AT LEAST 1 EVERY WEEK
RFI	CONSULTANTS OR COORDINATION	CHANGE OF SOLUTION OR CLASHES	APROX. 90 AT THE MOMENT
PERSONAL MEETING	CONSULTANTS	VERIFYING THE MODEL	AT 3RD STAGE AND WHEN REQUESTED

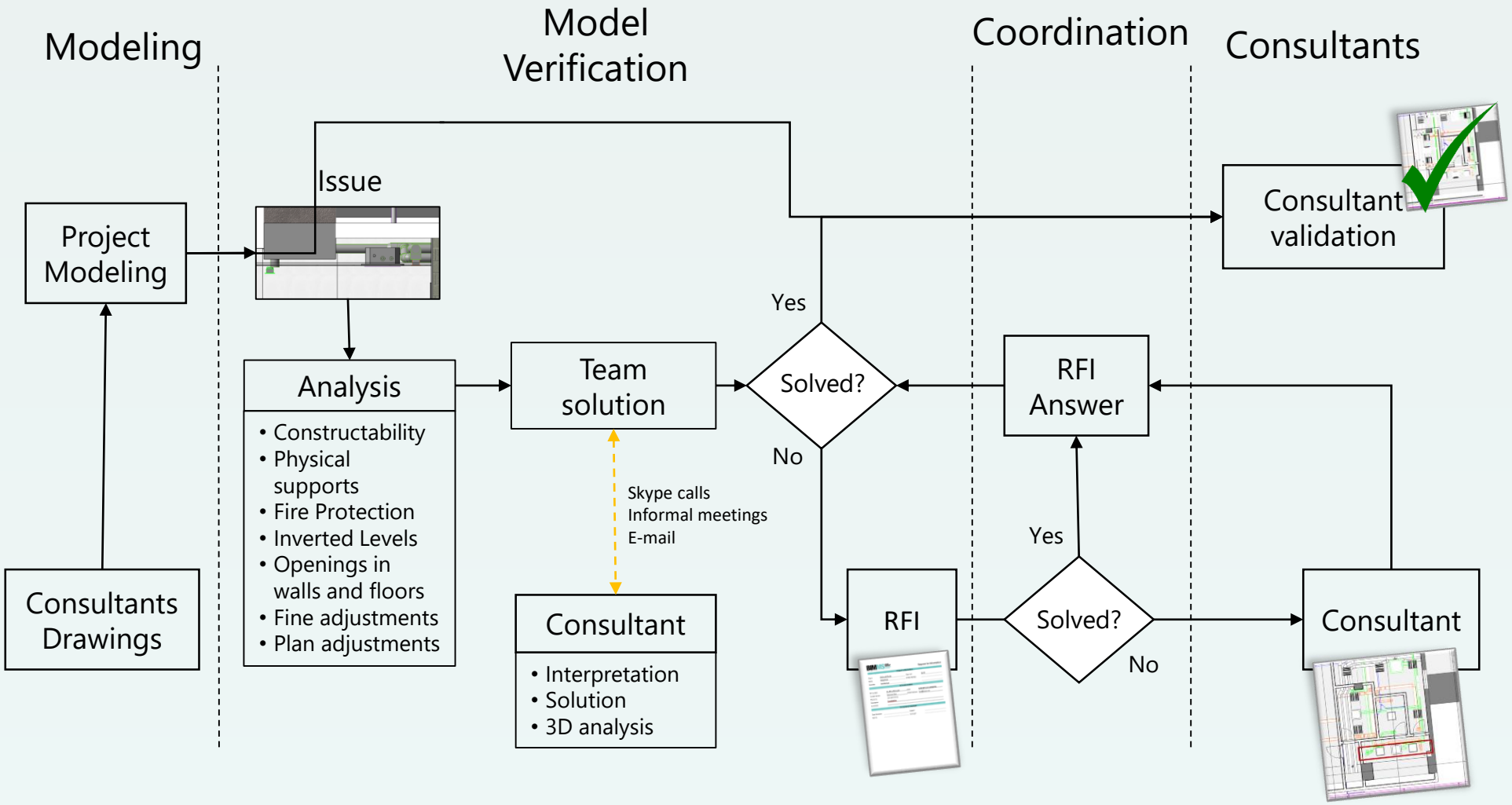
BIM TEAM


COORDINATION
BIMMS
Francisco
BIM COORDINATOR
BIMMS
Luisa
BIM MODELER
A
S
M
PD
PW
FP
E
Nuno
Eulalia
Pedro
Rita
João
Francisco
Emanuel
Bruno
Fabio
Bernardino
Marcelo
Taya
Mariana
Hugo
Júlio
Renato
Nuno
Ana
Nuno
Cláudio
Senior
Expert

BIM PROCESS

STAGES	DESCRIPTION	MODEL	OBS
1ST STAGE	BIM MODEL ACCORDING TO CONSULTANTS DRAWINGS AND MVCC COORDINATION DRAWING	3D MODEL WITHOUT BIMMS FULL COORDINATION	MODELLING ACCORDING TO THE BEST PRACTICES OF INSTALLATION ORGANIZATION
2ND STAGE	BIM MODEL WITH INTERNAL COORDINATION	3D MODEL WITH BIMMS COORDINATION	INTERNAL COORDINATION. ADJUSTMENTS ON INVERTED LEVELS. CONTACTS WITH SEVERAL CONSULTANTS
3RD STAGE	BIM MODEL FULL COORDINATED	BIM MODEL FINALIZED	DESIGN COORDINATION CONTACTS WITH COORDINATION TEAM AND CONSULTANTS
4TH STAGE	PRODUCTION OF 2D DWG PLANS AND SECTIONS FOR CONSULTANTS	EXTRACT 2D DRAWINGS FROM THE MODEL	CONSULTANTS CAN MAKE THE FINAL APPROVE AND INTEGRATE ON DRAWINGS EXACT POSITIONS DEFINED IN BIM MODEL

BIM PROCESS



COORDINATION REQUESTS FOR INFORMATION brief

DISCIPLINE	TYPE 1	TYP E 2	TYP E 3	Nº RFI	Nº ISSUES	CHANGES IN THE			
						NETWORK/ LAYOUT	EQUIPMENT POSITION/ TYPE	STRUCTURAL OPENINGS	CEILINGS HEIGHT/ GEOMETRY
COORDINATION	49	152	0	56	201	75	60	32	57

DISCIPLINE	NETWORK/ LAYOUT	EQUIPMENT POSITION/ TYPE	STRUCTURAL OPENINGS	CEILINGS HEIGHT/ GEOMETRY
STRUCTURAL	2	-	32	-
ARCHITECTURAL	11 (DATA CHANGES)	-	-	57
PLUMBING DRAINAGE	15	5	-	-
MECHANICAL	25	38	-	-
PLUMBING FIRE	16	8	-	-
PLUMBING SUPPLY	1	-	-	-
ELECTRICAL	5	9	-	-

Discipline	Nº changes
TOTAL	223 (279 in total)
AdF	34 (54 in total)
MVCC	68 (>98 in total)
FbV	20
GET	63 (69 in total)
AZ76	25
OHM	14

BRIEF

56 Coordination RFI

+

36 MEP RFI

92 RFI

- ✓ 279 changes in total
- ✓ >284 issues
- ✓ 75 major changes in the original MEP networks due to BIMMS RFI's
- ✓ 60 equipment changed position or type. Some were deleted
- ✓ 34 Openings were changed or added to the project
- ✓ 57 ceilings were changed

SPECIFIC REQUESTS FOR INFORMATION brief

Discipline	Type 1	Type 2	Type 3	Nº RFI	Nº Issues	CHANGES IN THE			
						Network/ Layout	Equipment position/ type	Structural Openings	Ceilings height/ geometry
ARCHITECTURAL	-	-	>50	8	>50	>30	-	-	-
MECHANICAL	6	3	4	9	13	6	-	-	-
ELECTRICAL	-	-	3	3	3	-	-	-	-
STRUCTURAL	16	-	-	16	20	17 (data changes)	-	3	-
TOTAL	22	3	>57	36	>83	>53		3	

Discipline	Nº changes
TOTAL	56
AdF	20
MVCC	30
GET	6

2D EXPORTED ELEMENTS

CAD's	DWFx (3D models)	Others
1988	82	54

CONSULTANTS DOCUMENTATION

Documentation
>4500

BRIEF

- ✓ 71 Type 1 clashes
- ✓ 155 Type 2 clashes
- ✓ >57 Type 3 clashes
- ✓ >1988 Exported Elements

DOCUMENTS

(result of RFIs and/or project revisions/ support info) (CAD or other)

DISCIPLINE	Dates																		Nº
STRUCTURAL	07.03	07.04	12.04	22.04	29.04	04.05	06.05	30.05	30.05	03.06	15.06	07.07	12.07	08.09	10.10	09.11	16.11			16
ARCHITECTURE	25.02	10.03	14.04	20.04	28.04	03.05	06.05	20.05	31.05	03.06	06.06	29.06	30.06	08.07	01.08	03.08	11.08	11.10	10.01.2017	19
PLUMBING DRAINAGE	11.02	20.03	20.05	12.06	18.07	11.10														6
MECHANICS	16.02	06.03	09.03	15.03	16.03	05.04	22.04	28.04	19.05	06.06	20.07	30.01.2017	16.02.2017							12
PLUMBING FIRE	11.02	20.03	19.04	22.04	30.05	04.08	10.08													7
PLUMBING SUPPLY	11.02	20.03	19.04	06.06	08.06	04.08														6
ELECTRICAL	16.02	23.02	08.03	11.04	28.04	18.05	19.05	23.05	24.05	02.06	14.06	16.06	22.06	30.06	03.08	04.09	25.11			17
COORD	11.02	10.03	18.05	30.06	12.09	27.10	13.12	06.01.2017	08.02.2017	06.07	28.11									11

DELIVERS	
INITIAL PACKAGE	March
BLACK DOT	19.05.2016
RED DOT	09.06.2016
BLACK DOT	14.07.2016

COORDINATION REQUESTS FOR INFORMATION

RFI ID SK_RFI_COORD _XXX	TYPE (1/2/3)	Nº	LEVEL	DISCRIPTION	SENT (DATE)	ANSWERD (DATE)	CHANGES IN THE				CONSULTANT	DESIGN/ COORDINATION	CONSTRUCTION/INSTALLATION	OPERATION / MAINTENANCE
							NETWORK/ LAYOUT	EQUIPMENT POSITION/ TYPE	STRUCTURAL OPENINGS	CEILINGS HEIGHT/ GEOMETRY				
000	2	1	00	CORES MEP COORDINATION	07/03/2016	07/03/2016	-	-	-	-	-	-	-	-
	2	2	B1	GUTTER IN THE TECHNICAL CORRIDOR	08/03/2016	10/03/2016	-	X	-	-	FBV	X	-	-
	2	3	00	NECESSARY PROTECTIONS FOR VERTICAL DUCTS 2.00.038	11/03/2016	21/01/1900	-	-	-	-	-	-	-	-
	1	4	00	VERTICAL DUCT INTERSECTS WITH FIRE CABINET AND NEEDS SLAB OPENING 2.00.018 CORE 2.9	11/03/2016	21/01/1900	-	X	X	-	GET ADF	X X	- -	- -
	2	5	00	TRANSITION SLAB EAST	11/03/2016	18/03/2016	-	-	-	-	-	-	-	-
	2	6	00	DUCT VISIBLE IN HALL THAT ACCESSES B3. NEEDS ANOTHER NETWORK LAYOUT	17/03/2016	18/03/2016	X	-	-	-	GET	X	-	-
	2	7	00	2.00.38 – DUCT IN THE FLOOR WITH AIR TERMINALS	18.03.2016	18/03/2016	X	X	-	-	GET	X	-	-
	1	8	00	OPENINGS FOR FIRE PIPES CORE 2.3, 2.00.130	18.03.2016	21.03.2016	X	-	X	-	ADF AZ76	X X	- -	- -
	2	9	00	CAR SECURITY PARK ROOM. CEILING IS TOO HIGH	18.03.2016	12.04.2016	-	-	-	X	MVCC	X	-	-

DESIGN / COORDINATION

Some off the design areas the existing spaces **are not enough to install the MEP networks** as well **as the equipment**.

In order to find a solution, in some cases, it was necessary to modify the design.

The BIM model proposed solution, in order to have all the MEP network and equipment in risers and false ceilings, shows a lot of MEP coordination frailties.

CONSTRUCTION / INSTALATION

The hanger's solutions and supports to ducts and pipes, in the most of the cases **should be custom made** to measure on site adapted to the MEP section network reality.

In some cases, the **MEP network need a sequence assembly programing study**, in order to place part of the elements in a non-sequential order.

In many cases, **the assembly sequence** of the different MEP networks, **does not obey logical and linear programming** to put the varies network in place. It is necessary to intercalate the different network specialities, even in continuous and/or contiguous spaces.

To access cable trays for the placing of the electrical cables, in certain zones, it will be very difficult. It is advisable the use of guides.

The water and air proofing tests, in the cases that the networks are very dense and overlap, should be made in segments, in order to guarantee the network good performance.

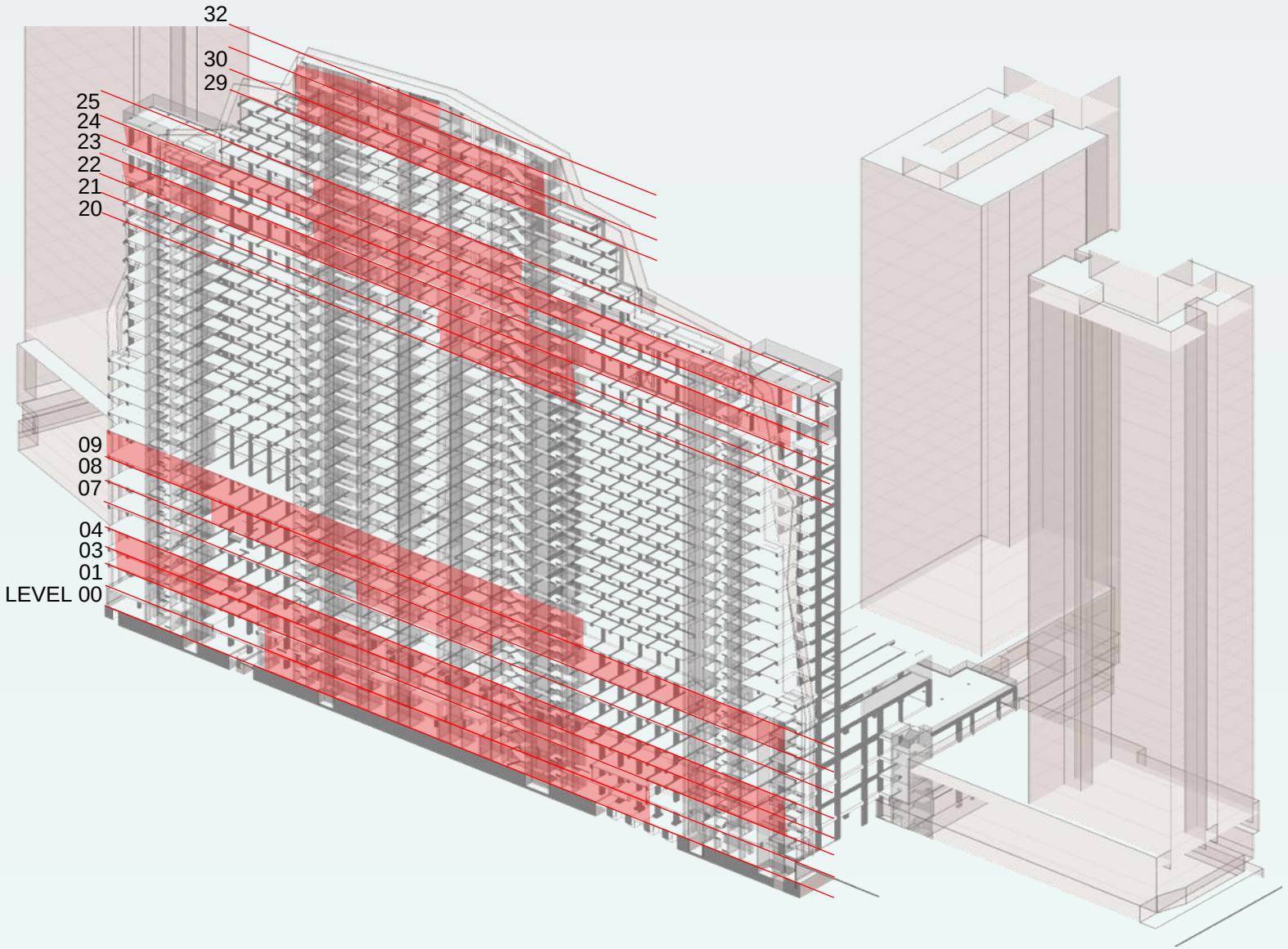
OPERATION / MAINTENANCE

In many areas of the B2, It's observable that t**he space to visually inspect the networks is not sufficient**.

In some cases of the maintenance and operation space in the network's areas, there are also insufficient work conditions.

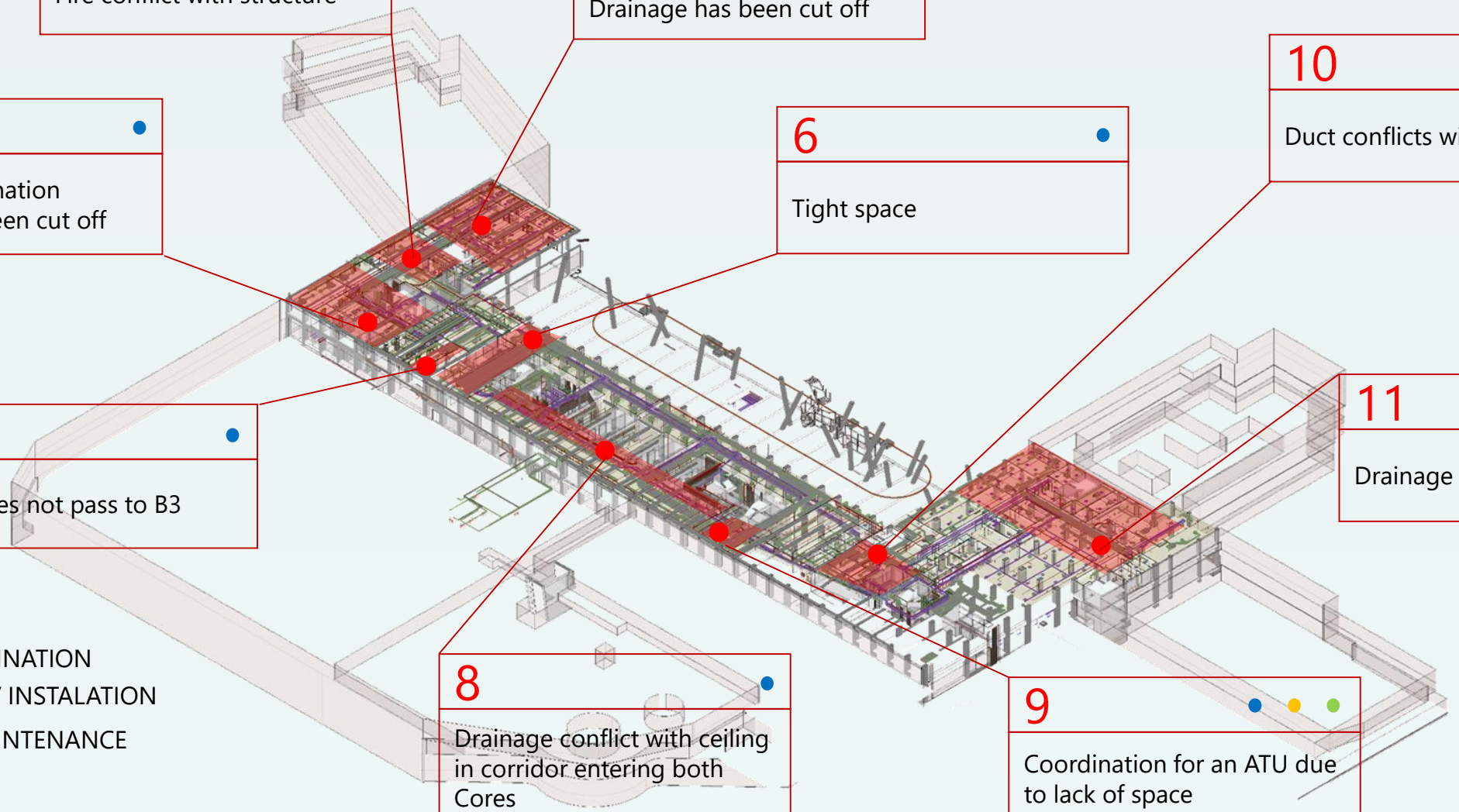
In case of pipe failure and/or collapse of some of any network section or segment, to be possible to access and repair the failure, **it will be necessary to remove and disassembly of some ducts, pipes, cable trays**, etc. In these cases, **it will certainly occur the interruption of the system's operability,** putting some of the building areas off service.

Any alteration of parts of the building that originate a network reset or reinforcement, it will be strongly conditioned by the lack of reserve spaces and/or optional solutions, restricting the choices of an ideal network placing



LEVELS

@JCLino et al. 2019



2 & 5
Fire conflict with structure

1
Difficult coordination.
Drainage has been cut off

3 & 4
Difficult Coordination
Drainage has been cut off

6
Tight space

10
Duct conflicts with structure

7
Fire does not pass to B3

11
Drainage has been cut off

8
Drainage conflict with ceiling in corridor entering both Cores

9
Coordination for an ATU due to lack of space

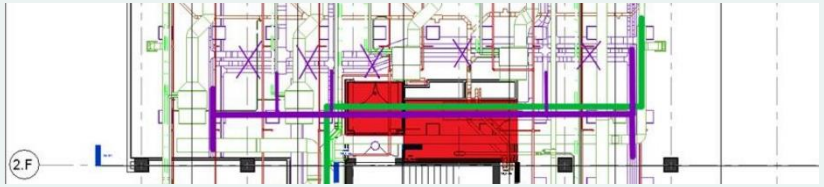
- DESIGN / COORDINATION
- CONSTRUCTION / INSTALATION
- OPERATION / MAINTENANCE

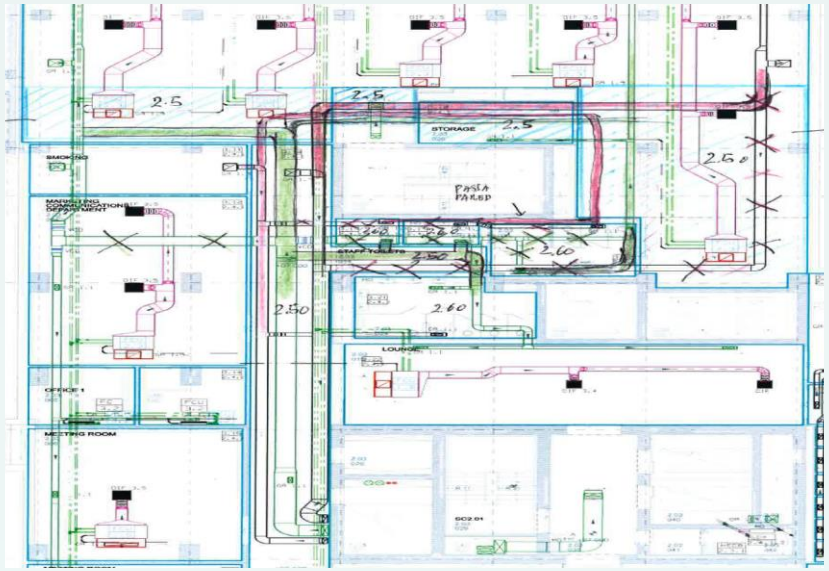
Level 03

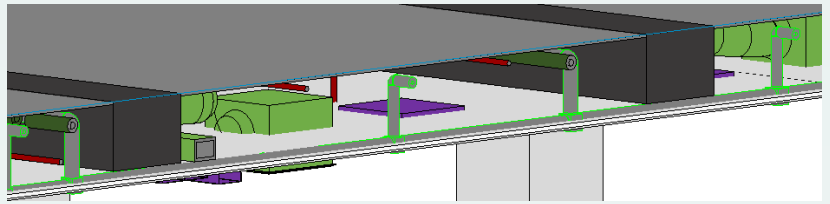
1

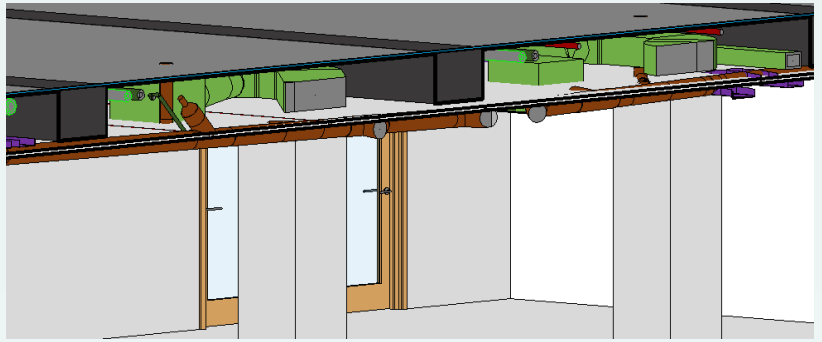
SK_RFI_COORD_017 (following RFI 12 and 13)

Issue: Massive Coordination Issues
Level 03 Ceiling
Grid 2.C - H – 2.1 – 6





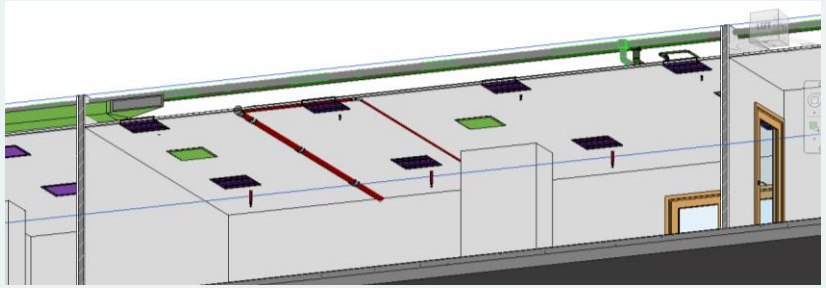


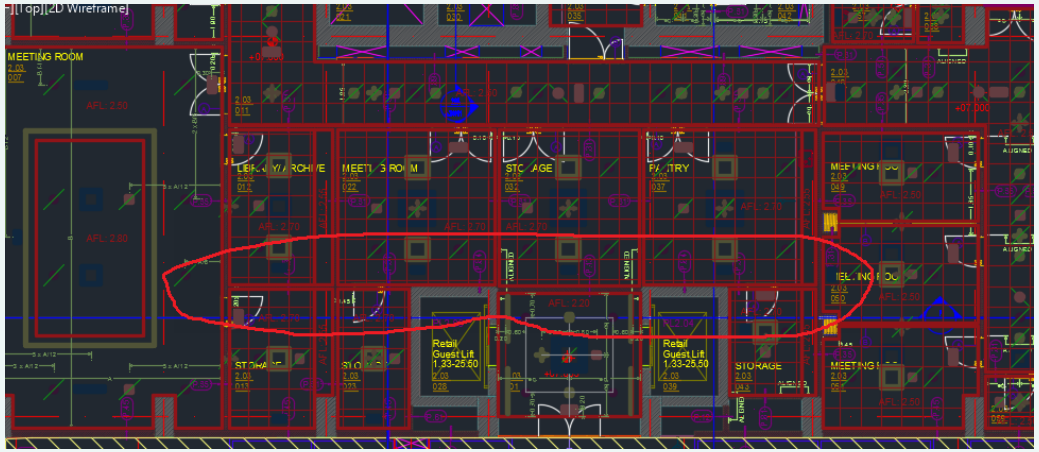


2

SK_RFI_COORD_018

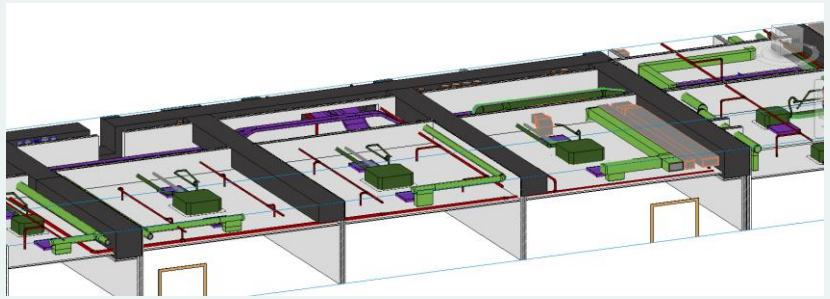
Issue: Fire under false ceiling due to conflict with structure
Level 03 Ceiling
Grid 2.H - G – 2.2
Room: 2.03.004 – Marketing Communications department

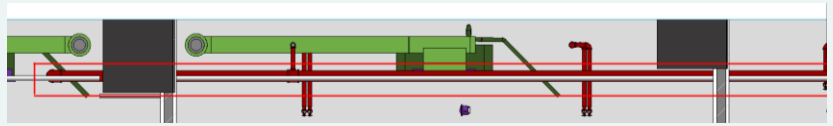


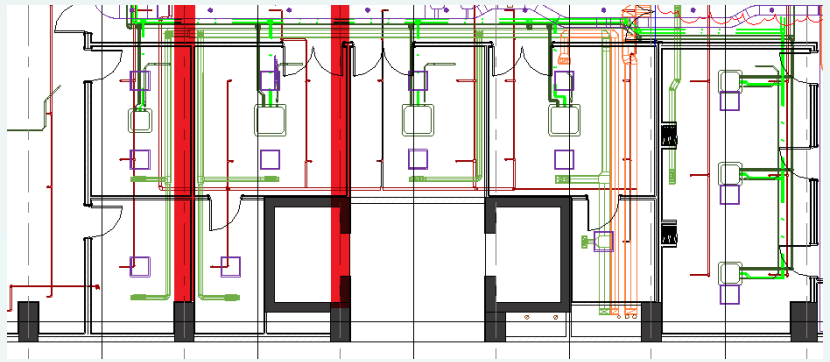


3

Issue: Fire conflict with structure
Level 03 Ceiling
Grid 2.K - L – 2.3 - 6
Room: 2.03.004 – Marketing Communications department



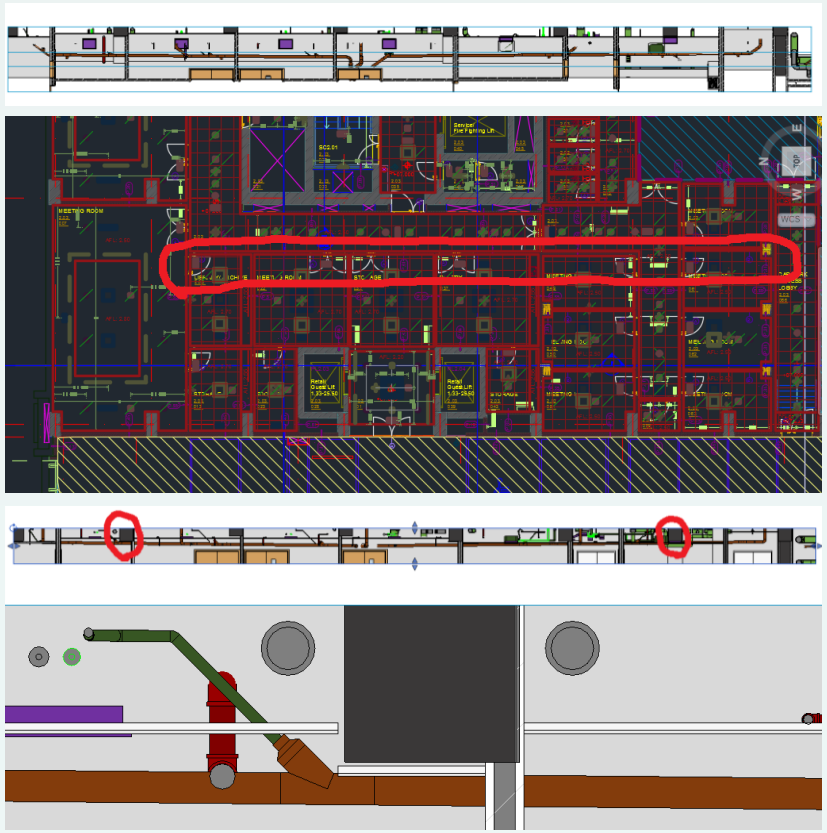


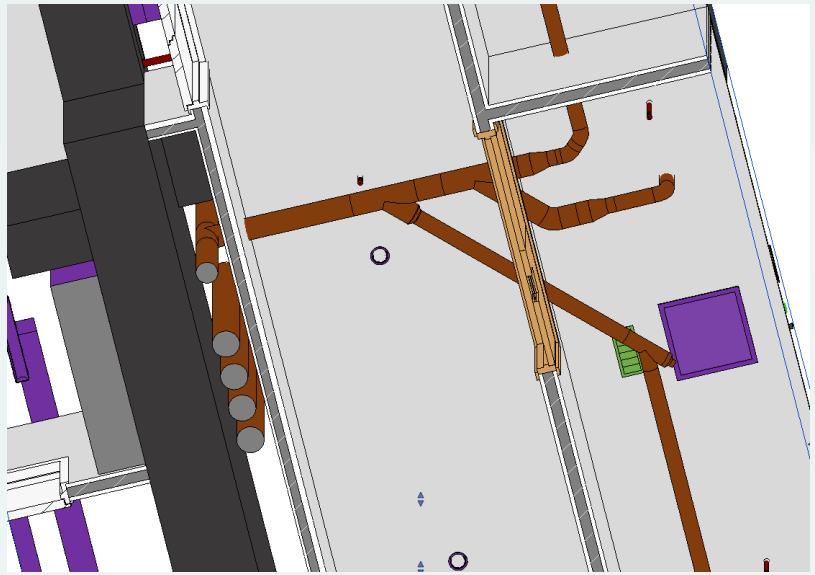


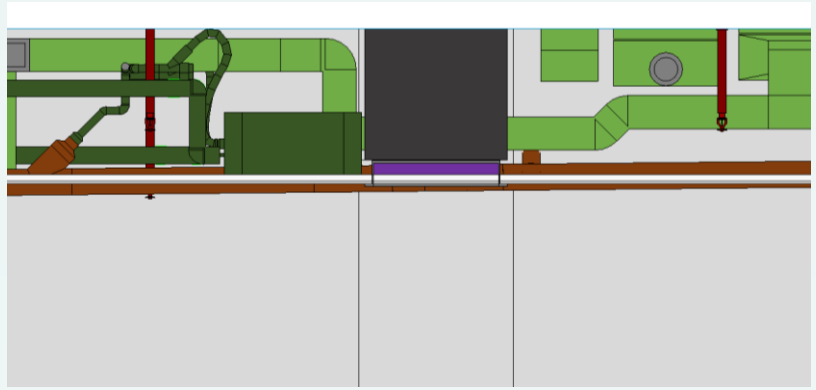
4

SK_RFI_COORD_015

Issue: Drainage under false ceiling due to structure
Level 03 Ceiling
West of Core 2.01
Room: 2.03.007/ 011/ 012/ 022/ 032/ 037/ 049/ 048/ 061/ 066



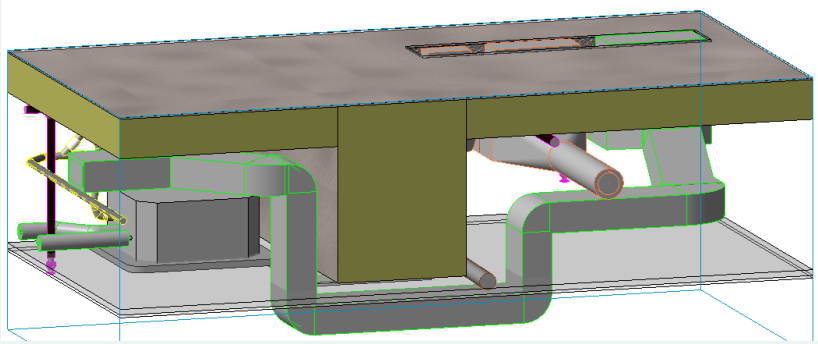


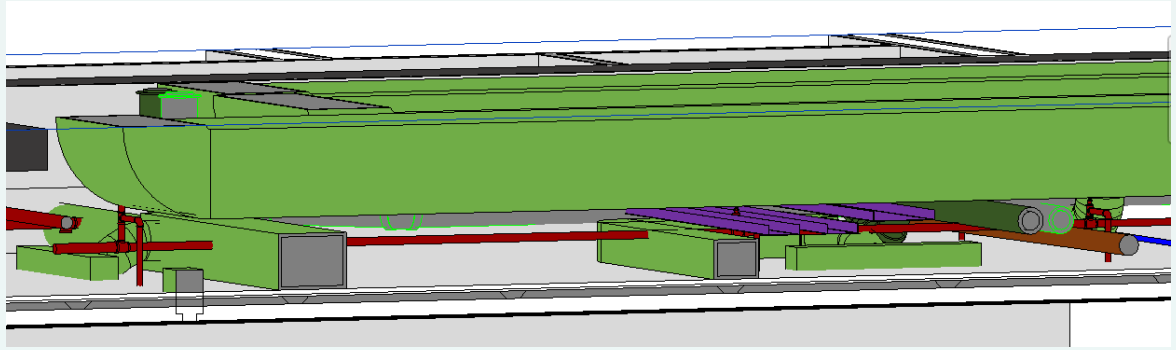


5

SK_RFI_COORD_013

Issue: Duct under false ceiling due to conflict with structure
Level 03 Ceiling
Grid: 2.K – 2.8

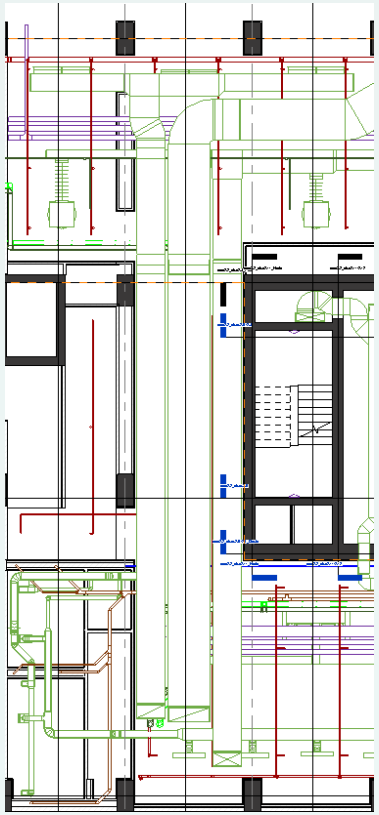


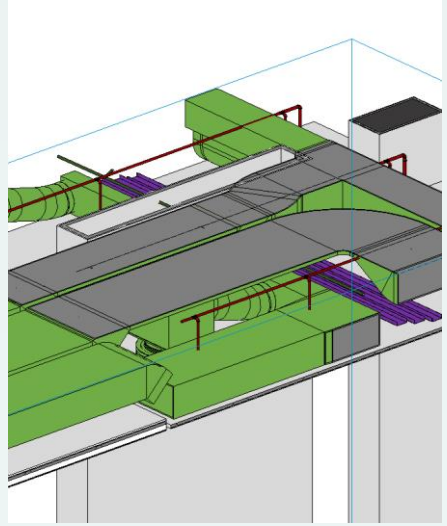


6

SK_RFI_COORD_016

Issue: Tight space
Level 03 Ceiling
Grid: 2.10 - 11

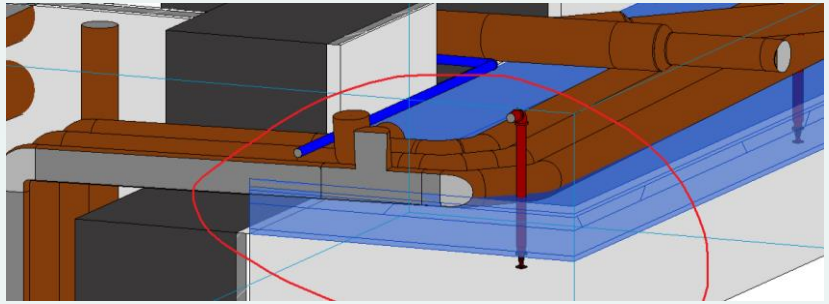




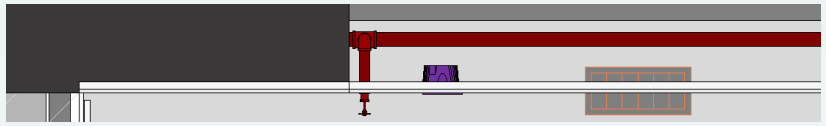
7 & 8

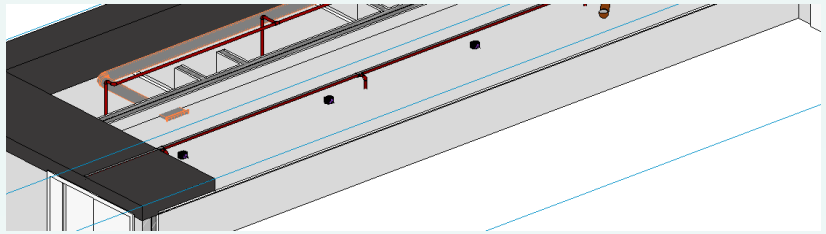
SK_RFI_COORD_020 and SK_RFI_COORD_018

Issue: Duct under false ceiling due to conflict with structure
Level 03 Ceiling
Grid: 2.K - L – 2.14



Issue: Duct under false ceiling due to conflict with structure
Level 03 Ceiling
Grid: 2.L – 2.9 Car Park Security Lobby

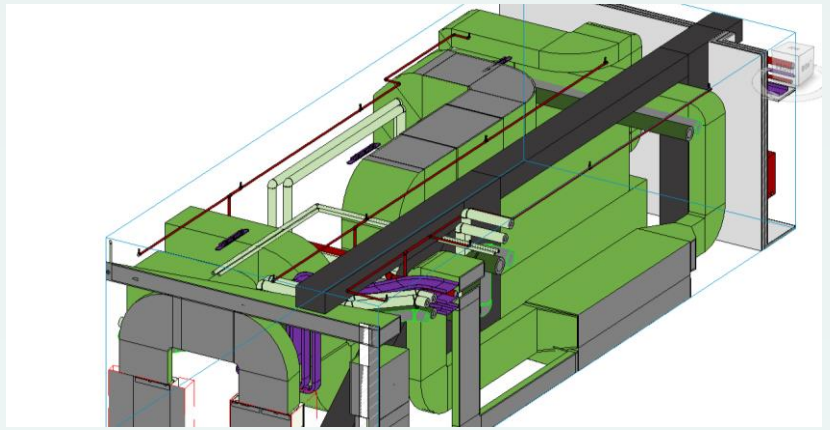




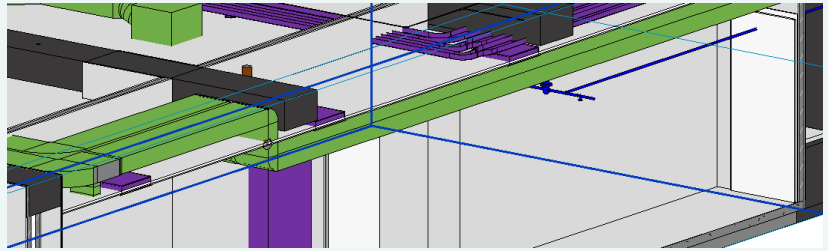
9 & 10

SK_RFI_COORD_020 and 012

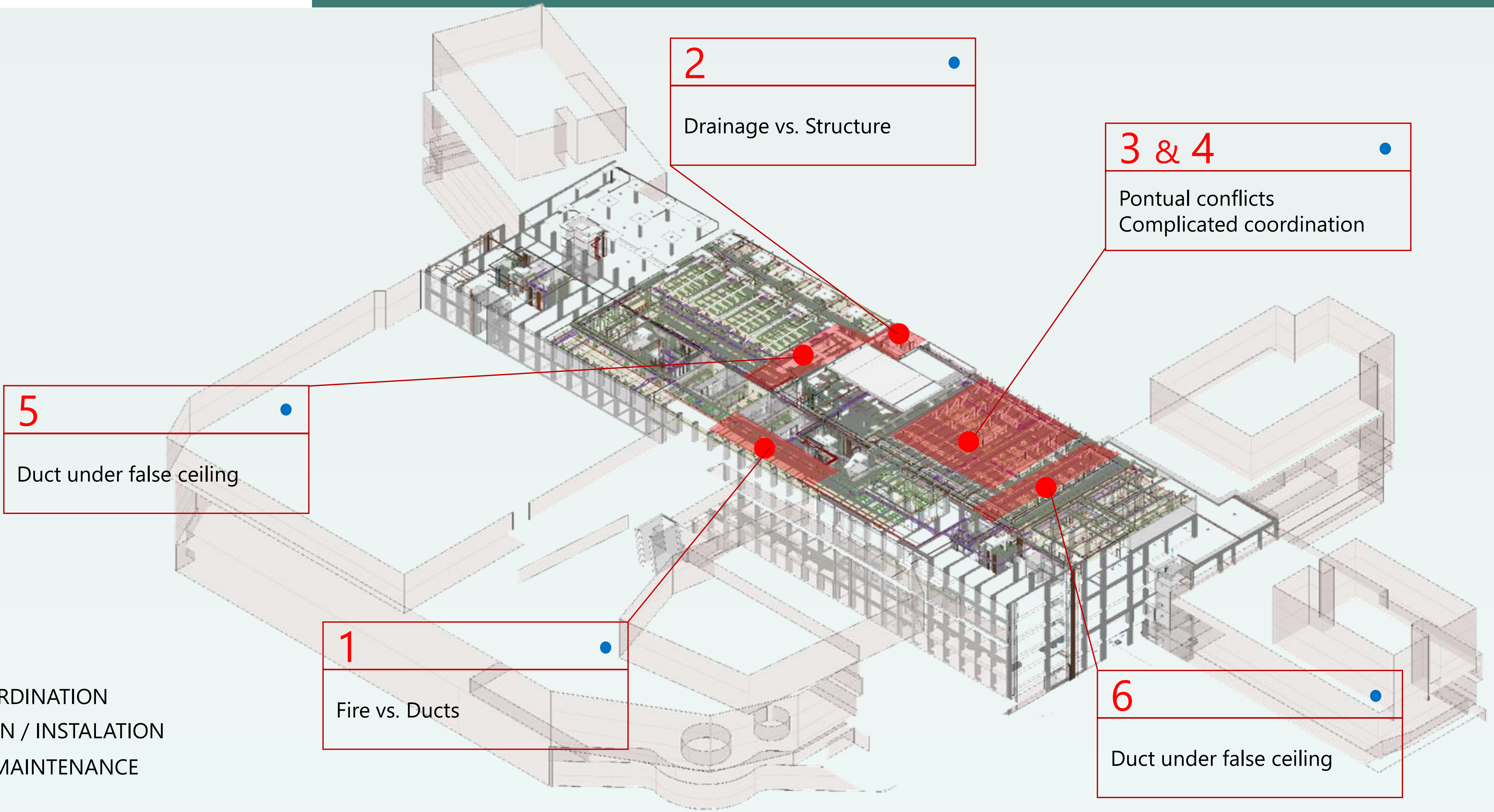
Issue: Duct under false ceiling due to conflict with structure
Level 03 Ceiling
Grid: 2.K – 2.28



Issue: Duct under false ceiling due to conflict with structure
Level 03 Ceiling
Grid: 2.K – 2.31 – Mini Market Storage



BIM na Prática



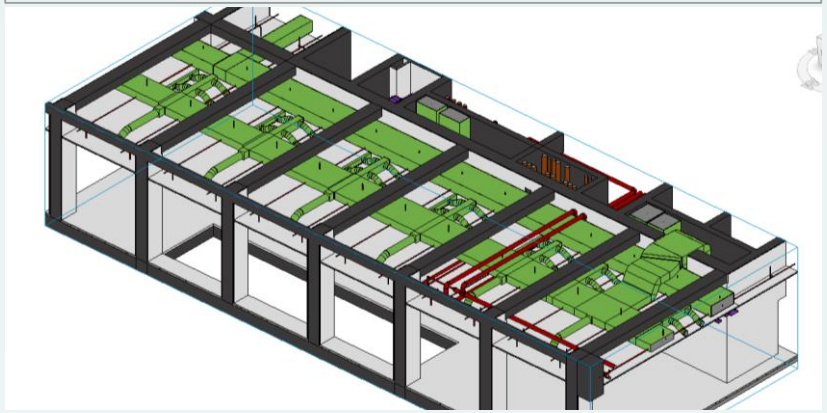
- DESIGN / COORDINATION
- CONSTRUCTION / INSTALATION
- OPERATION / MAINTENANCE

Level 08

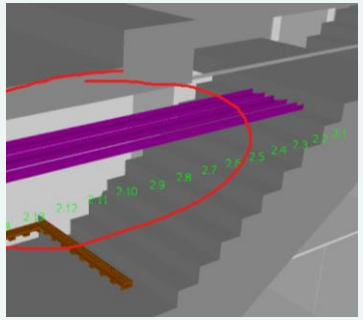
1 & 2

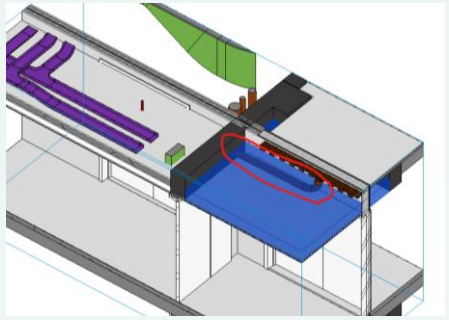
SK_RFI_COORD_020 and SK_RFI_COORD_026/028

Issue: Coordination between Fire and Ducts
Level 08 Ceiling
Grid: 2.J – 2.19 – 27 - West core 2.03



Issue: Drainage vs Structure and Cable Trays in space of stairs
Level 08 Ceiling
Grid: 2.C – 2.20 East of B2

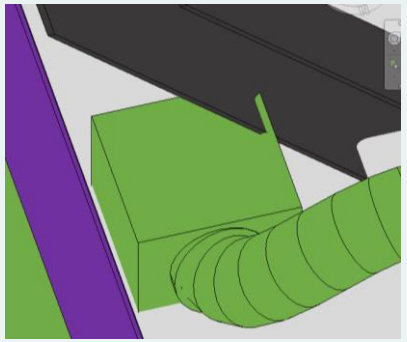


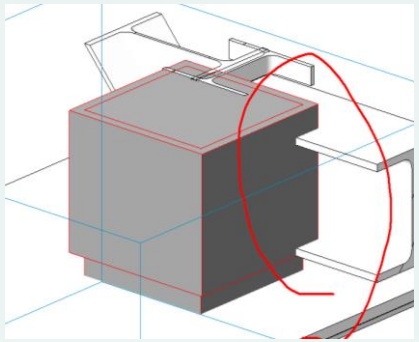


3 & 4

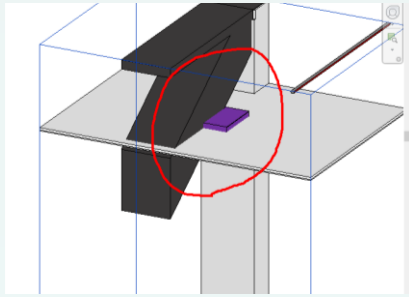
SK_RFI_COORD_029

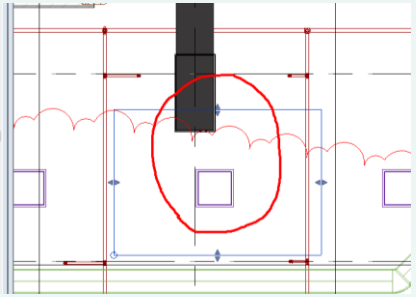
Issue: Air terminals conflict with structure
Level 08 Ceiling
Grid: 2.C - 2.28 and 2.30





Issue: Lighting Fixture conflicts with structure
Level 08 Ceiling
Grid: 2.C/D - 2.36

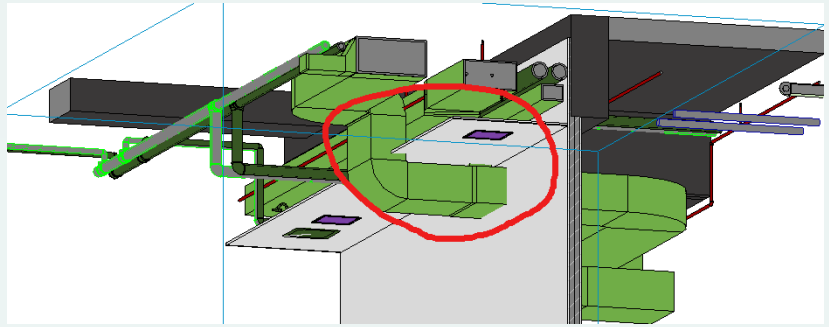


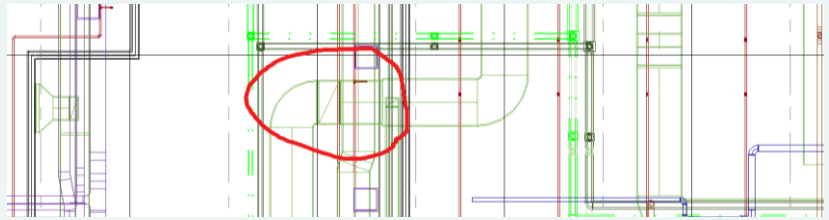


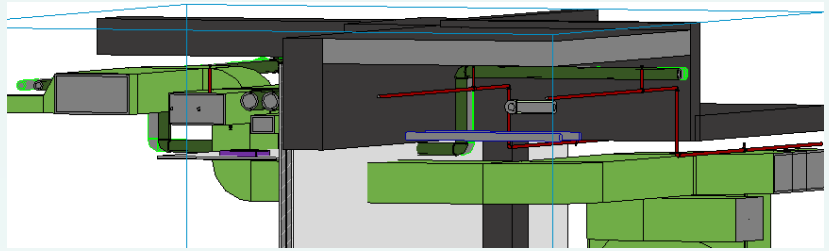
5

SK_RFI_COORD_021

Issue: Duct under false ceiling
Level 08 Ceiling
Grid: 2.G – 2.18 - 19



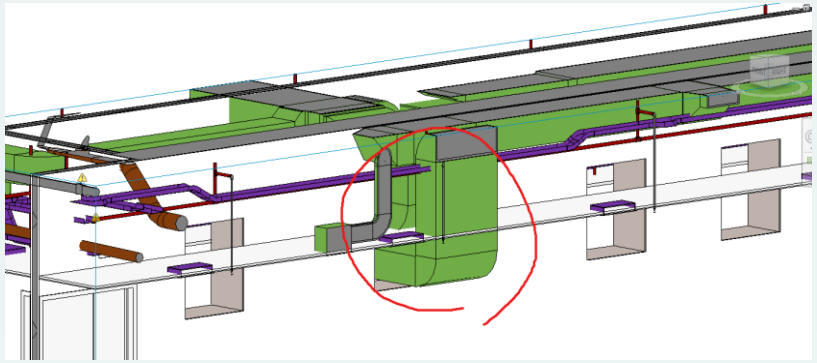


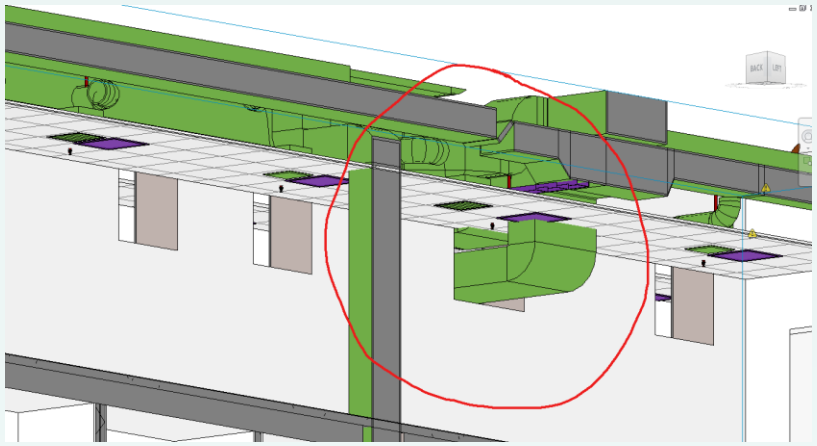


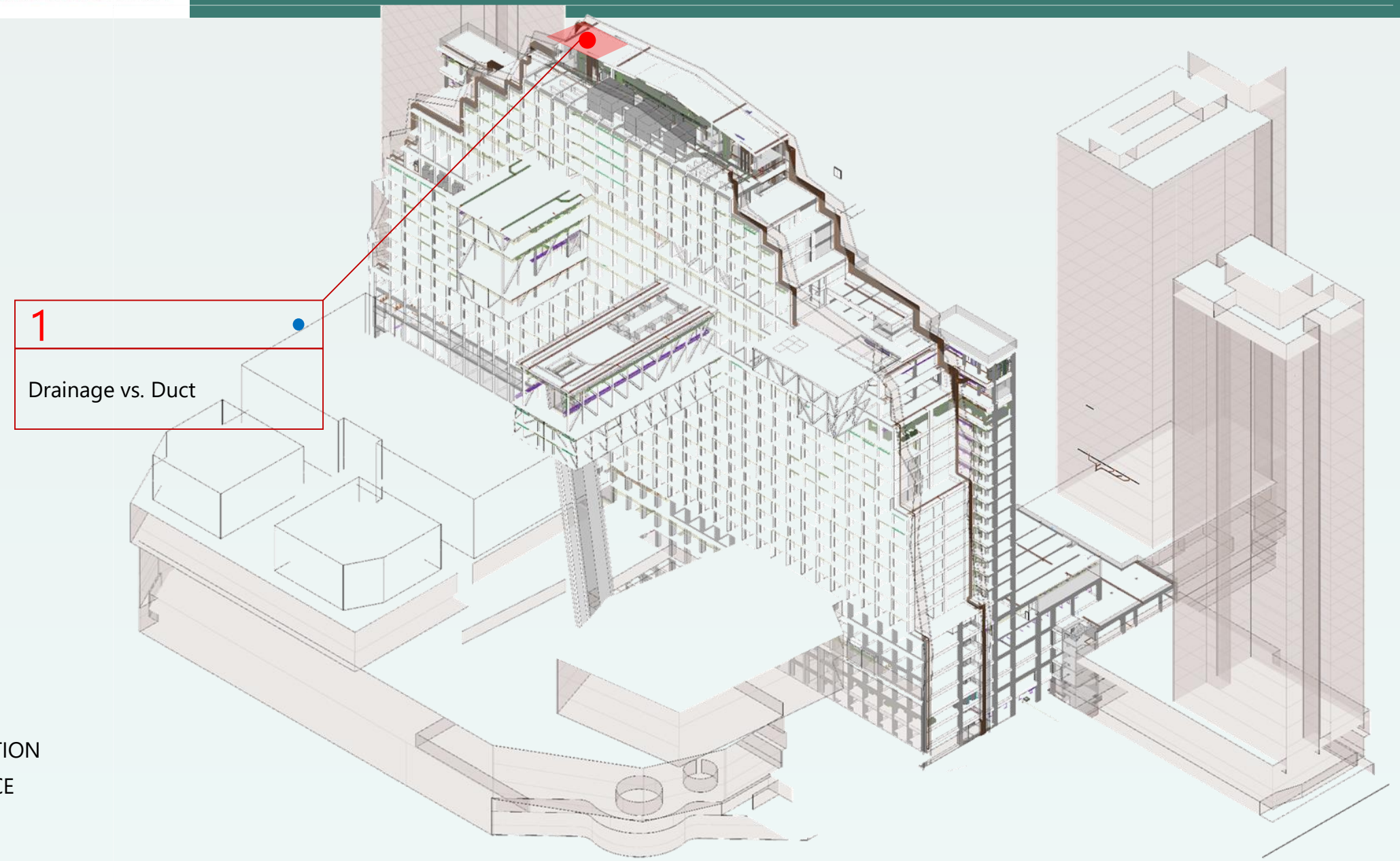
6

SK_RFI_COORD_027

Issue: Duct under false ceiling
Level 08 Ceiling
Grid: 2.34 - 35







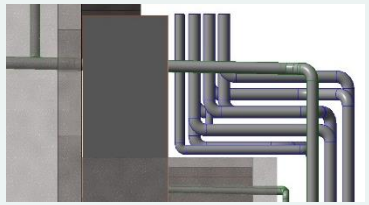
- DESIGN / COORDINATION
- CONSTRUCTION / INSTALATION
- OPERATION / MAINTENANCE

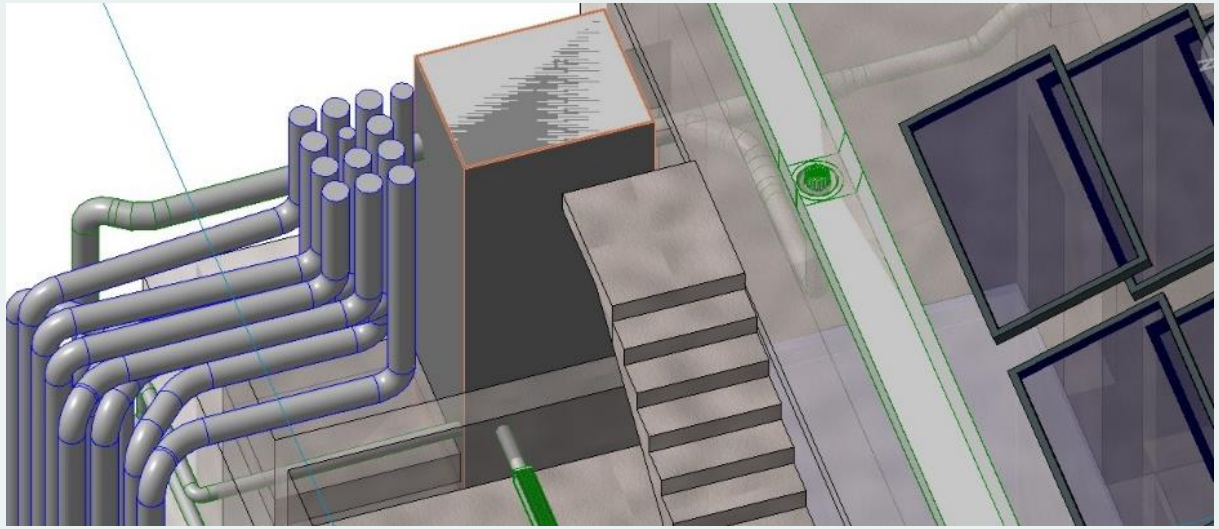
Level 32

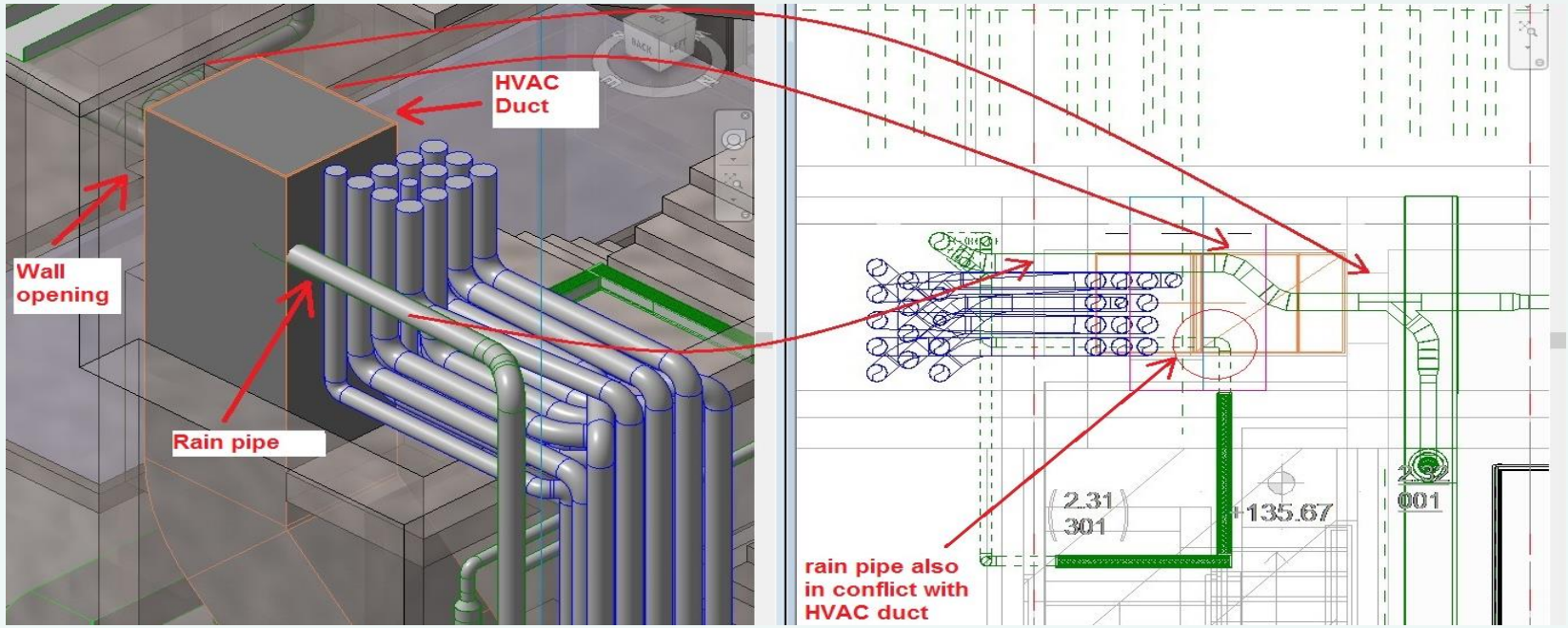
1

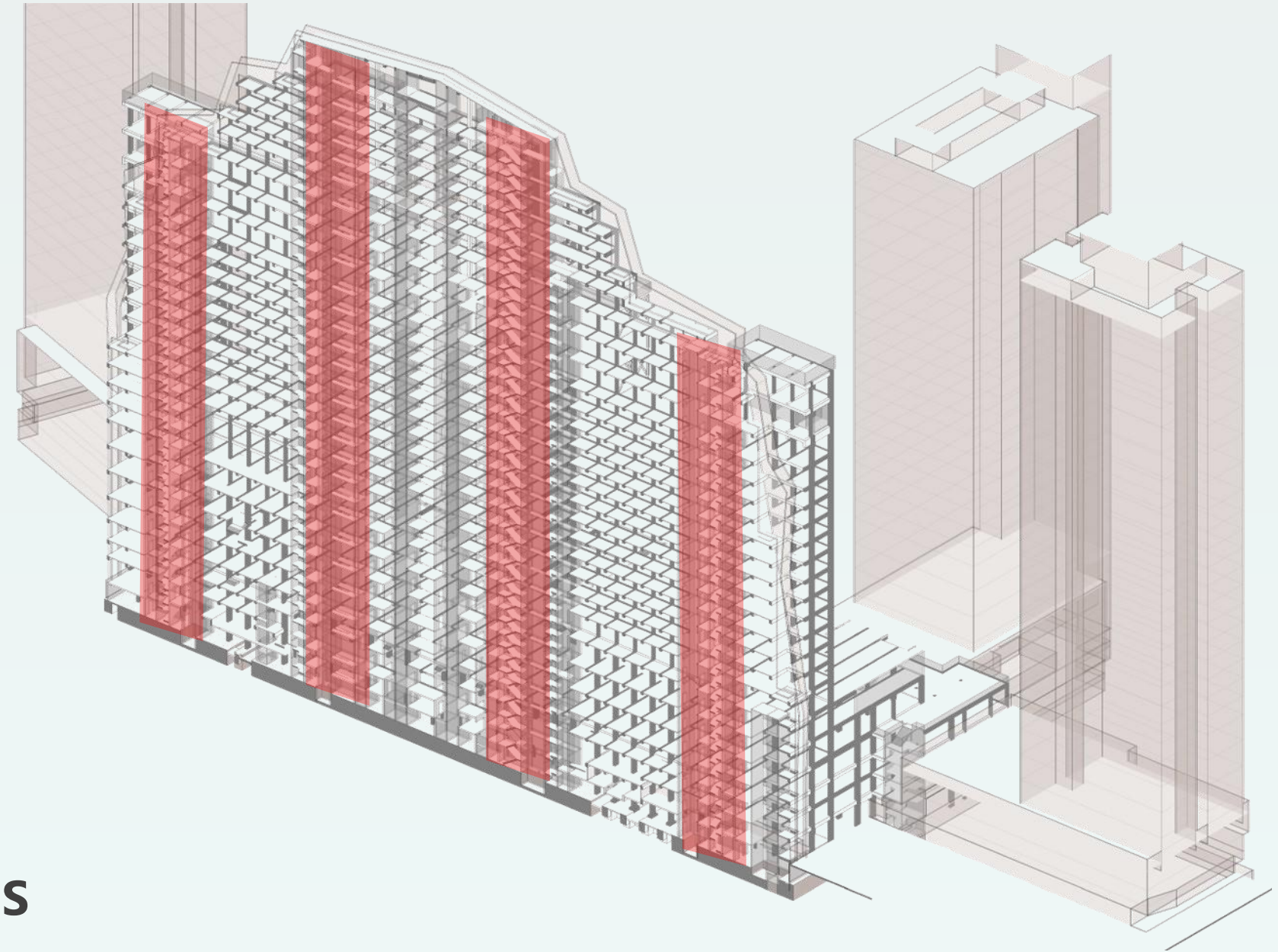
SK_RFI_COORD_045

Issue: Drainage has a conflict with Duct
Level 32
Grids: 2.J – 2.11

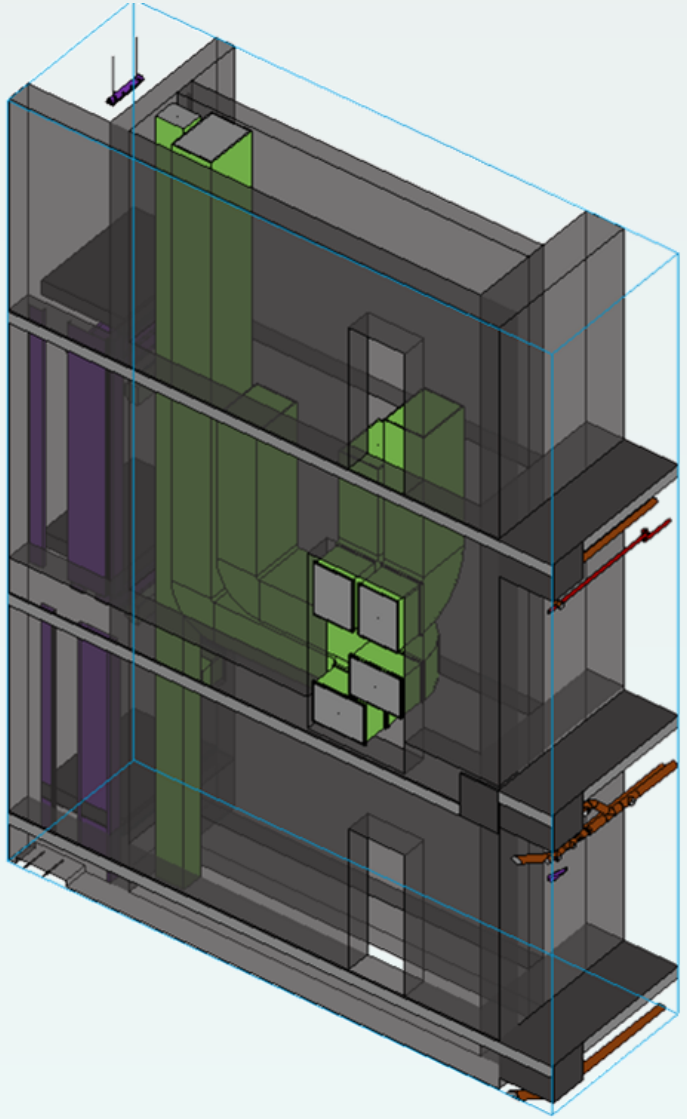


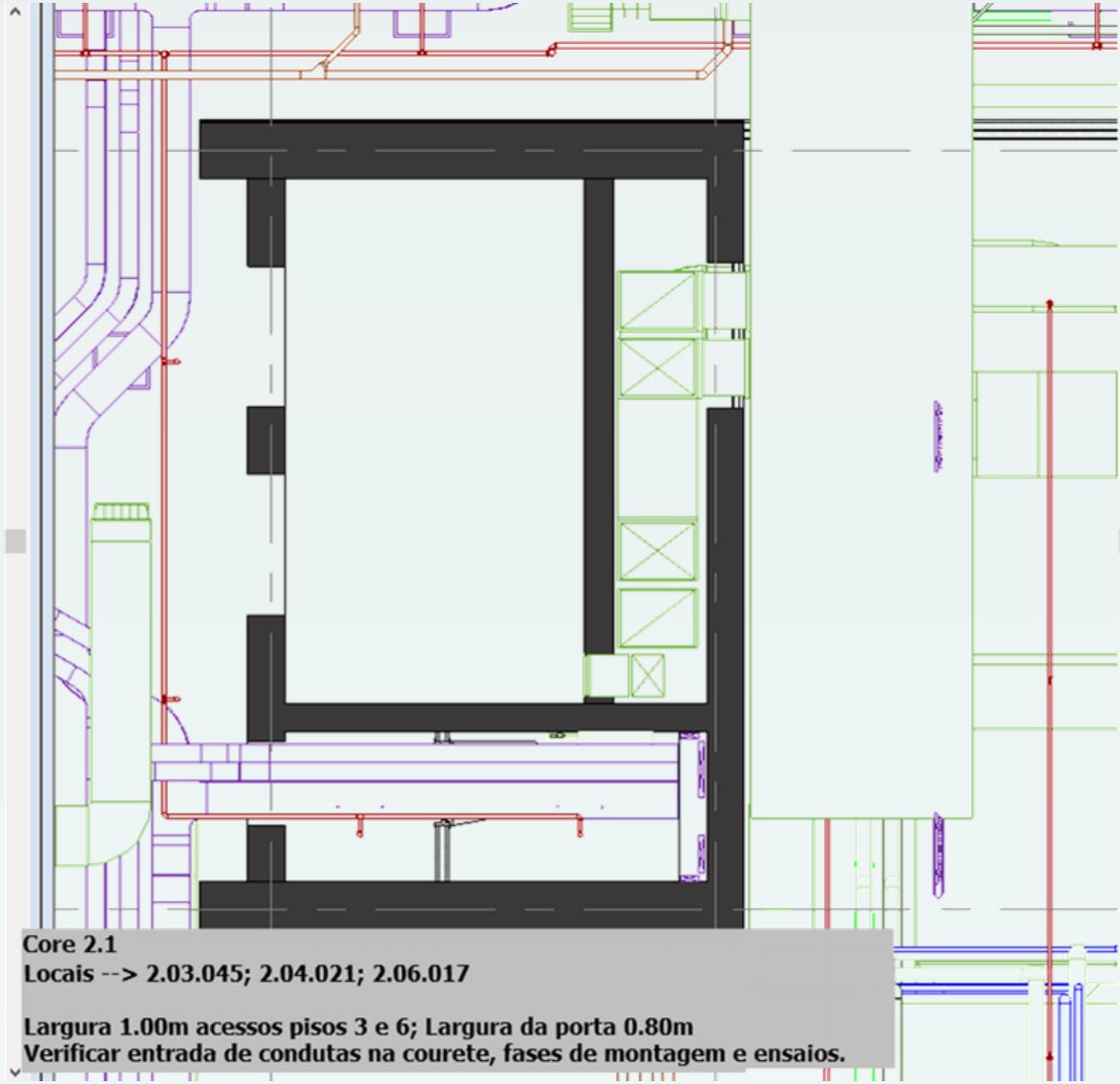






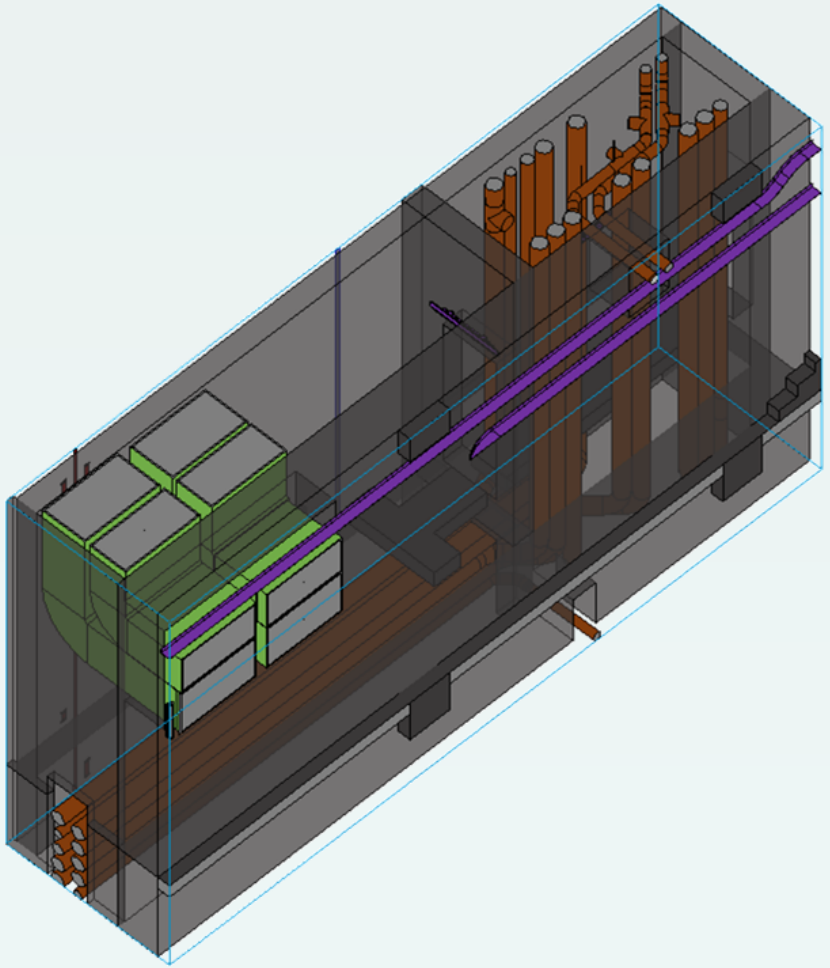
RISERS - CORES





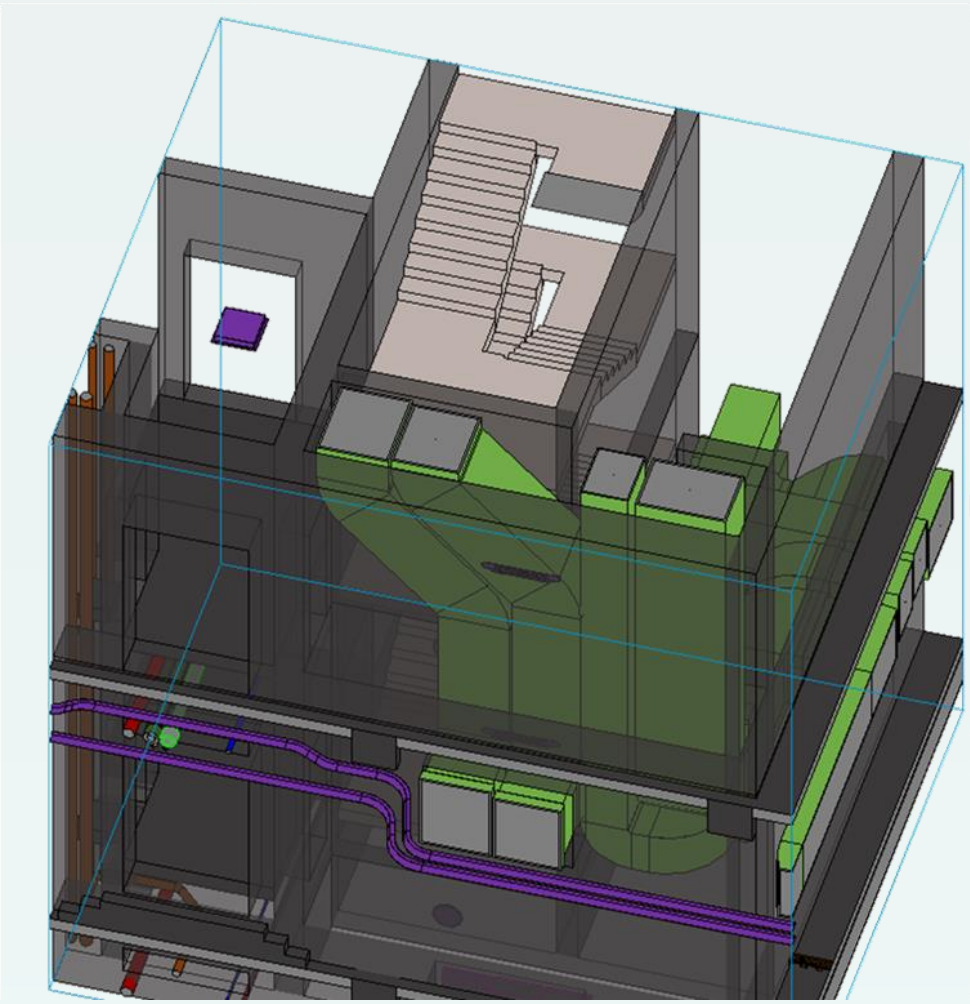
Access
Instalation
Comissioning
Maintenance

Core 2.01



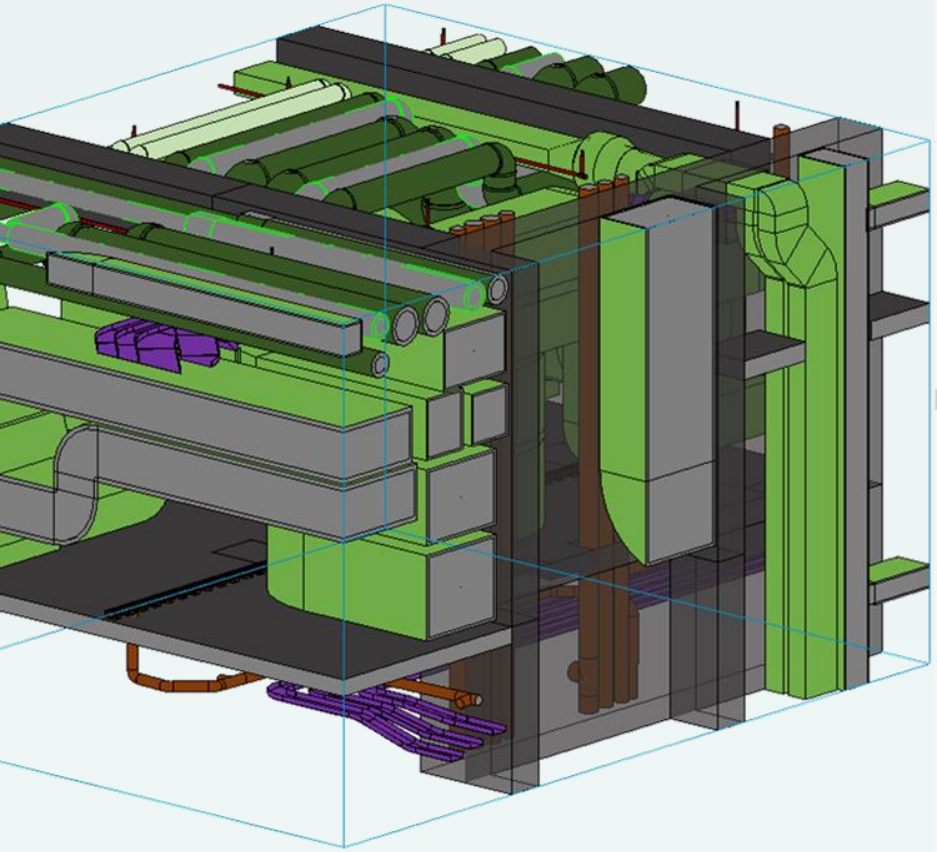

Core 2.3 (Questão colocada pela Miki)
Locais: 2.03.---; 2.04.065;2.06.048
Porta com 0.80m. Condutas com 1160x660m (inclui isol)
Analisar sequência de montagem e ensaios das condutas

Core 2.03



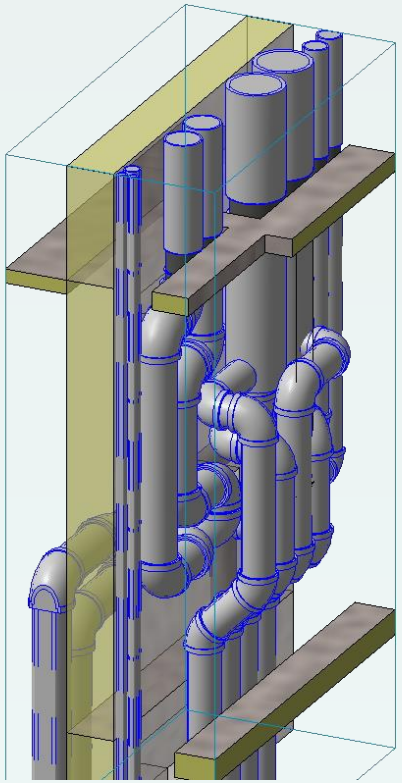

Core 2.3 (Questão colocada pela Miki)
Locais: 2.03.---;2.04.068;2.06.051
Porta com 0.80m; Conduta 1.160x0.960m
Analisar acesso de condutas, sequencia de montagem e ensaios.

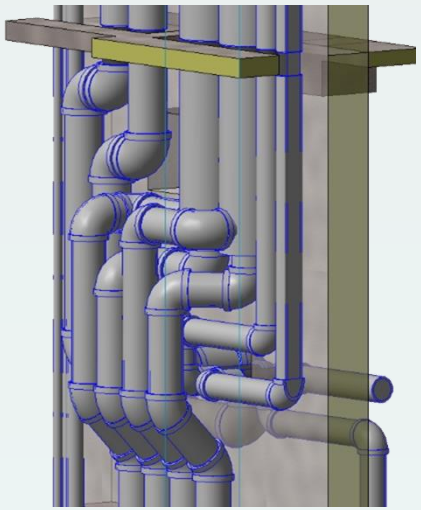
Core 2.03

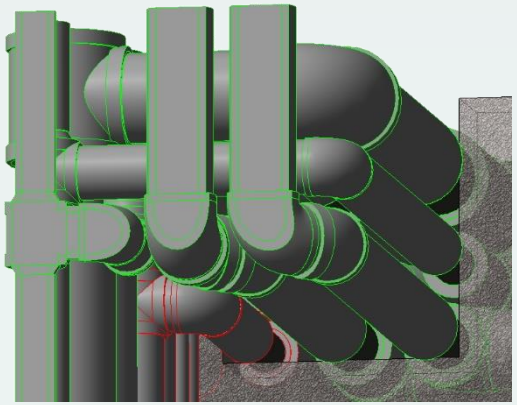


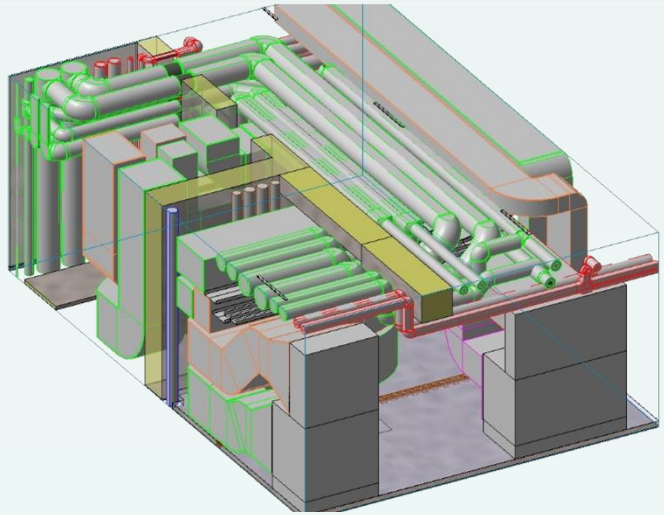

Locais: eixos 2.34/2.36; 2K/2L
Analisar sequencia de montagem,
de ensaios e condições de acessibilidades para manutenção
2.34
2.35
2.36
2.37
2.38
2.39
2.40

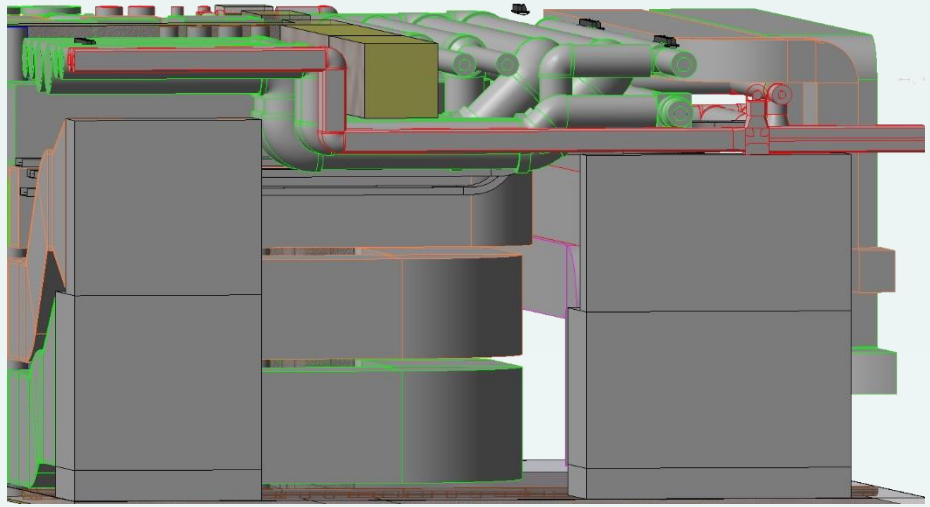
Core 2.04



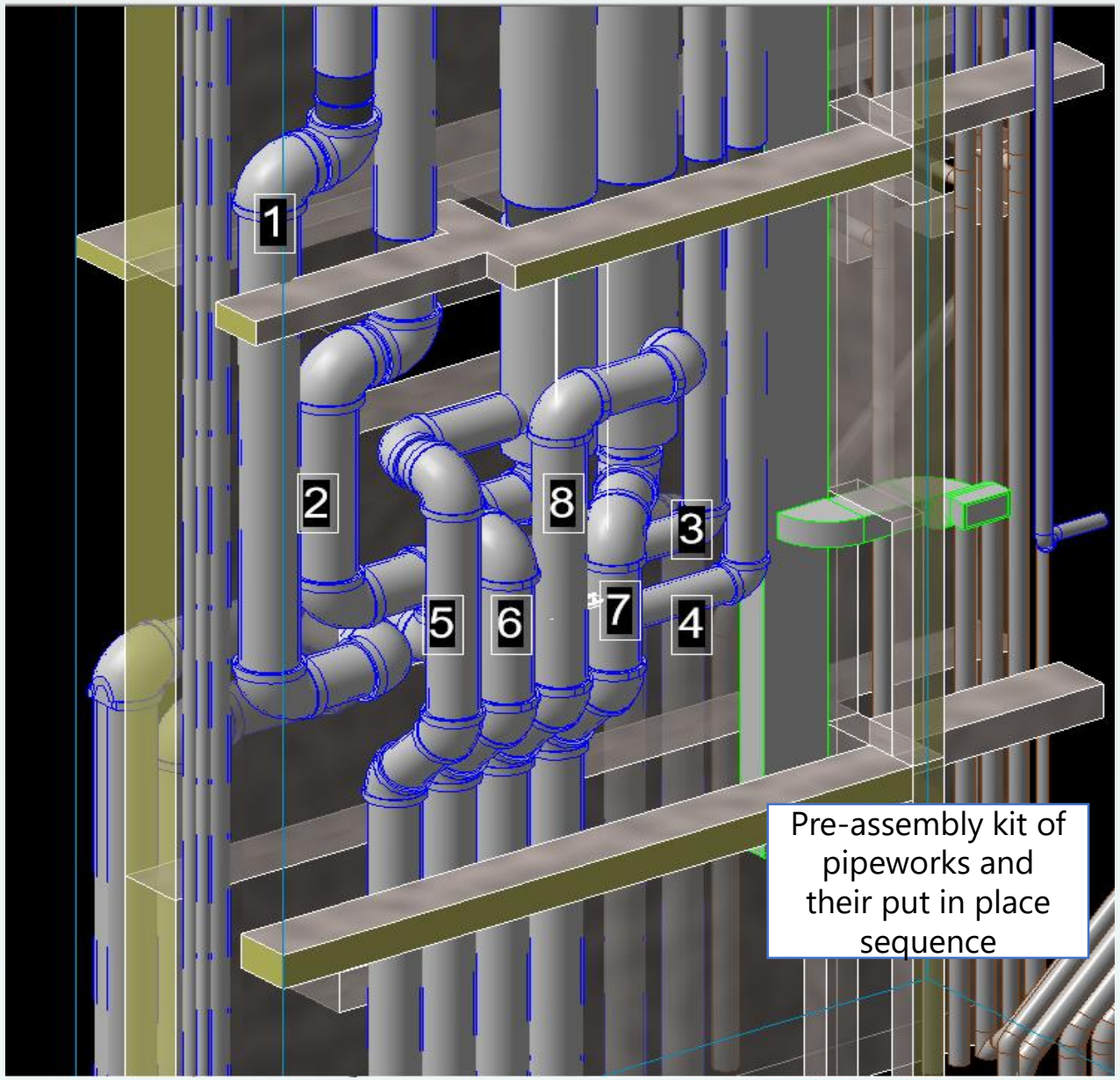




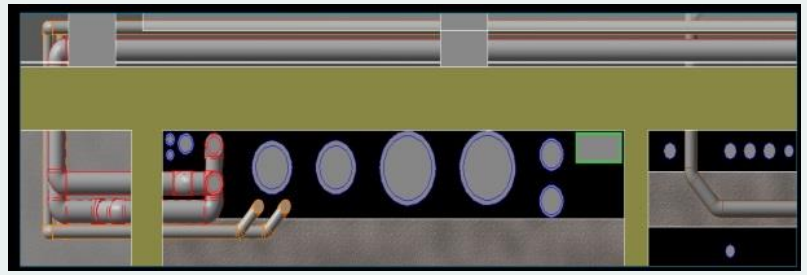


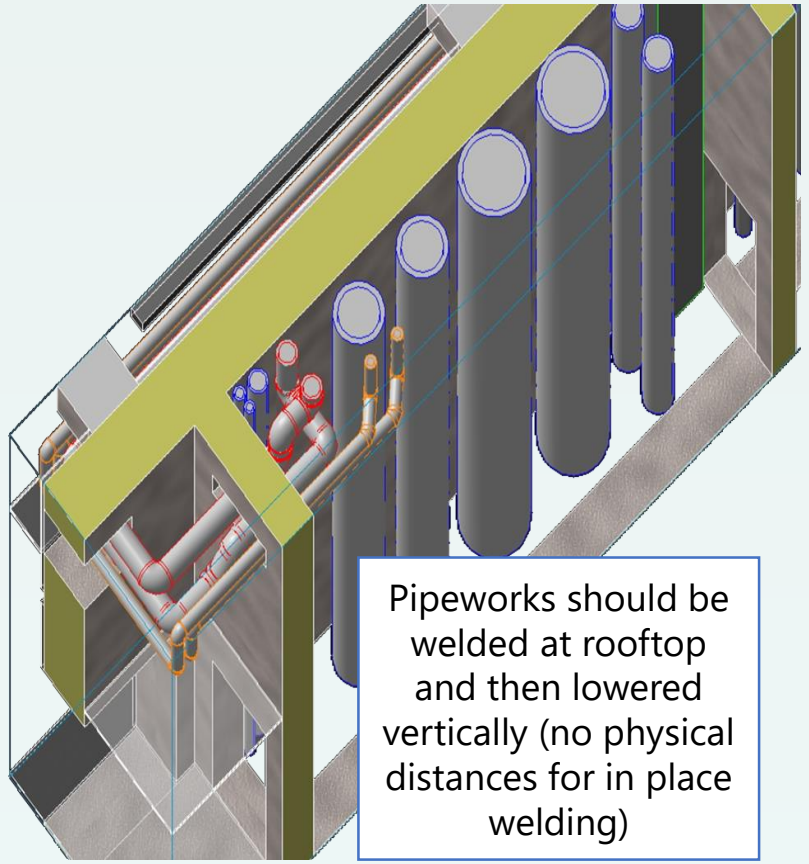


DIFFICULT INSTALLATION



Pre-assembly kit of pipeworks and their put in place sequence

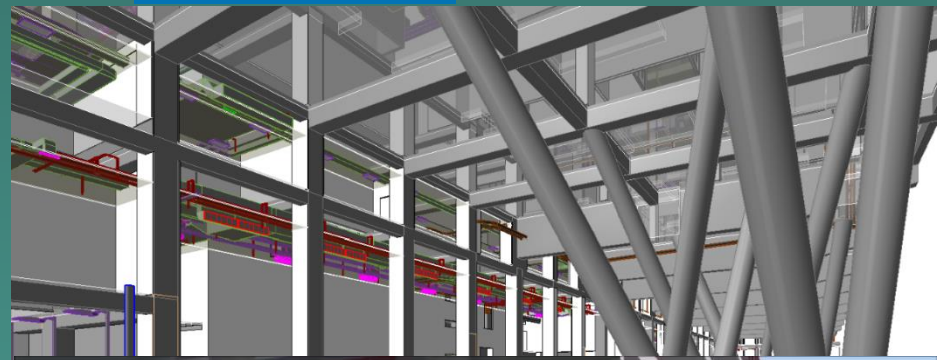


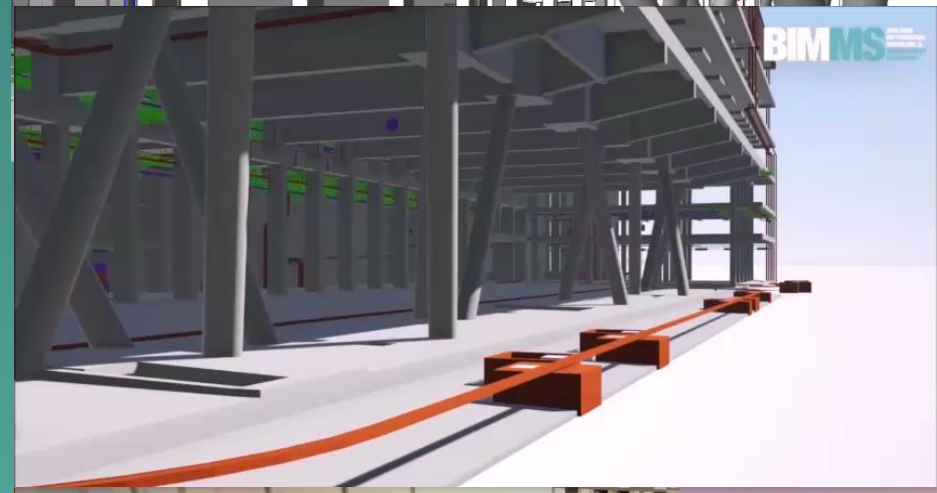


Pipeworks should be welded at rooftop and then lowered vertically (no physical distances for in place welding)

CONCLUSIONS

- BIM perseverance pays the bill;
- BIM Coordination is a teamwork;
- BIM Model Management to control huge tasks;
- Virtual Construction solves real problems;





04.

ULSTER UNIVERSITY

Ulster, United Kingdom | University | 75.000m^2

UNIVERSITY

UNITED KINGDOM

75.000m^2

BIMMS

A Era BIM 2º Seminário Internacional

sinaenco
SINDICATO DA ARQUITETURA E DA ENGENHARIA

BIM na Prática

Data Management

- Documentation creation
- Analysis and control

Procurement Support

- Contracts
- Buildability Reports

Model Compliance with BIM Standards

BIM Implementation & BIM Execution Planning

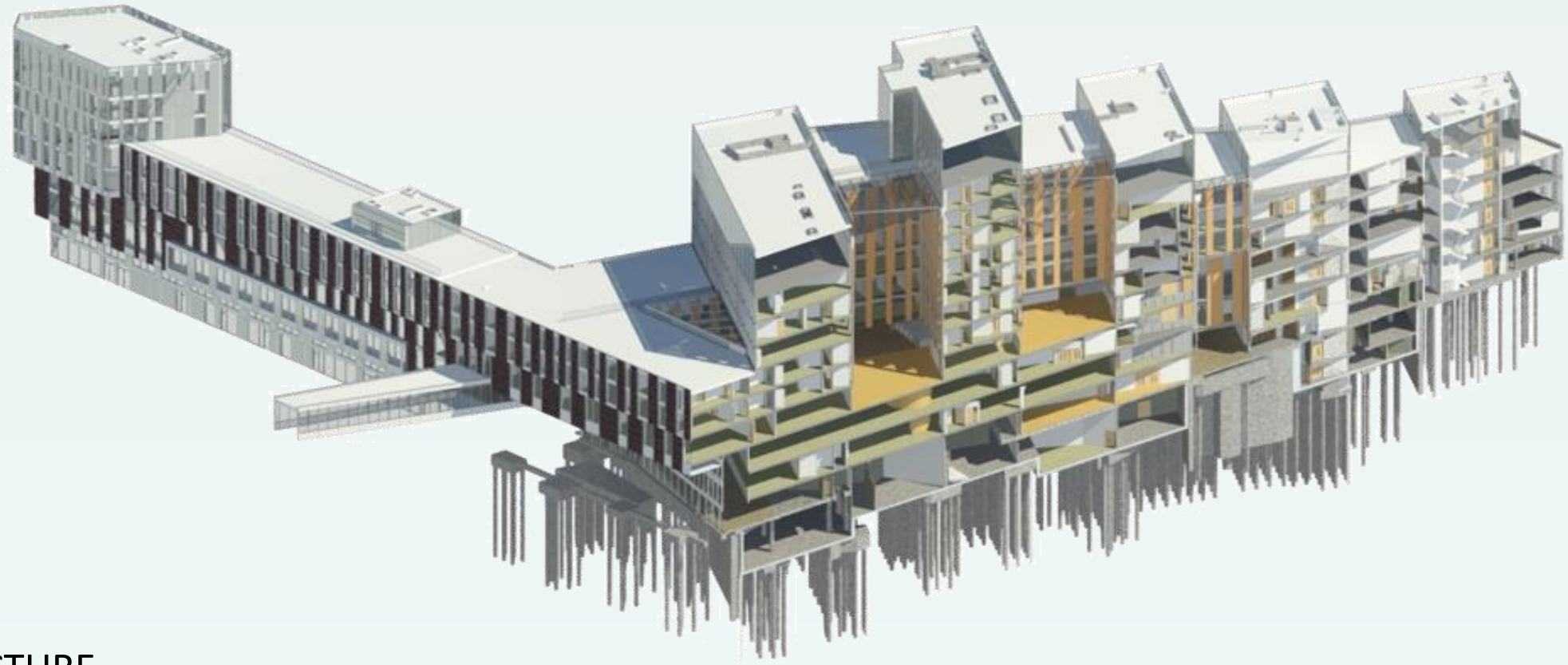
- Classification and Project Delivery Systems
- BIM complex Modelling
- Parametric Objects

Onsite Technical Support

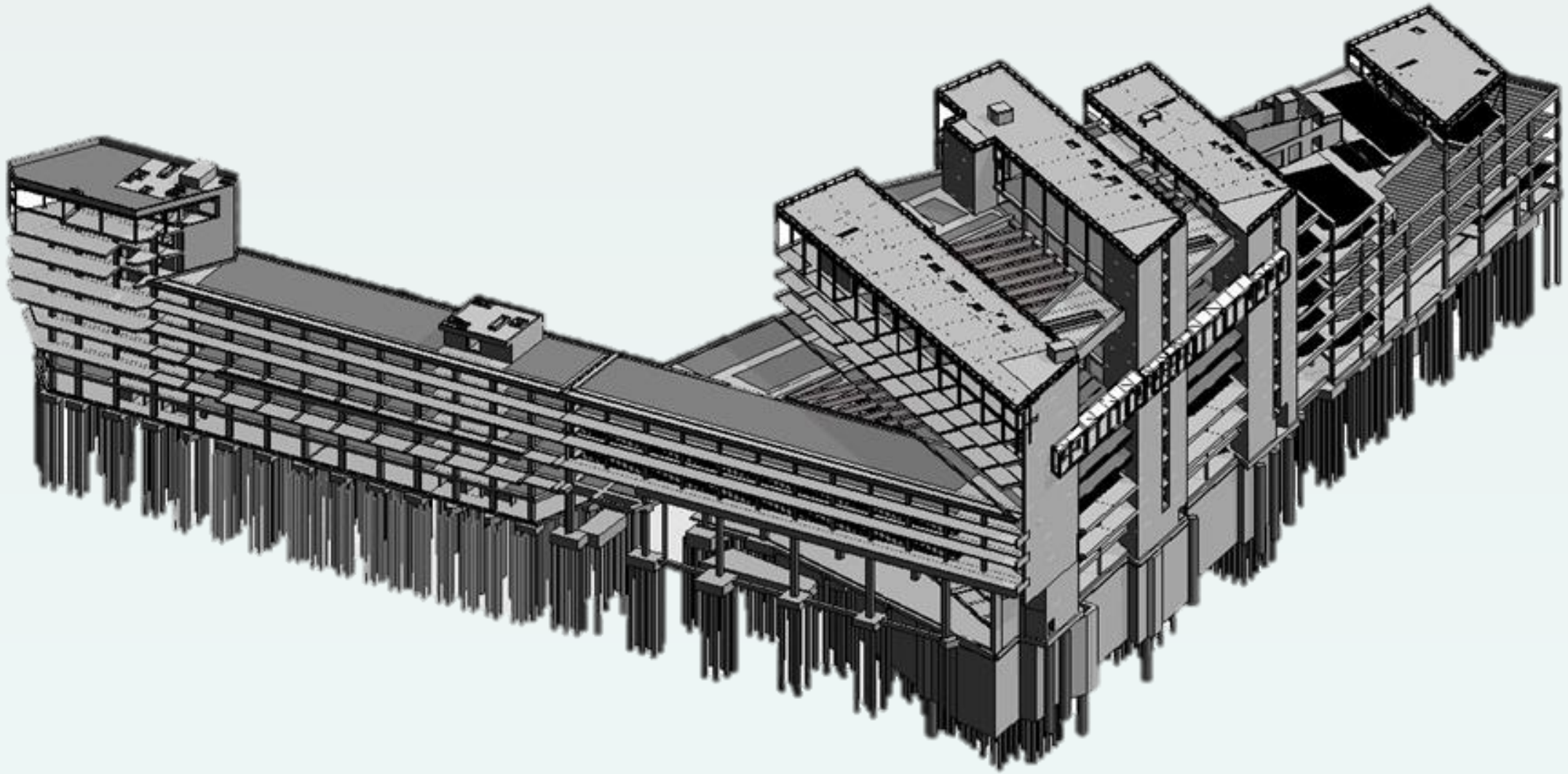
- Issue Management (RFI's)
- Design Coordination and Management Support
- Conflict support/ Errors and Omissions Identification
- Soft Landing support

CDM (Health & Safety) Integration

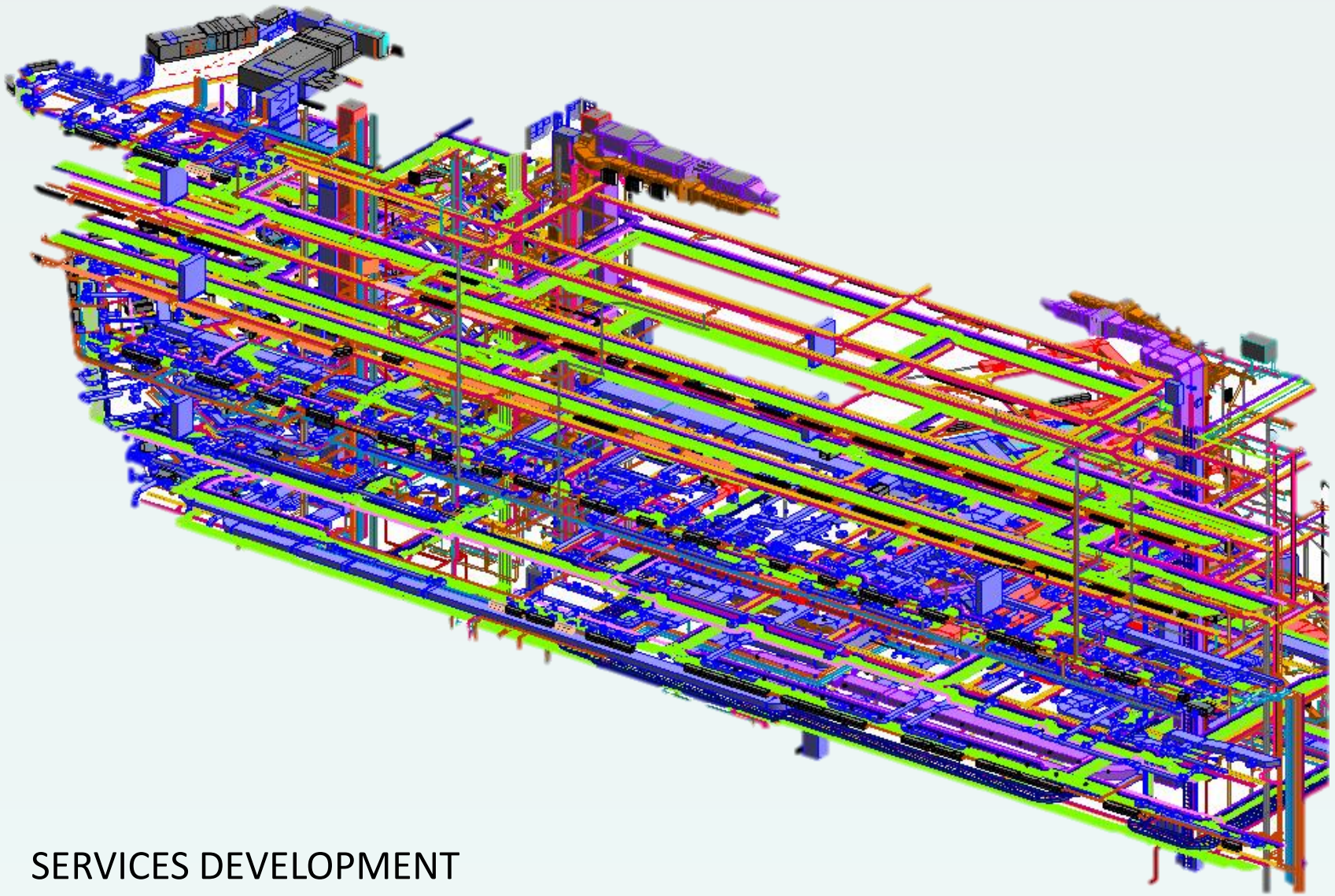
Field & Commissioning Integration



ARCHITECTURE



STRUCTURE



SERVICES DEVELOPMENT

Mechanical;

Above ground drainage;

Rainwater;

Domestic water services;

Natural gas;

Heating & cooling;

Ventilation;

Fire fighting;

Electrical;

Containment;

Small power & data;

Lighting;

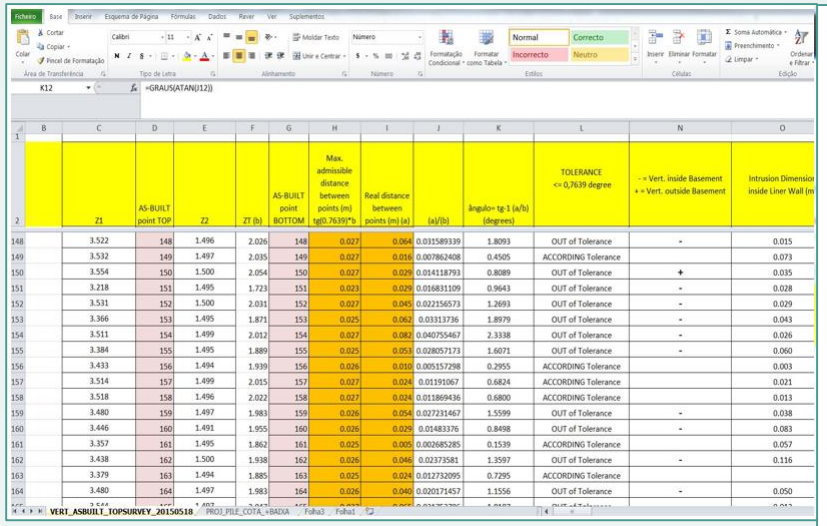
Fire alarm;

Security & access control.

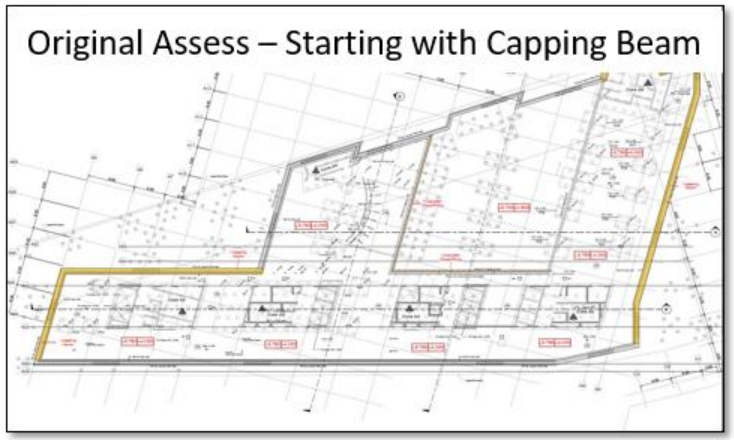
The ulster university project was developed in partnership with foreign entities which allowed the implementation of BIM software through its coordination.

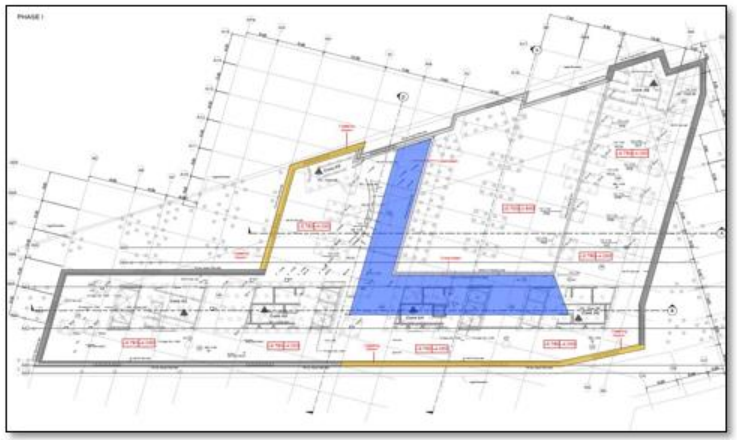
For this to be possible it was necessary to use platforms such as:

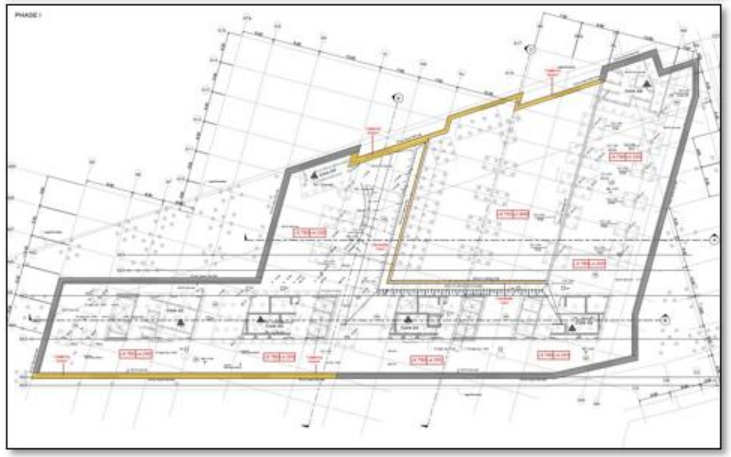
- Asite
- Bim 360

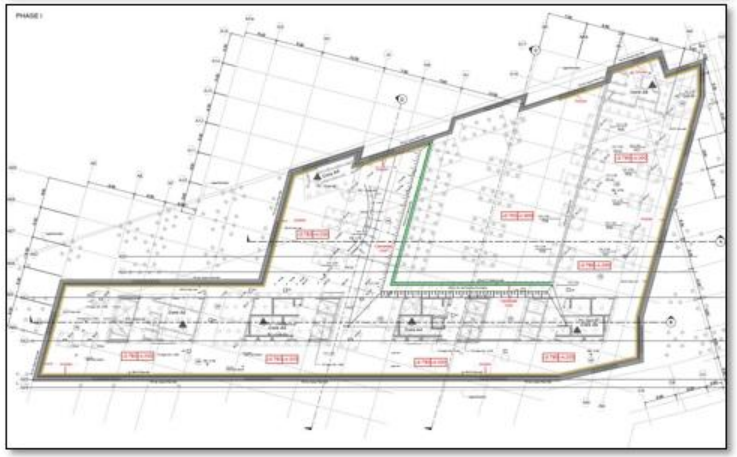


	Z1	AS-BUILT point TOP	Z2	ZT (b)	AS-BUILT point BOTTOM	Max. admissible distance between points (m) tg(0.7639)*b	Real distance between points (m) (a)	(a)/(b)	ângulo= tg-1 (a/b) (degrees)	TOLERANCE <= 0,7639 degree	- = Vert. inside Basement + = Vert. outside Basement	Intrusion Dimension inside Liner Wall (m
148	3.522	148	1.496	2.026	148	0.027	0.064	0.031589339	1.8093	OUT of Tolerance	-	0.015
149	3.532	149	1.497	2.035	149	0.027	0.016	0.007862408	0.4505	ACCORDING Tolerance		0.073
150	3.554	150	1.500	2.054	150	0.027	0.029	0.014118793	0.8089	OUT of Tolerance	+	0.035
151	3.218	151	1.495	1.723	151	0.023	0.029	0.016831109	0.9643	OUT of Tolerance	-	0.028
152	3.531	152	1.500	2.031	152	0.027	0.045	0.022156573	1.2693	OUT of Tolerance	-	0.029
153	3.366	153	1.495	1.871	153	0.025	0.062	0.03313736	1.8979	OUT of Tolerance	-	0.043
154	3.511	154	1.499	2.012	154	0.027	0.082	0.040755467	2.3338	OUT of Tolerance	-	0.026
155	3.384	155	1.495	1.889	155	0.025	0.053	0.028057173	1.6071	OUT of Tolerance	-	0.060
156	3.433	156	1.494	1.939	156	0.026	0.010	0.005157298	0.2955	ACCORDING Tolerance		0.003
157	3.514	157	1.499	2.015	157	0.027	0.024	0.01191067	0.6824	ACCORDING Tolerance		0.021
158	3.518	158	1.496	2.022	158	0.027	0.024	0.011869436	0.6800	ACCORDING Tolerance		0.013
159	3.480	159	1.497	1.983	159	0.026	0.054	0.027231467	1.5599	OUT of Tolerance	-	0.038
160	3.446	160	1.491	1.955	160	0.026	0.029	0.01483376	0.8498	OUT of Tolerance	-	0.083
161	3.357	161	1.495	1.862	161	0.025	0.005	0.002685285	0.1539	ACCORDING Tolerance		0.057
162	3.438	162	1.500	1.938	162	0.026	0.046	0.02373581	1.3597	OUT of Tolerance	-	0.116
163	3.379	163	1.494	1.885	163	0.025	0.024	0.012732095	0.7295	ACCORDING Tolerance		
164	3.480	164	1.497	1.983	164	0.026	0.040	0.020171457	1.1556	OUT of Tolerance	-	0.050





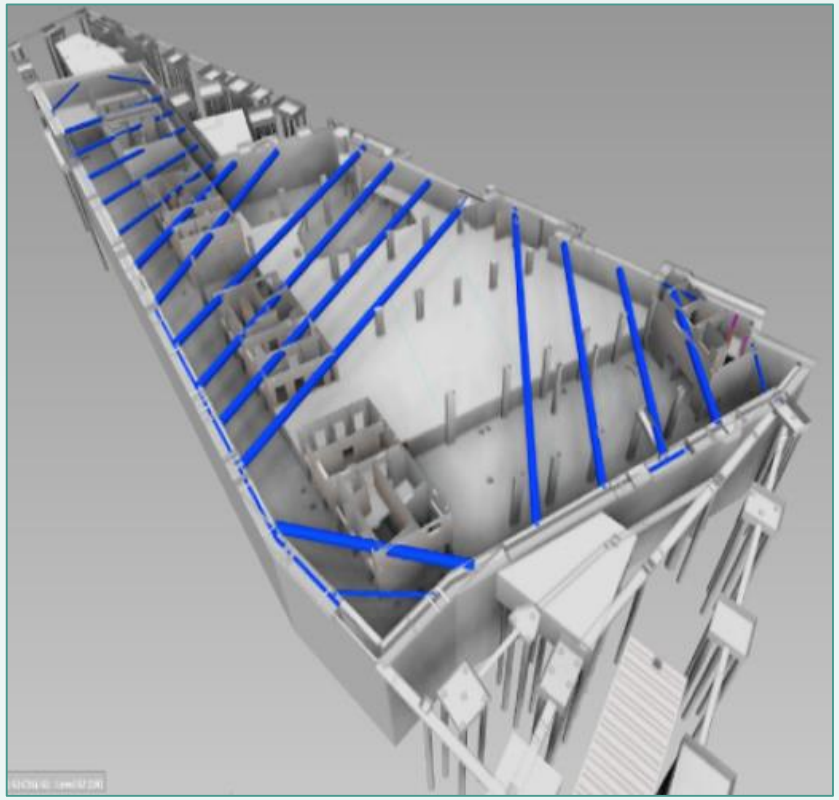


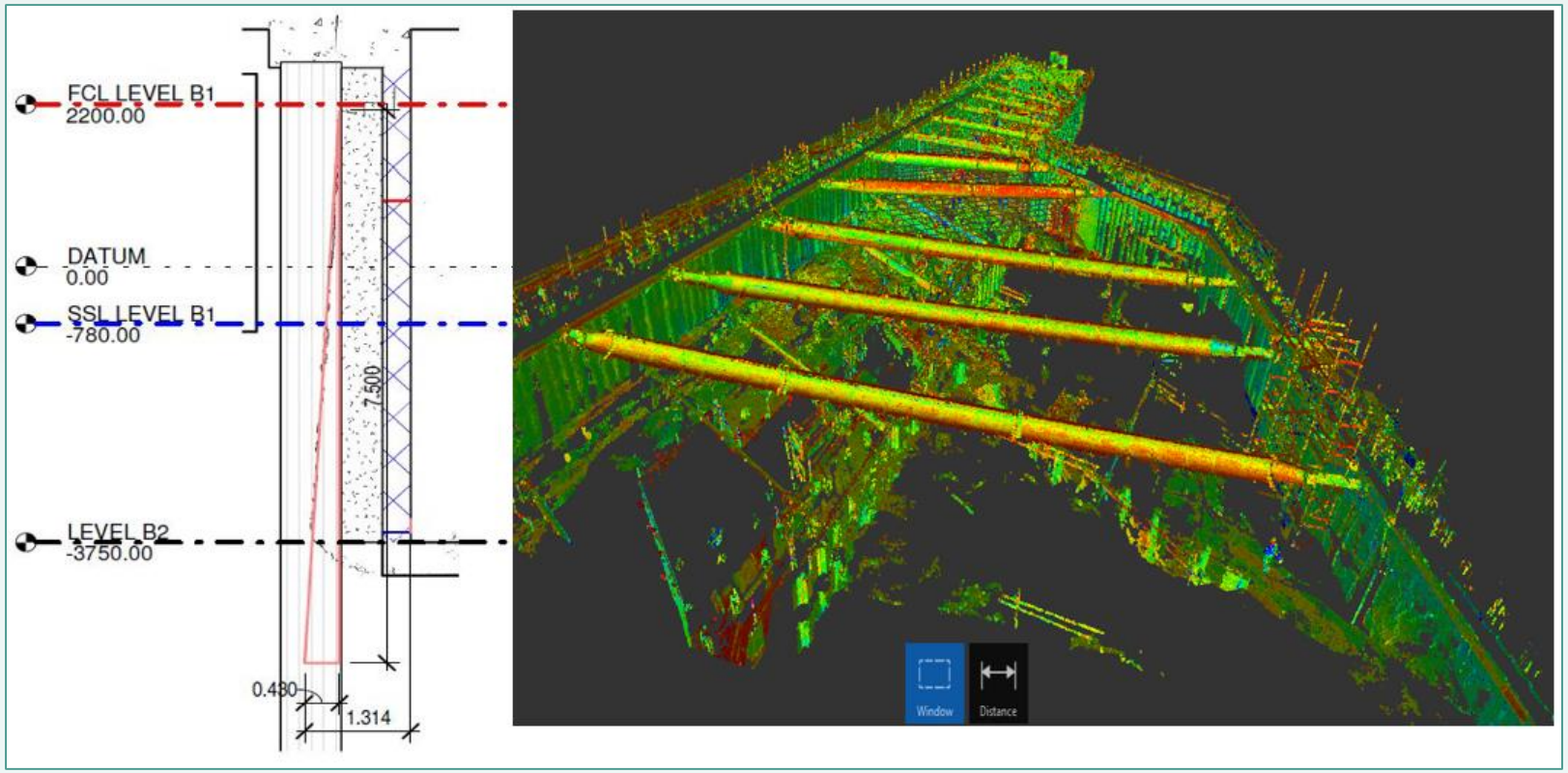


Site Logistic Planning

Logistic & Vehicle Movement Studies

SURVEY TO MANAGEMENT AND DESIGN ADJUSTMENT





Technical Queries

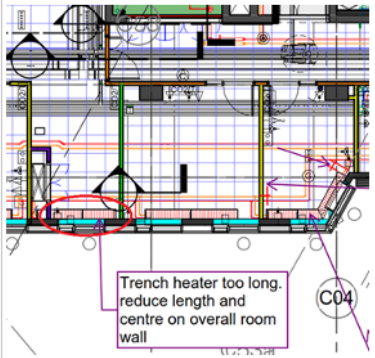
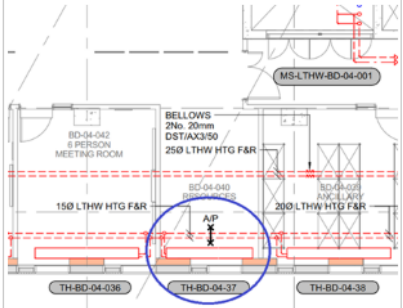
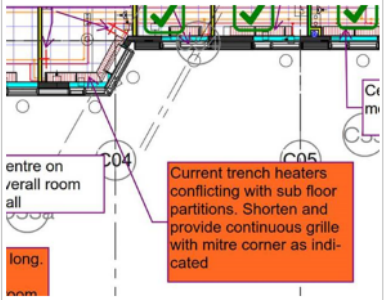
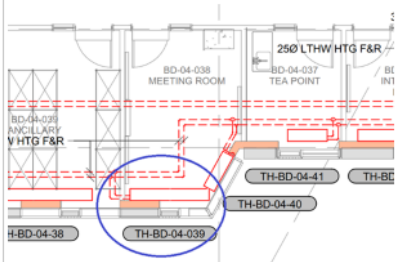
BMS.04.002

Project Ref.	O.18.026
Title	Trench Heaters - Dimensions and Positions to be confirmed
Date	2018.07.31
Tracker ID	BMS.04.002

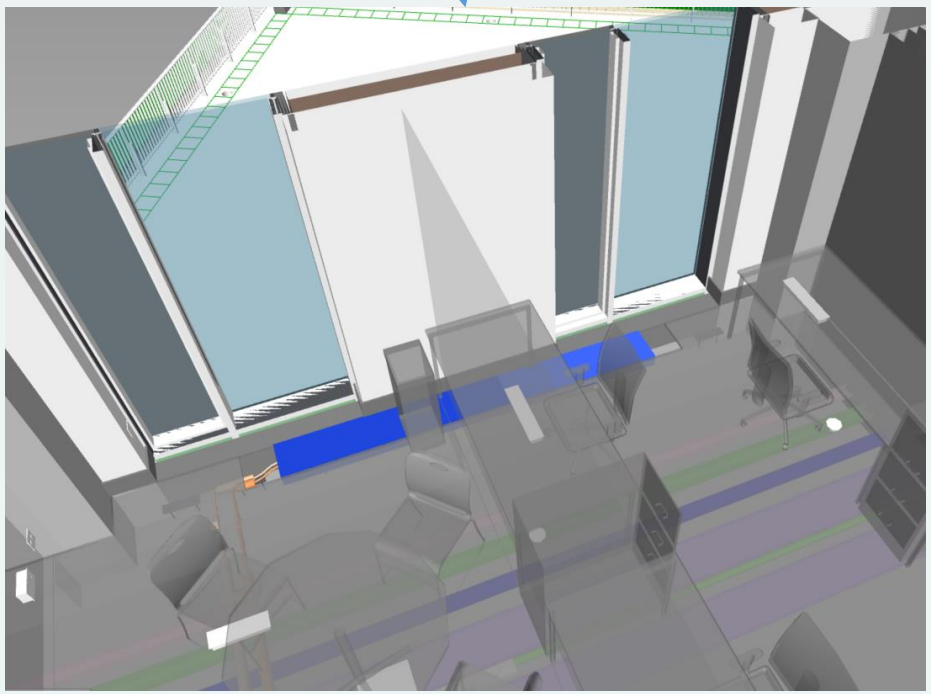
BIMMS

Query Description

Trench heaters dimensions and positions are not compatible with architecture layout. STW has also raised some comments regarding this issue, which is presented below.

Location	STW indications	MEP impact	BIMMS comments
BD-04-040	Trench Heater too long. Reduce length and centre on overall room wall 	**1 No. Trench Heater** TH-BD-04-037: 270Wx110Dx2500L **Length reduction required**	RPS to review STW comment and advise the revised dimensions to accommodate this and meet the thermal loads of the space. 
BD-04-038	Trench Heater length to be reduced 	**1 No. Trench Heater** TH-BD-04-039: 210Wx110Dx2000L **Length reduction required**	RPS to review STW comment and advise the revised dimensions to accommodate this and meet the thermal loads of the space. 

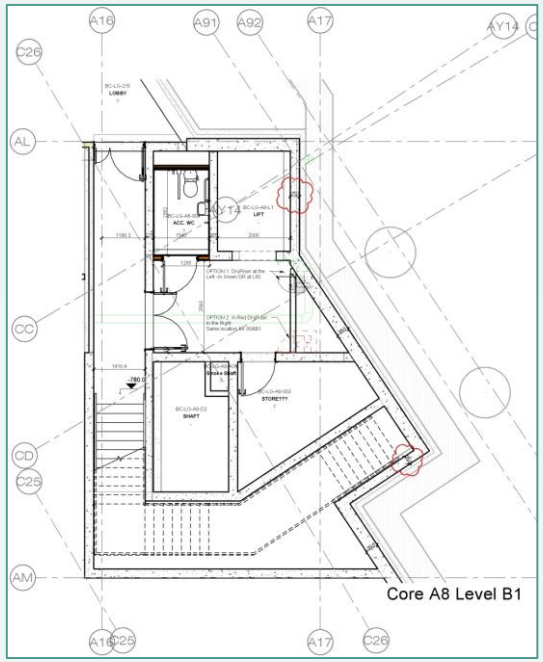
Issue reporting

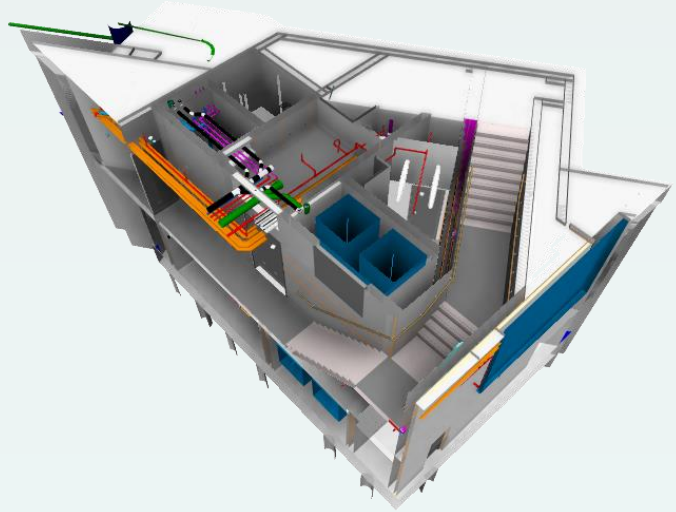


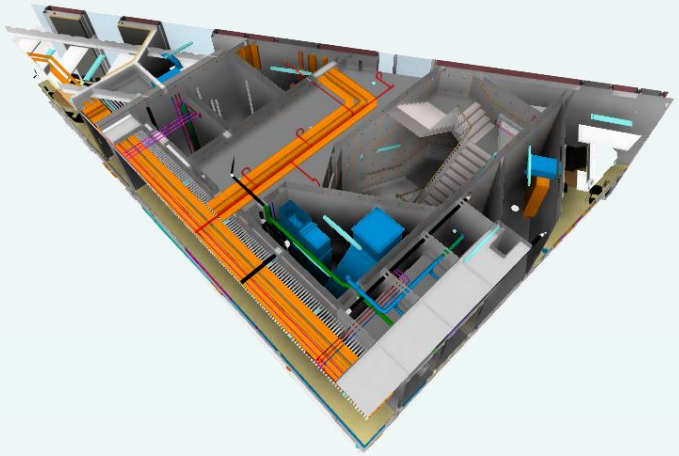
Solution implemented

DOCUMENTATION

DOCUMENTAÇÃO







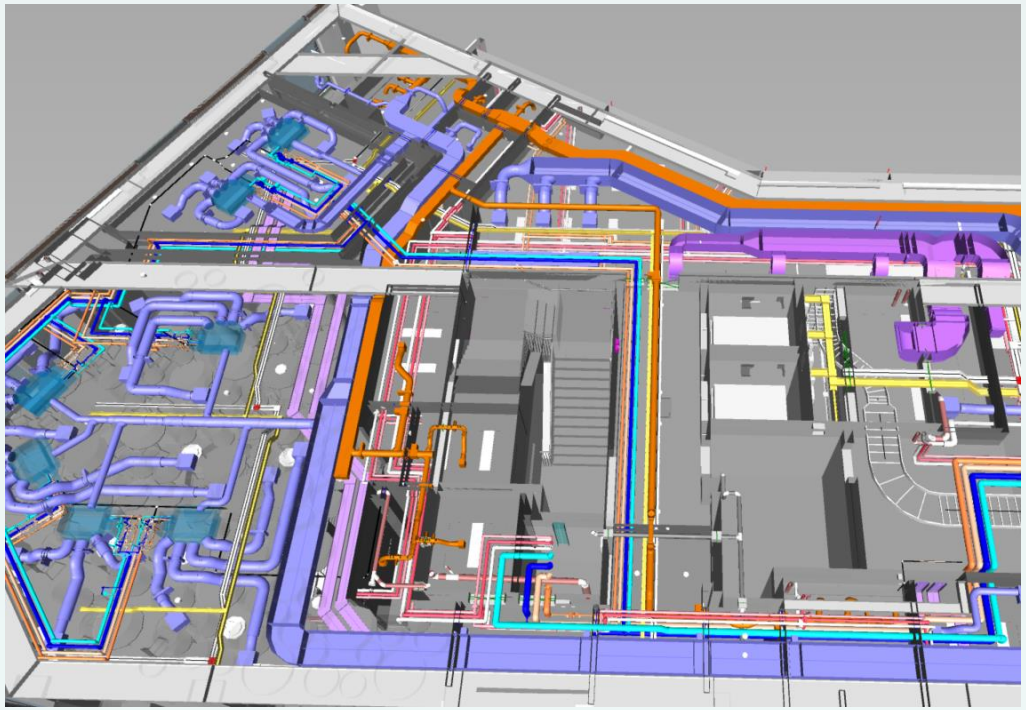
COORDINATION

MEP services
vs.
Structures
&
Architecture

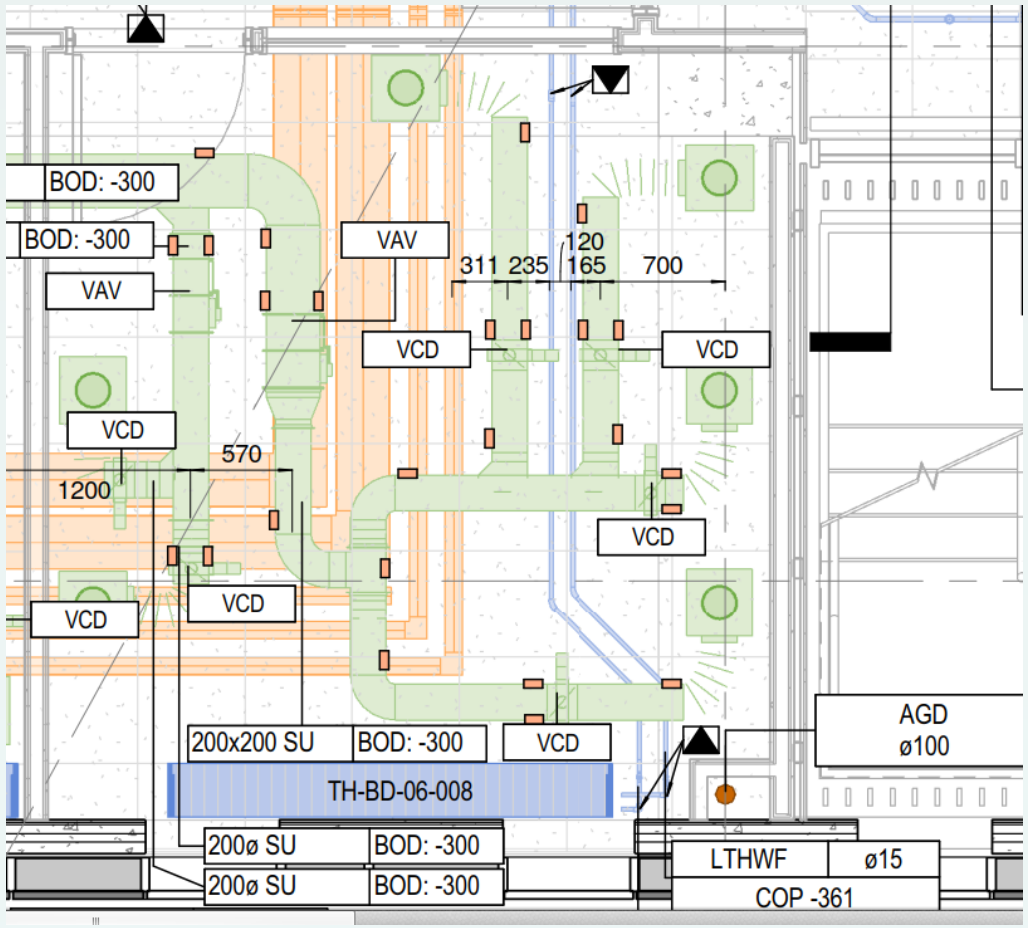
Example

Issue: lack of space to accommodate all services

Possible solution: re-route toilet extract duct

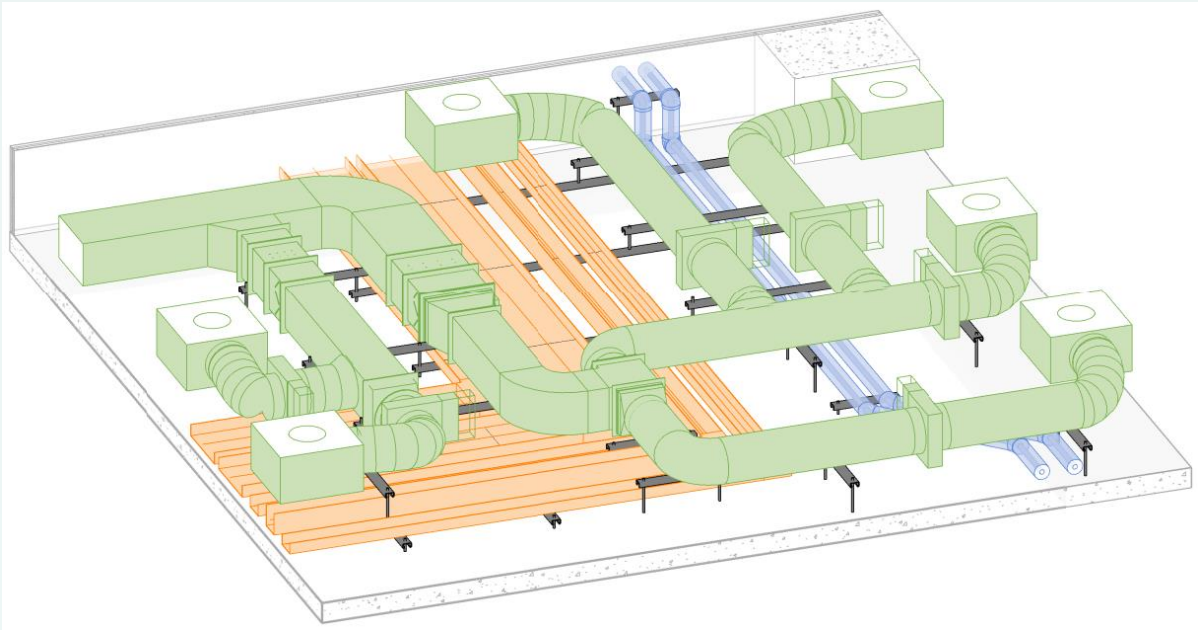


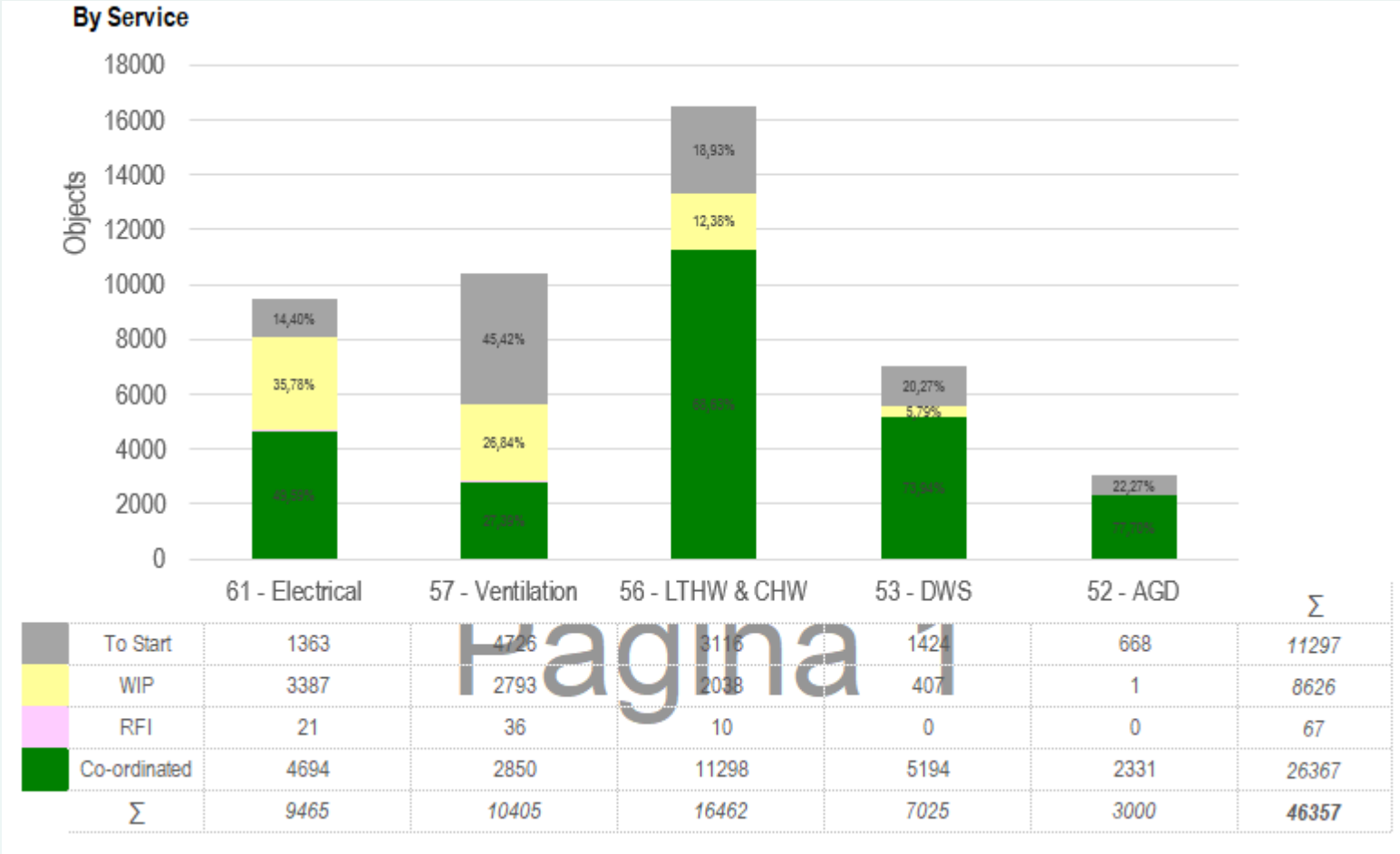
Implementation



Coordinated working drawings

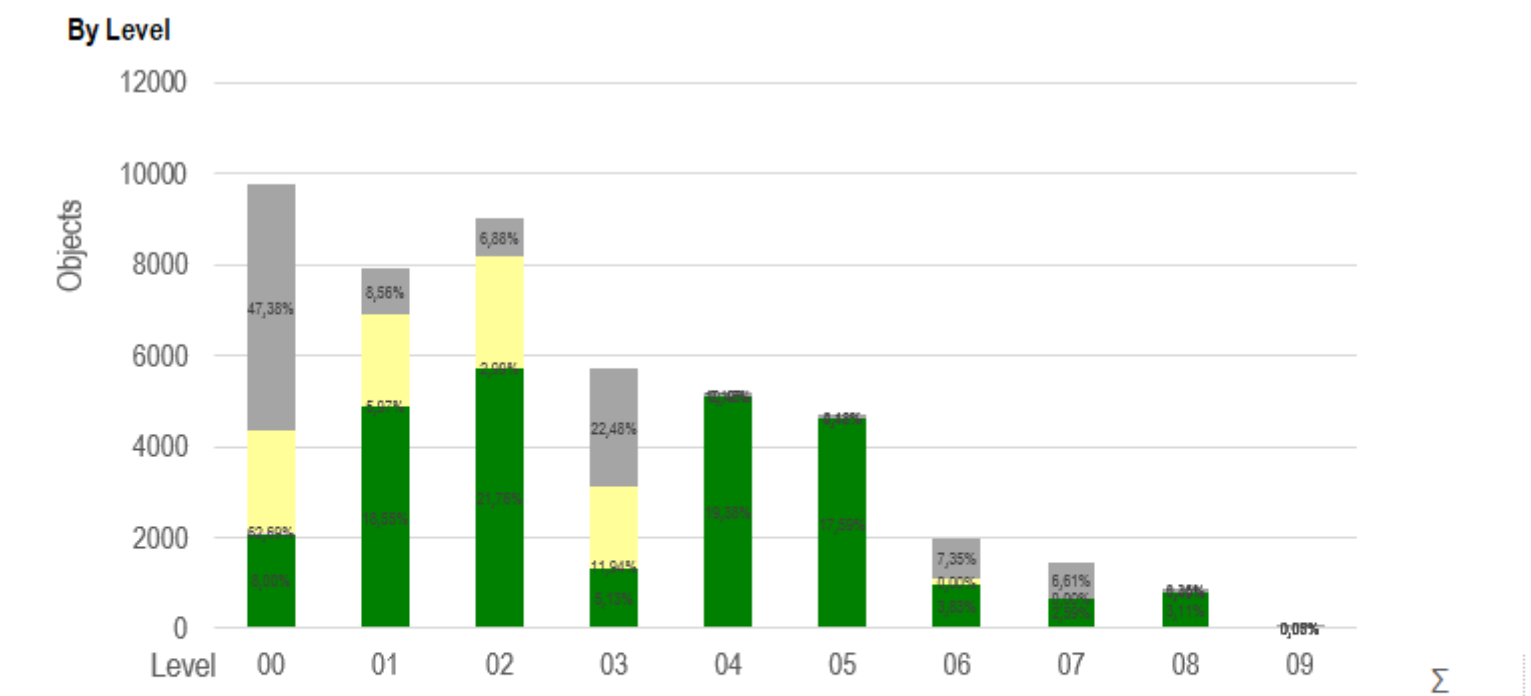
Support solutions analysis





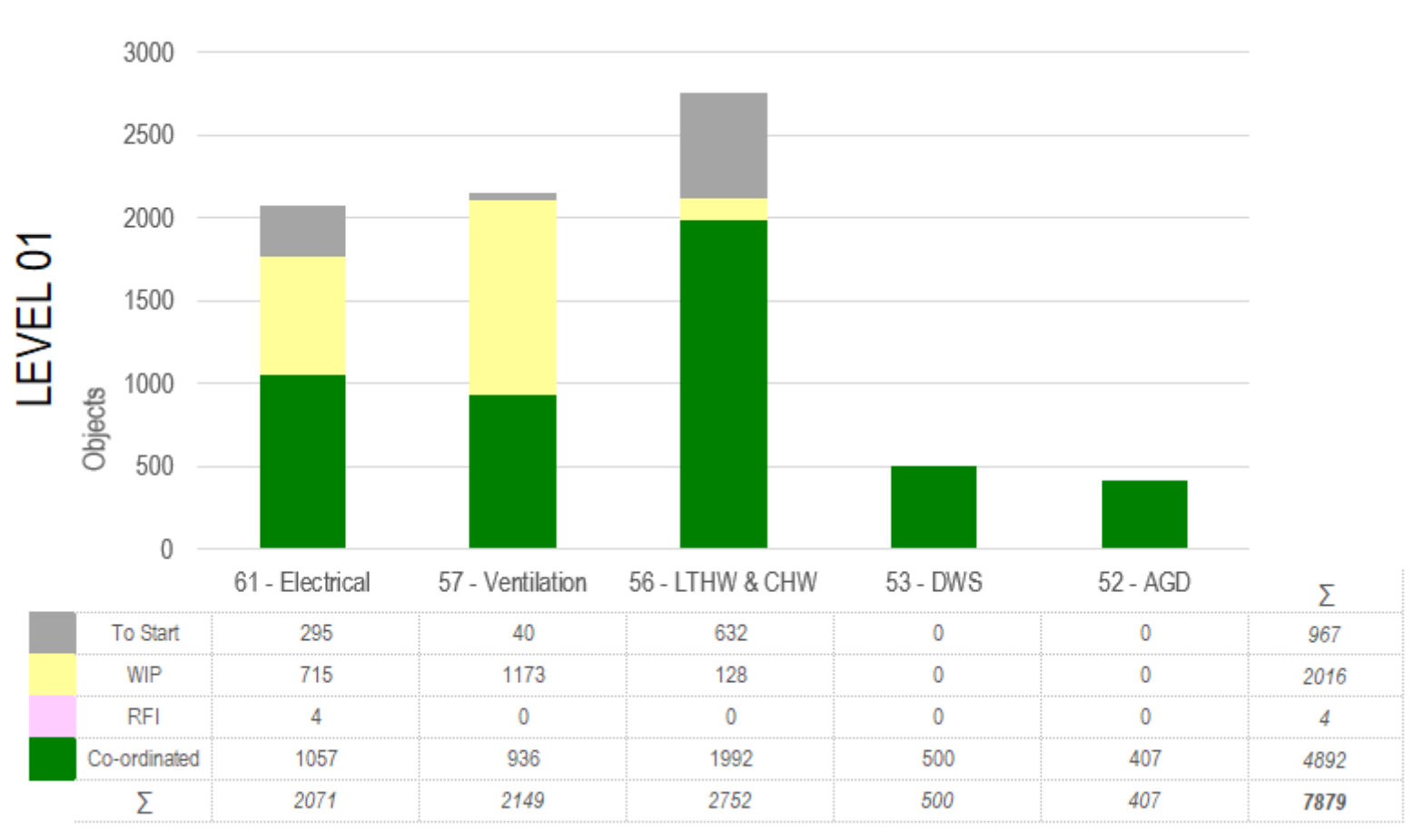
	61 - Electrical	57 - Ventilation	56 - LTHW & CHW	53 - DWS	52 - AGD	Σ
To Start	1363	4726	3116	1424	668	*11297*
WIP	3387	2793	2038	407	1	*8626*
RFI	21	36	10	0	0	*67*
Co-ordinated	4694	2850	11298	5194	2331	*26367*
Σ	*9465*	*10405*	*16462*	*7025*	*3000*	***46357***

Global Status Review (co-ordination status) – by type of service



Level	00	01	02	03	04	05	06	07	08	09	Σ
To Start	5352	967	777	2540	22	13	830	747	41	8	*11297*
WIP	2230	2016	2478	1797	0	0	105	0	0	0	*8626*
RFI	42	4	2	8	7	3	0	0	1	0	*67*
Co-ordinated	2110	4892	5738	1353	5110	4639	1009	683	820	13	*26367*
Σ	*9734*	*7879*	*8995*	*5698*	*5139*	*4655*	*1944*	*1430*	*862*	*21*	***46357***

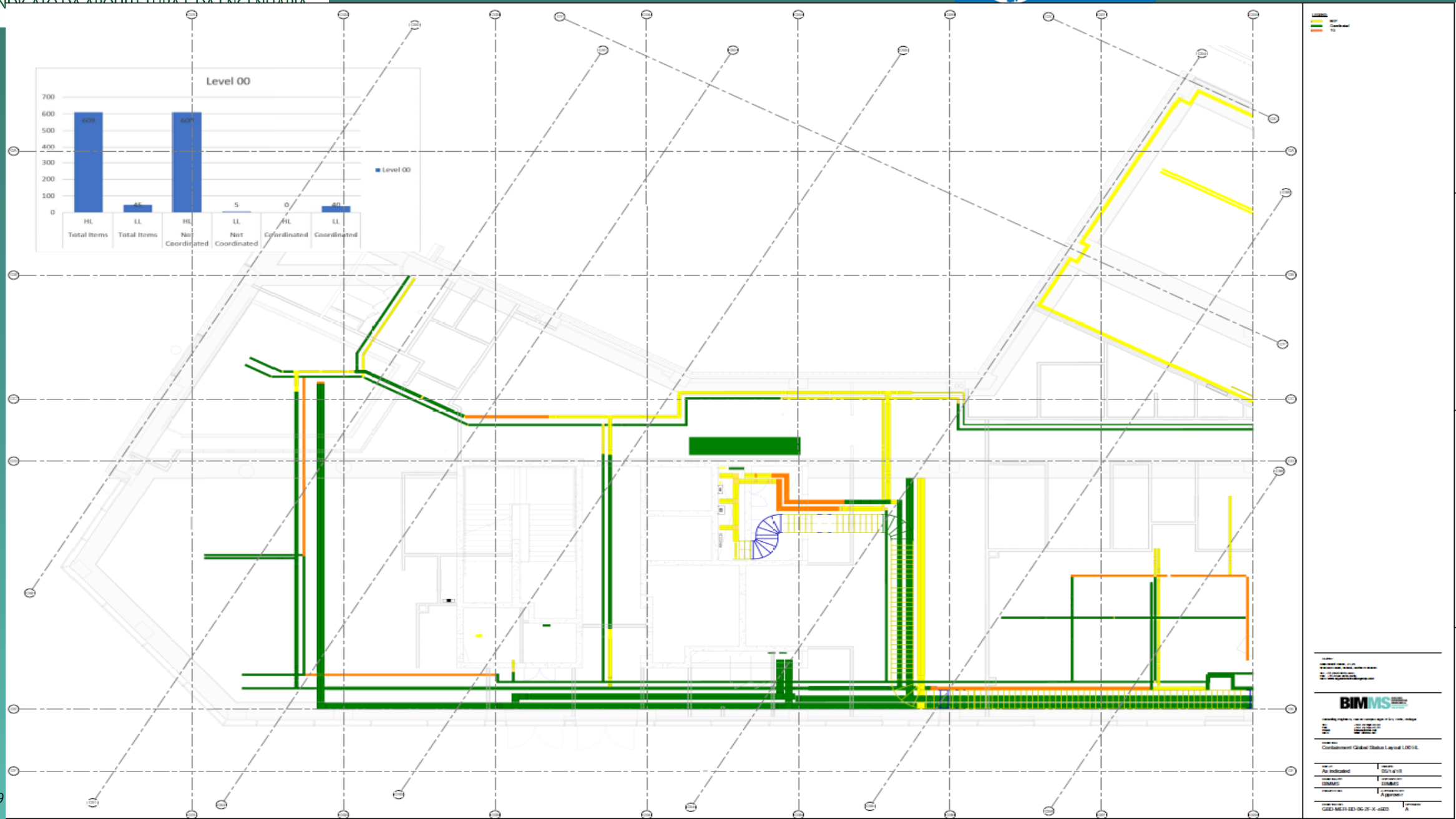
Global Status Review (co-ordination status) – by level



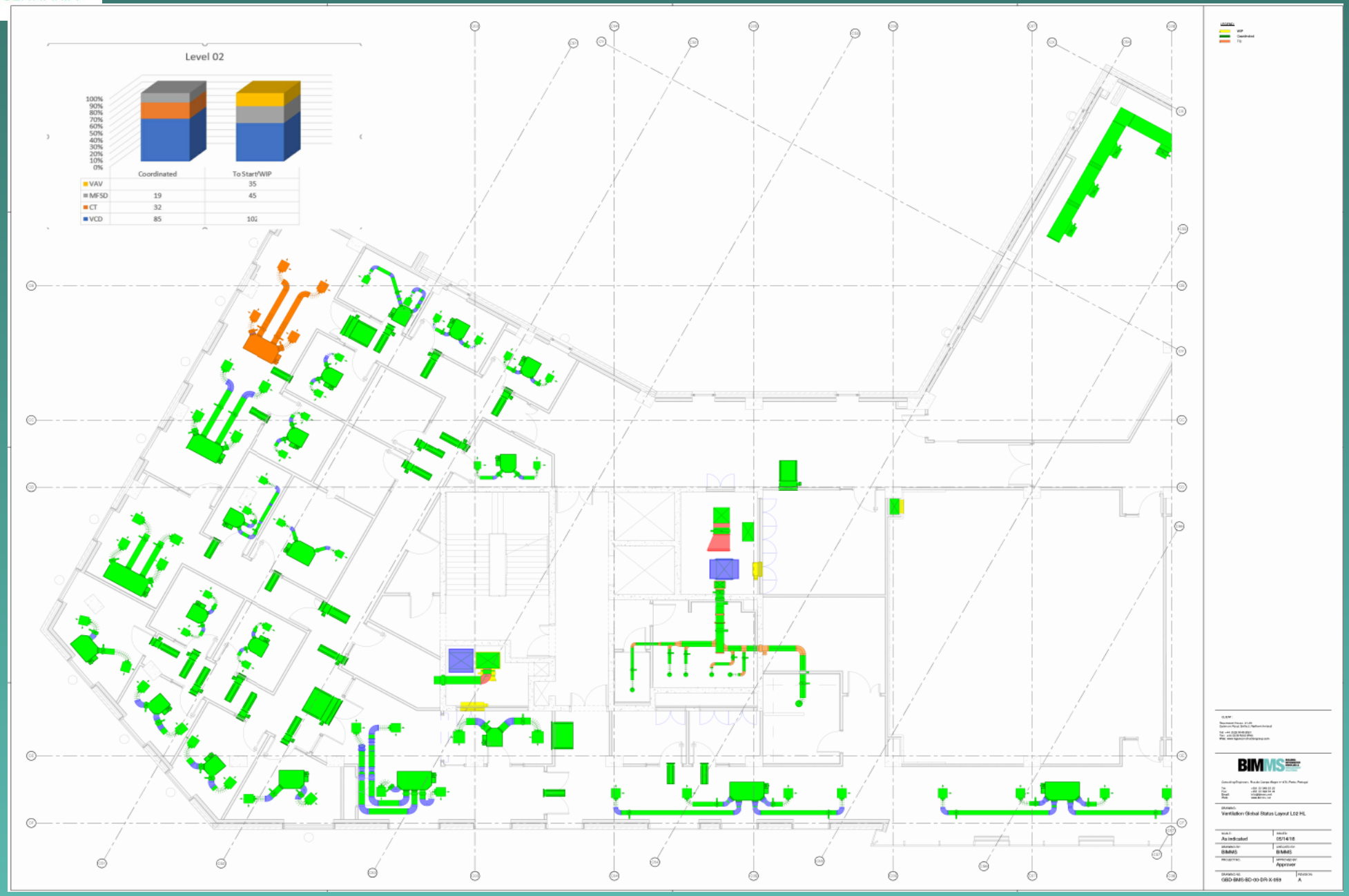
	61 - Electrical	57 - Ventilation	56 - LTHW & CHW	53 - DWS	52 - AGD	Σ
To Start	295	40	632	0	0	*967*
WIP	715	1173	128	0	0	*2016*
RFI	4	0	0	0	0	*4*
Co-ordinated	1057	936	1992	500	407	*4892*
Σ	*2071*	*2149*	*2752*	*500*	*407*	***7879***

Detailed Status Review (co-ordination status) – Level 01

Global Status Layout



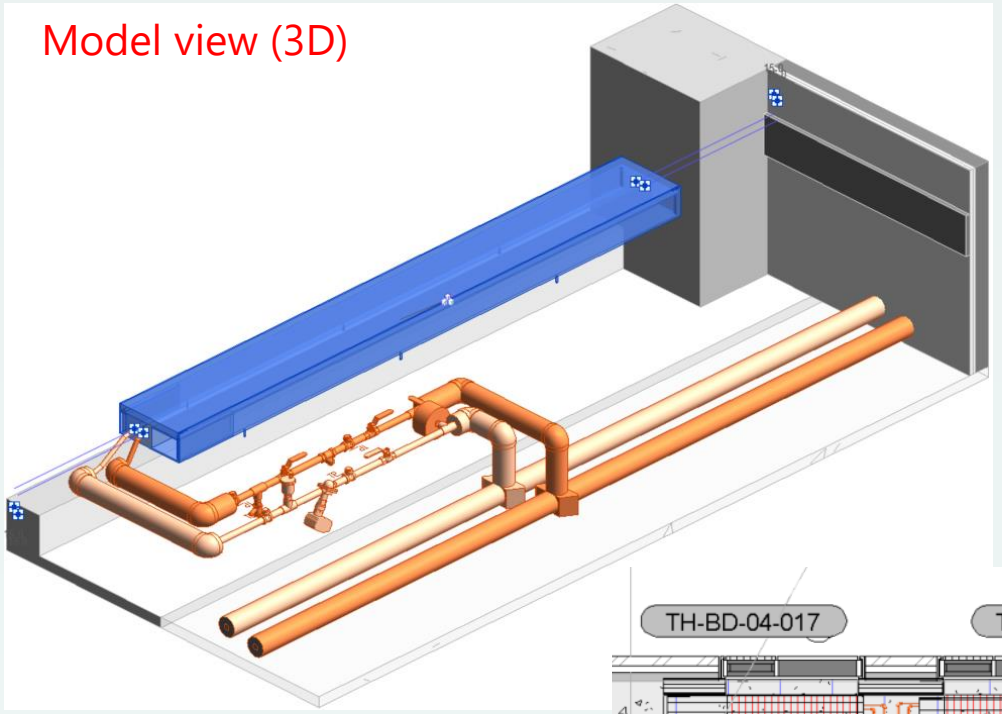
Global Status Layout



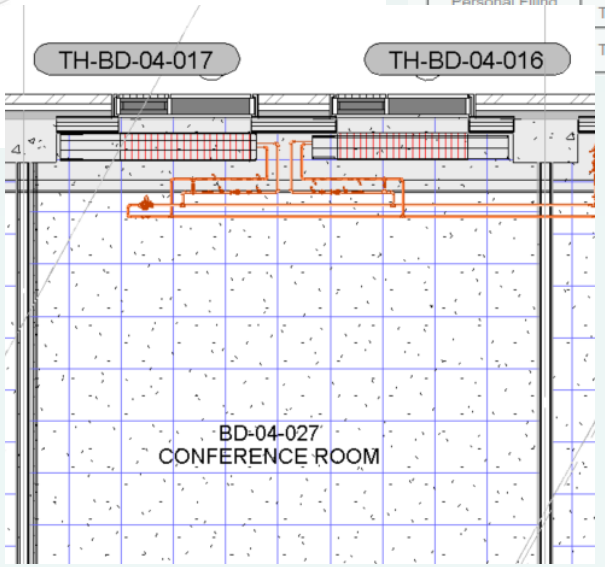
FACILITY MANAGEMENT

Trench Heater

Model view (3D)



Plan view (2D)



Equipment Schedule

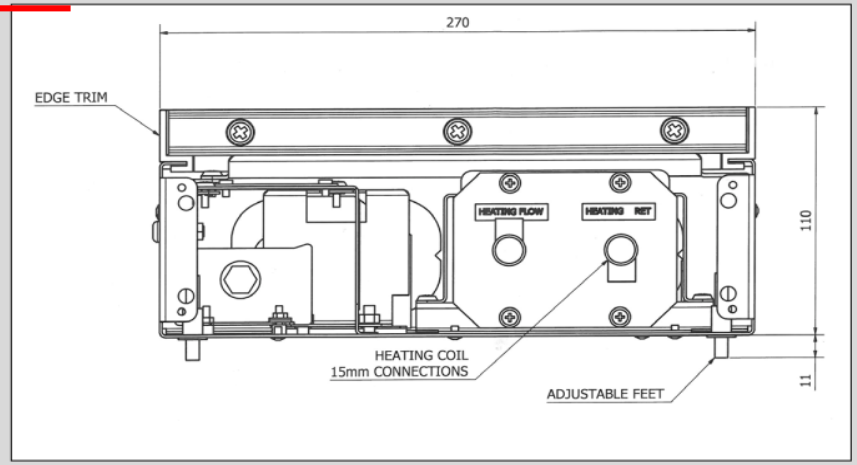
DB

AEROCOURSE TRENCH HEATING SCHEDULE

Project Name: University of Ulster
Quotation Number: 22265SE08-1
Postcode:
Date:

Location	Reference	Style	Overall Dimensions (W x D x H) Width (mm)	Depth (mm)	Length (mm)	Unit Length (mm)	Dummy Length (mm)	LPHW Flow/Return °C		Room Air °C	Speed (Volts)	Sound Pressure level dB(A) @ 3.0m Q4 Free-Field	Requested Output (W)	Actual Output (W)	Quantity Of Units
Open Plan Workspace / Personal Filing	TH-BD-04-005.1	AFA-2P	310	110	2250	2250	0	65	50	20	3.0	19.5	2212	1321	1
	TH-BD-04-005.2	AFA-2P	310	110	1750	1750	0	65	50	20	3.0	18.8		973	1
	TH-BD-04-008.1	AFA-2P	310	110											
	TH-BD-04-008.2	AFA-2P	310	110											
	TH-BD-04-011	AFA-2	270	110											
	TH-BD-04-014.1	AFA-2P	310	110											
	TH-BD-04-014.2	AFA-2P	310	110											
Conference Room	TH-BD-04-016	AFA-2	270	110											
	TH-BD-04-017	AFA-2P	310	110											
Open Plan Workspace / Personal Filing	TH-BD-04-018.1	AFA-2P	310	110											
	TH-BD-04-018.2	AFA-2P	310	110											
	TH-BD-04-020	AFA-2P	310	110											
	TH-BD-04-023	AFA-2	270	110											

Equipment Datasheet



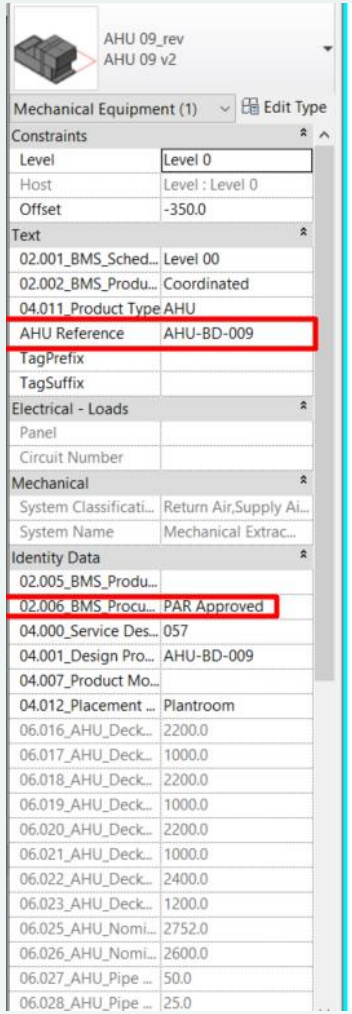
Heat Outputs (W) @ ΔT = 60K		Fan speed (V DC) 2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Casing Length (mm)	1250	762	1059	1294	1533	1616	1648	1668	1693	1713
	1750	1185	1647	2013	2384	2514	2563	2595	2634	2665
	2250	1609	2235	2732	3236	3412	3478	3522	3575	3617
	2750	2032	2823	3451	4087	4310	4394	4449	4516	4569
	3250	2456	3411	4170	4939	5207	5309	5376	5456	5520

Heat Output Correction Factors													
ΔT (K)	60	59	58	57	56	55	50	45	40	35	30	25	20
Factor	1.00	0.981	0.962	0.944	0.925	0.906	0.813	0.723	0.633	0.544	0.458	0.373	0.290

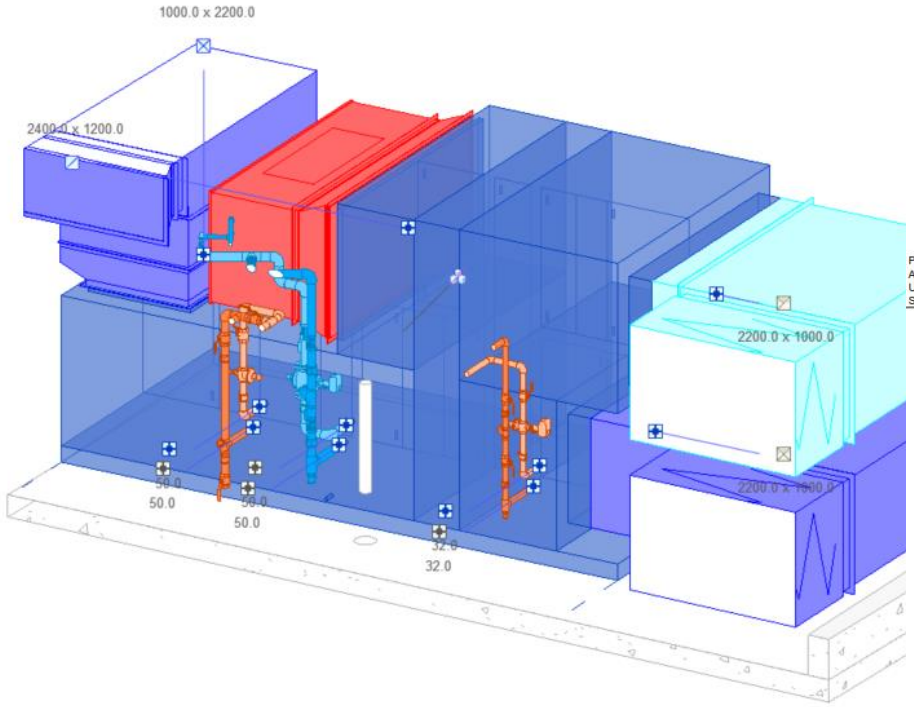
ΔT is mean water temperature less room air (or return air) temperature

FACILITY MANAGEMENT

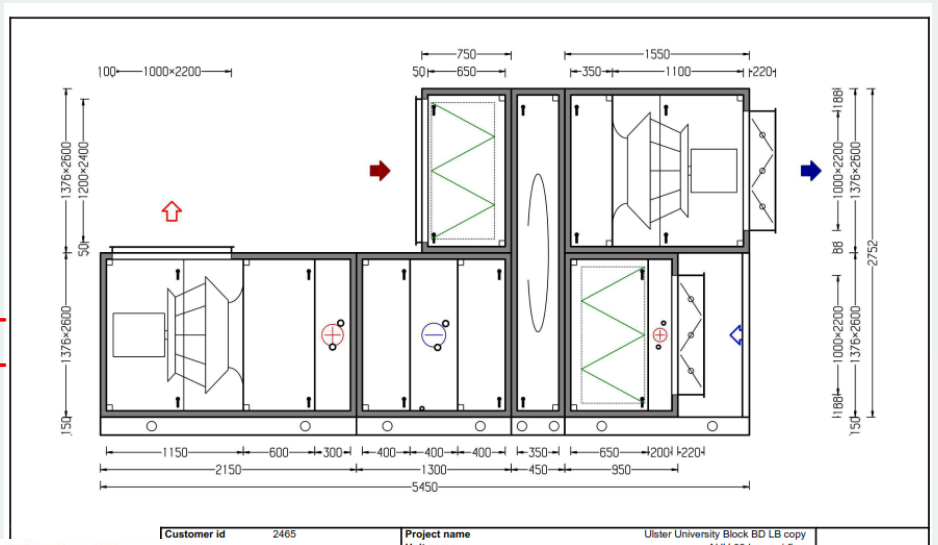
Air Handling Unit



Model view (3D)



Equipment Datasheet

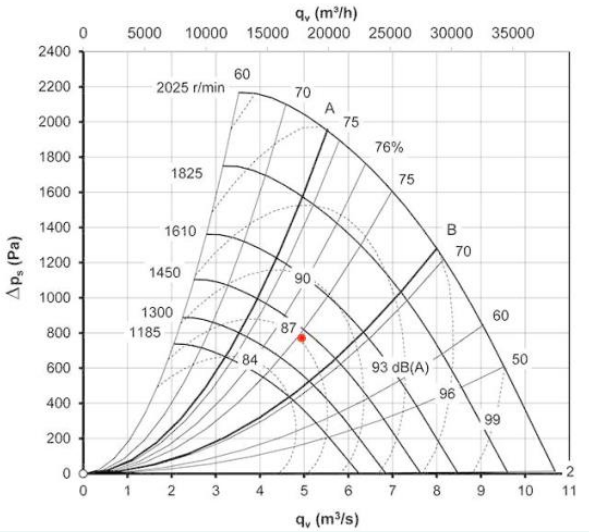


FläktGroup
AIR HANDLING UNIT eQ

Customer id	2465	
Project name		Ulster University Block BD LB copy
Unit name		AHU-09 lower airflow
Supply air	eQ-072	4.95 m³/sec
Exhaust air	eQ-072	3.34 m³/sec

Project	6382 () / Ulster University Block BD LB copy	Acon 2.35.180705.1
AOC	ACON-02130809	
Unit	17 () / AHU-09 lower airflow	2018-08-02
Size	072	Page 11/12

Fan chart - Supply air - EQLP-072-2-1-1-1-6-4-1-3-1-2-1



FläktGroup
AIR HANDLING UNIT eQ

Project	6382 () / Ulster University Block BD LB copy	Acon 2.35.180705.1
AOC	ACON-02130809	
Unit	17 () / AHU-09 lower airflow	2018-08-02
Size	072	Page 4/12
Customer		
Customers ref.		
Our ref.	Declan McCarthy	

Supply air volume flow rate	4.95 m³/sec	Exhaust air volume flow rate	3.34 m³/sec
External static pressure	470 Pa	External static pressure	330 Pa
Voltage	3 x 400V + N, 50 Hz	Weight	3080 kg
Specific electric power demand	1.64 kW/(m³/s)	Dimensioned for wet condition	
Ref. density	1.2 kg/m³	Ref. altitude above sea level	0 m

SUMMARY

Functional sections in direction of air flow	v0 (m/s)	Et (%)	tw (°C)	ts (°C)	dP* (Pa)
Supply air:					
Connection section	2.7				4
Preheater	1.8		-3 / 5		15
Filter	1.9				98
Heat exchanger	2.3	58.7	5 / 15	26 / 24.3	116
Inspection section					0
Air cooler	1.8			25 / 15	52
Inspection section					0
Air heater	1.8		5 / 21		15
Inspection section					0
Plenum fan		73.8	19 / 20	15 / 16	785
Fan system effect					15
Supply outlet					470
Exhaust air:					
Exhust inlet					330
Connection section	1.1				0
Filter	1.2				63
Heat exchanger	1.6		22 / 7.4	23 / 25.6	78
Inspection section					0
Plenum fan		74.0			479
Fan system effect					8

*Refers to the fan design case

SOUND POWER LEVELS
(standard: EN13053 ISO/CD 13347-2)

	Lw per octave band (dB)								LwA
Octave band (Hz)	63	125	250	500	1k	2k	4k	8k	dB(A)
Fresh air connection	69	76	72	68	56	55	47	40	68
Supply air connection	75	82	80	79	77	77	73	70	83
Extract connection	67	74	74	70	55	56	52	46	70
Exhaust connection	70	77	75	74	72	72	68	65	78
To surroundings	66	70	65	55	45	47	43	30	60

CONCLUSIONS

- UK BIM Standards compliance;
- BIM procurement support;
- Continuous support onsite;

05.

DATA CENTER

Mercury Engineering| Amesterdam, Netherlands | Data Center | 5575 m^2

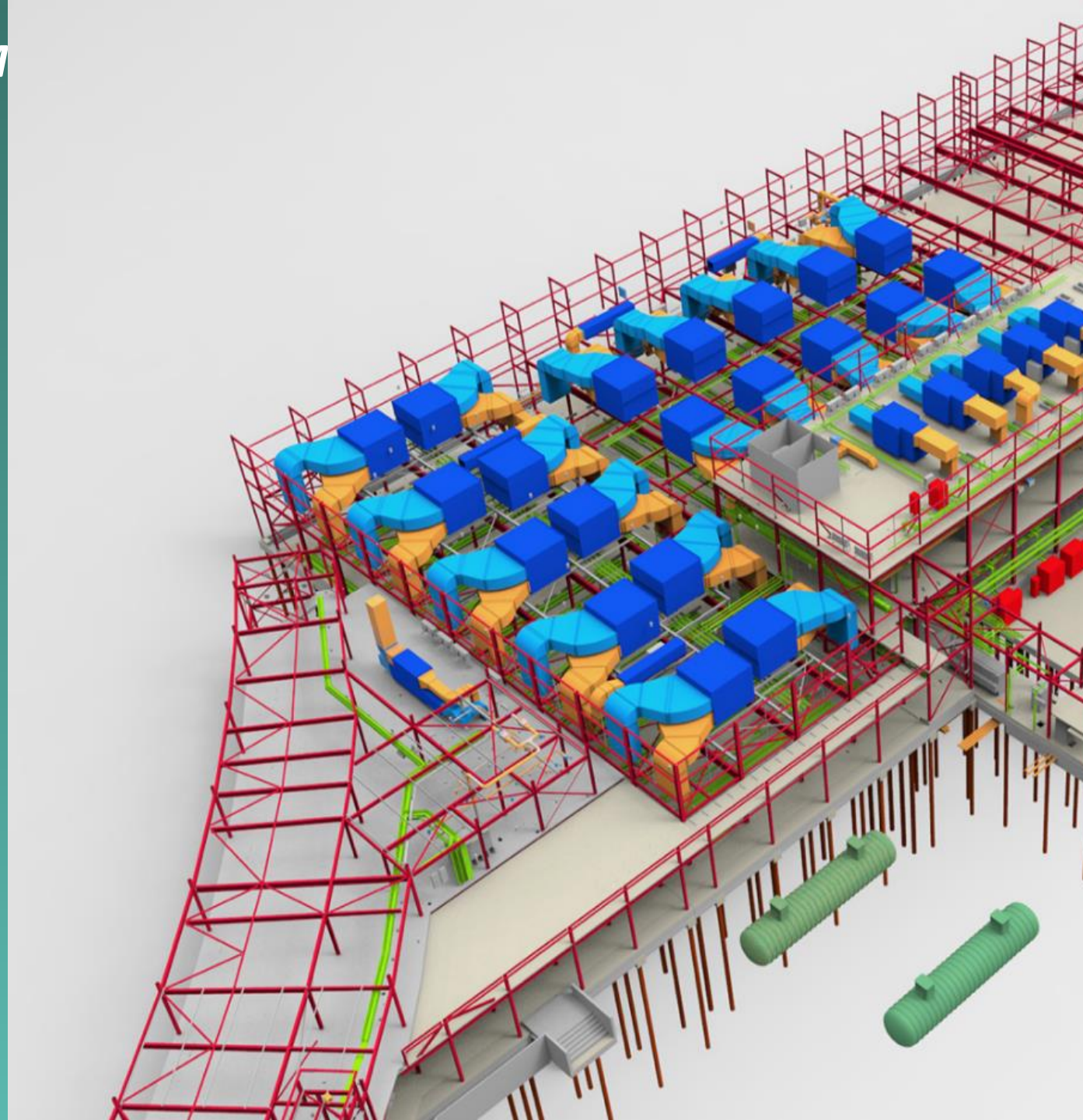
AMS15 - DATA CENTER

MEP Coordination and management support

BIM objects Modeling and integration within the models

As-built Drawings

On – site technical support



AMS16 – DATA CENTER

Design Model Coordination and management support

Clash detection and quality control

Brackets and Hangers coordination

Quantities Take Off

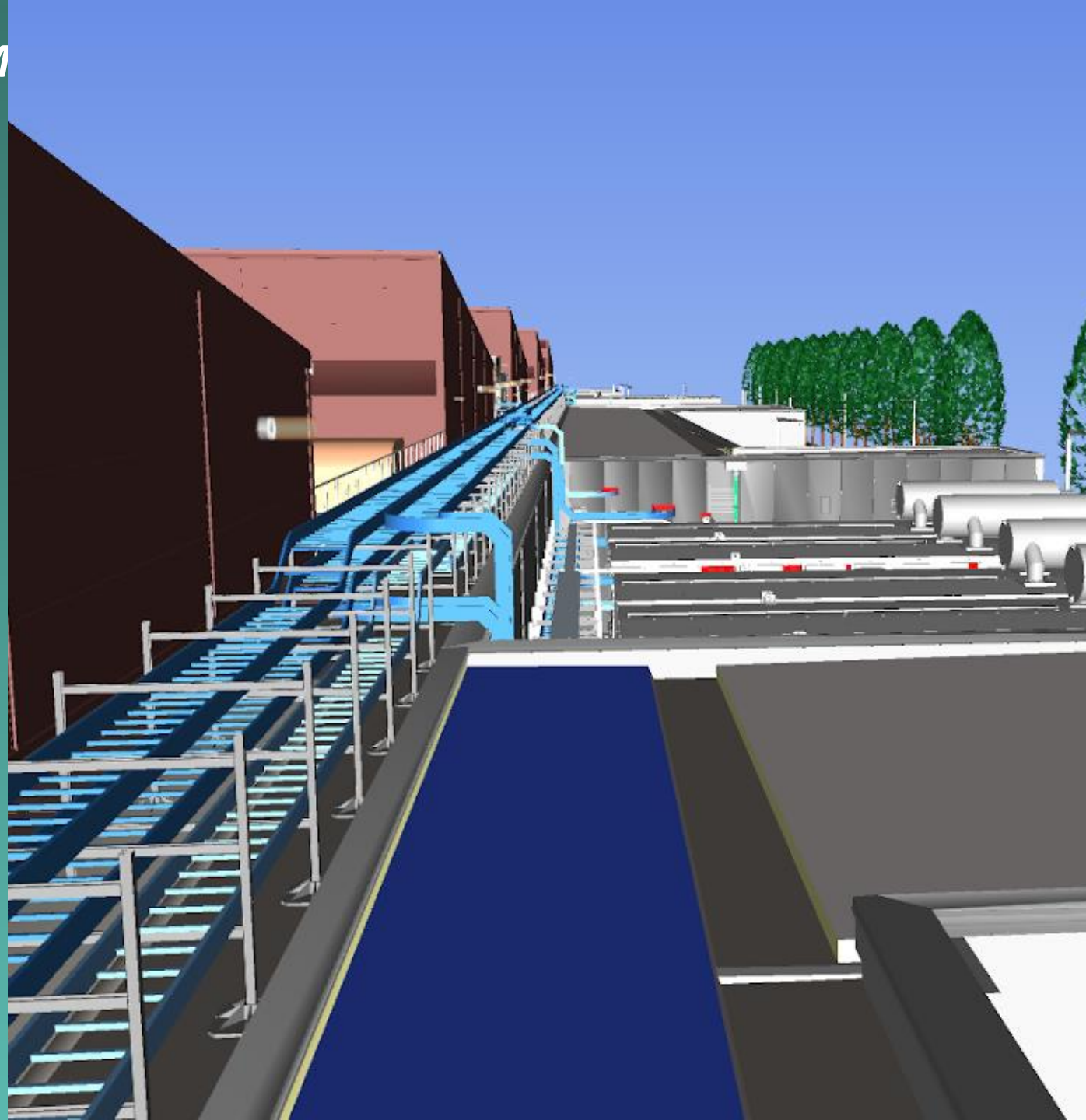
BIM objects Modeling and integration within the models

Handover of 2D & 3D Installation Drawings

On – site technical support

RFI's Submittals & Document Management

Data & Analytics



AMS15 - DATA CENTER

Ducts - 1272m

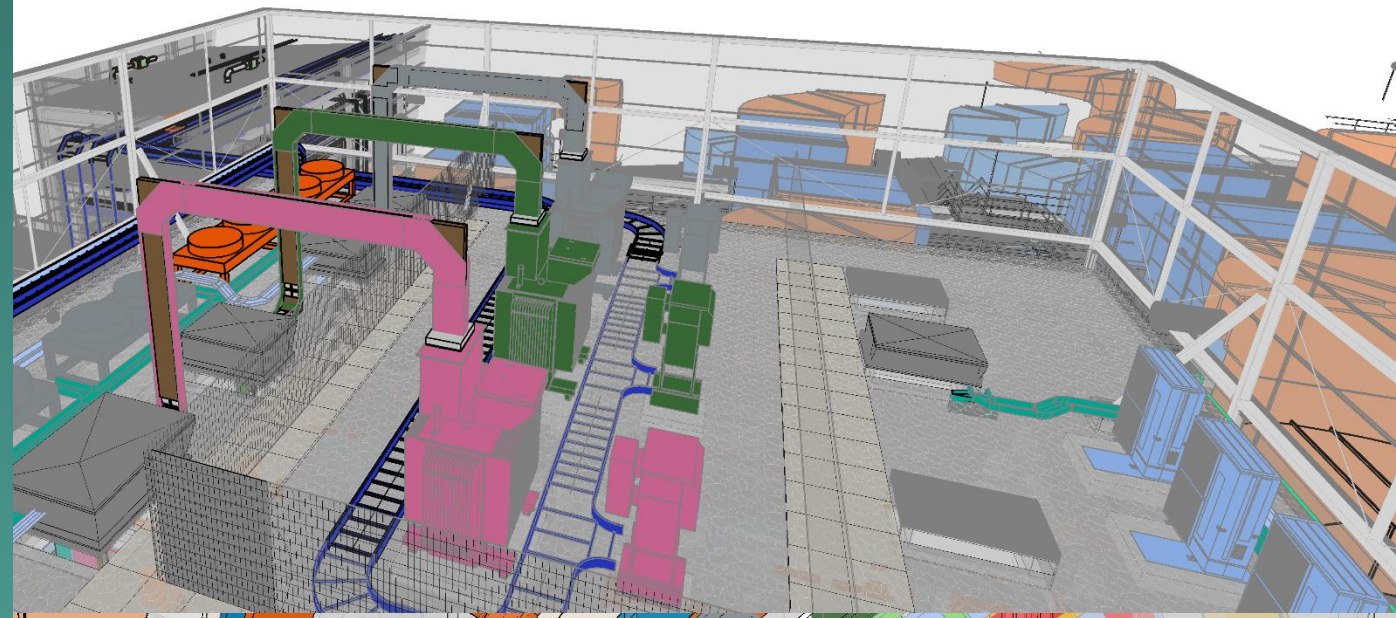
Pipes - 9431

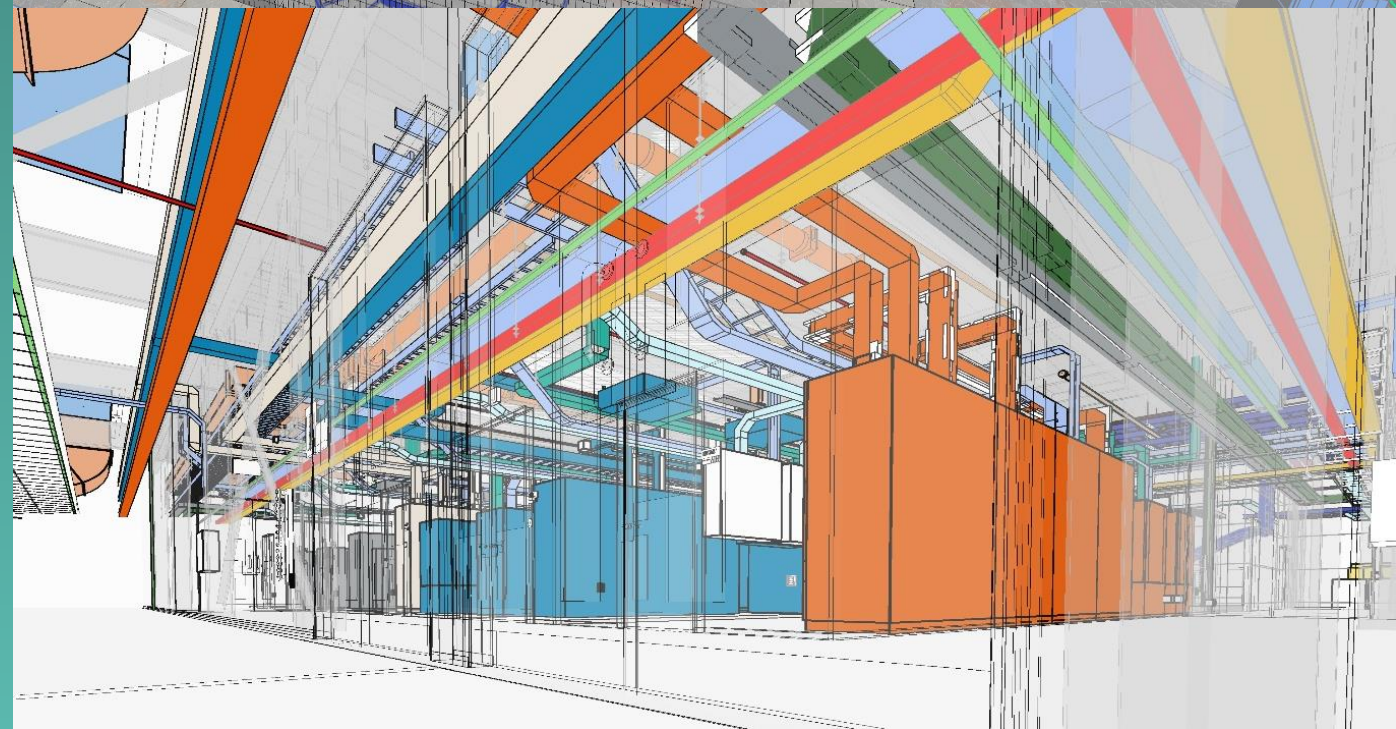
Air Terminal - 160

Mechanical Equipment - 208

Lighting Fixtures & Devices - 2625

Cable Trays - 15292 m





AMS16 – DATA CENTER

Ducts - 398 m

Pipes - 5093 m

Air Terminals - 97 uni.

Mechanical Equipment - 164 uni.

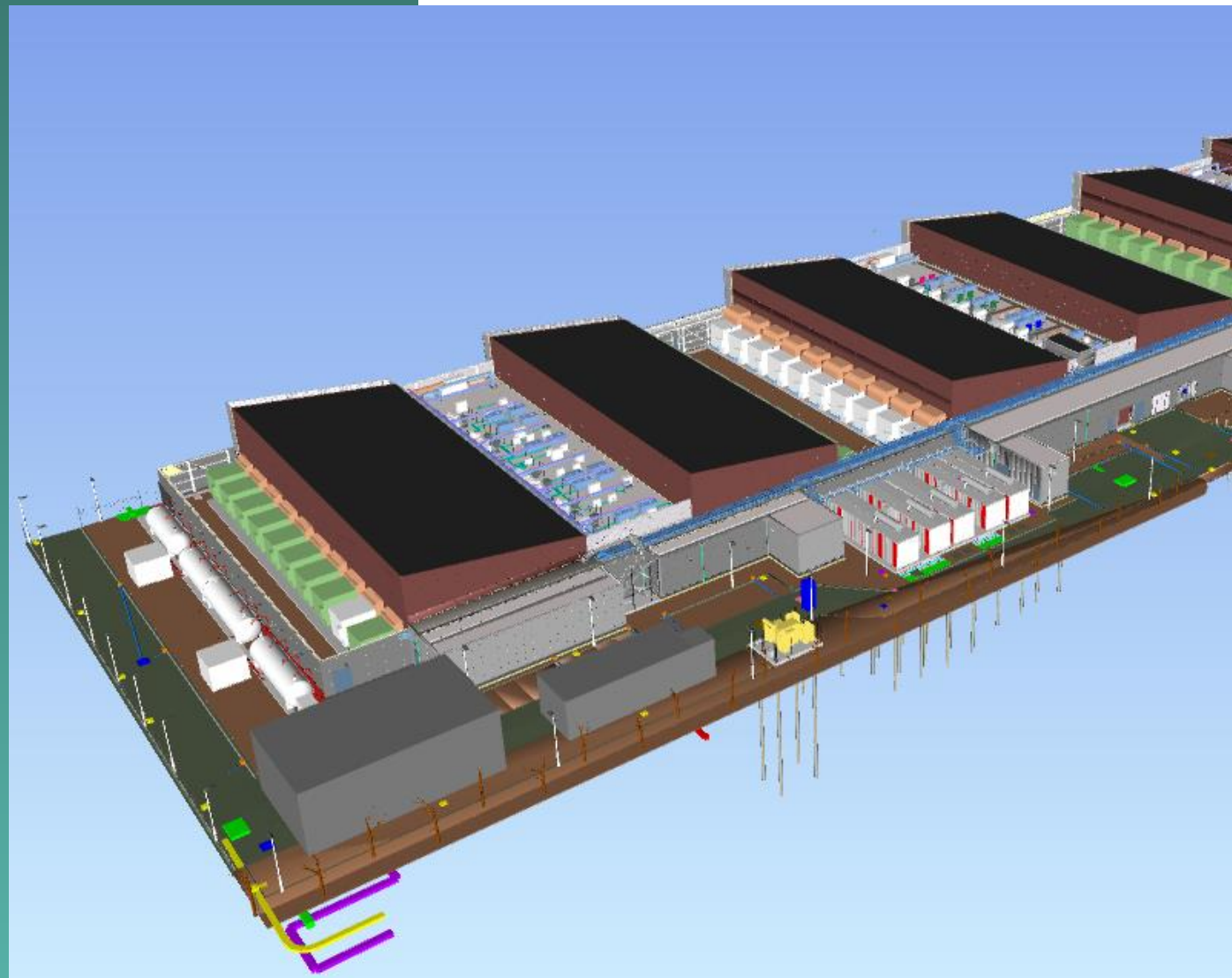
Electrical Equipment – 220 uni.

Lighting Fixtures & Devices – 2044 uni.

Cable Trays – 7866 uni.

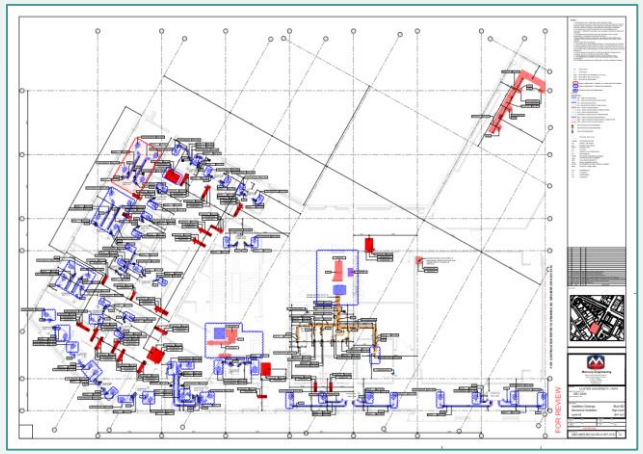
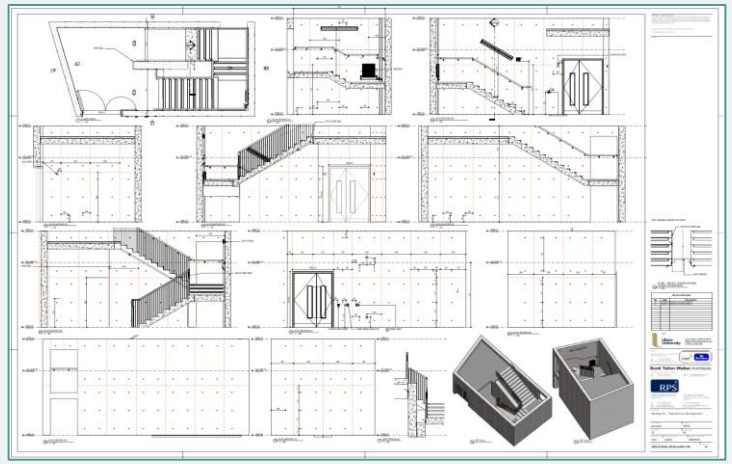
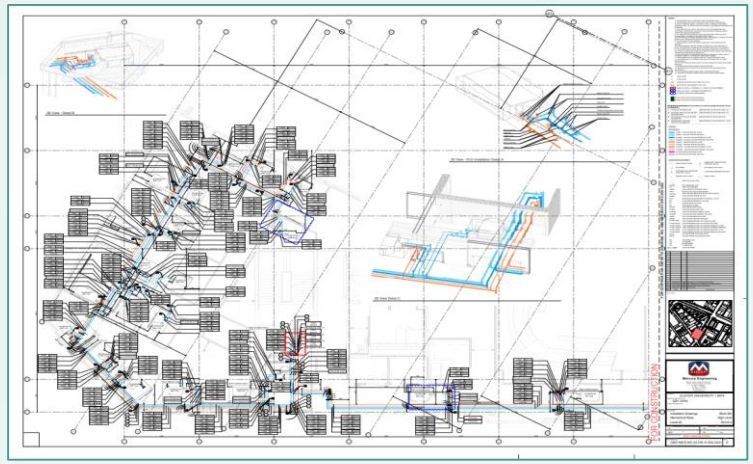
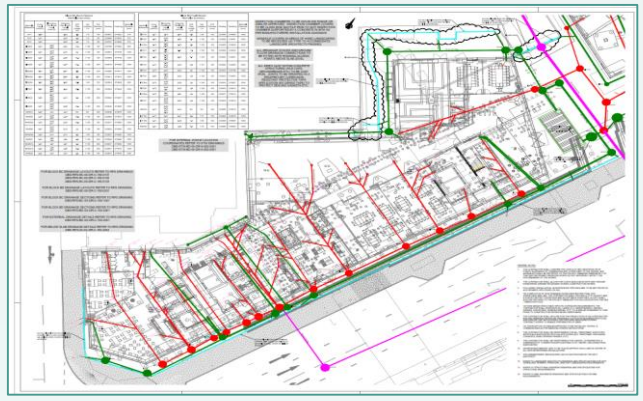
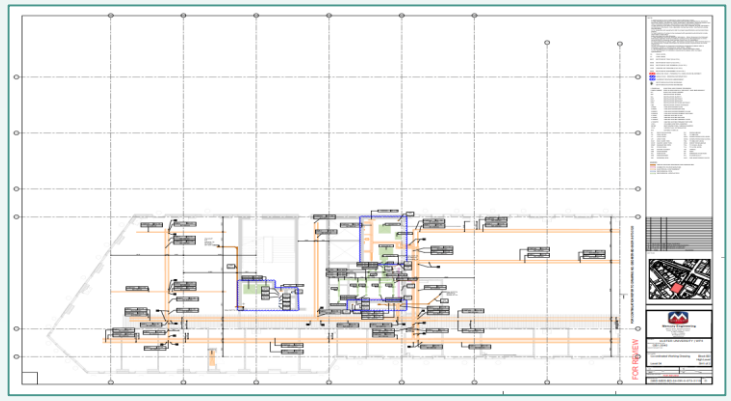
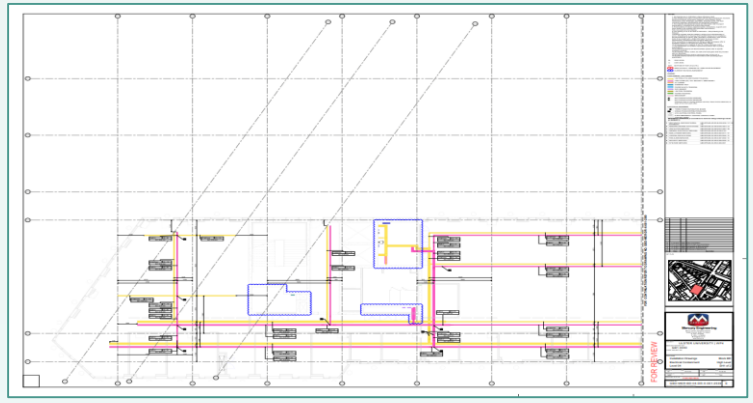
Ope's – 354 uni.

Brackets & Hangers - 1500 uni.



DOCUMENTATION

DOCUMENTAÇÃO

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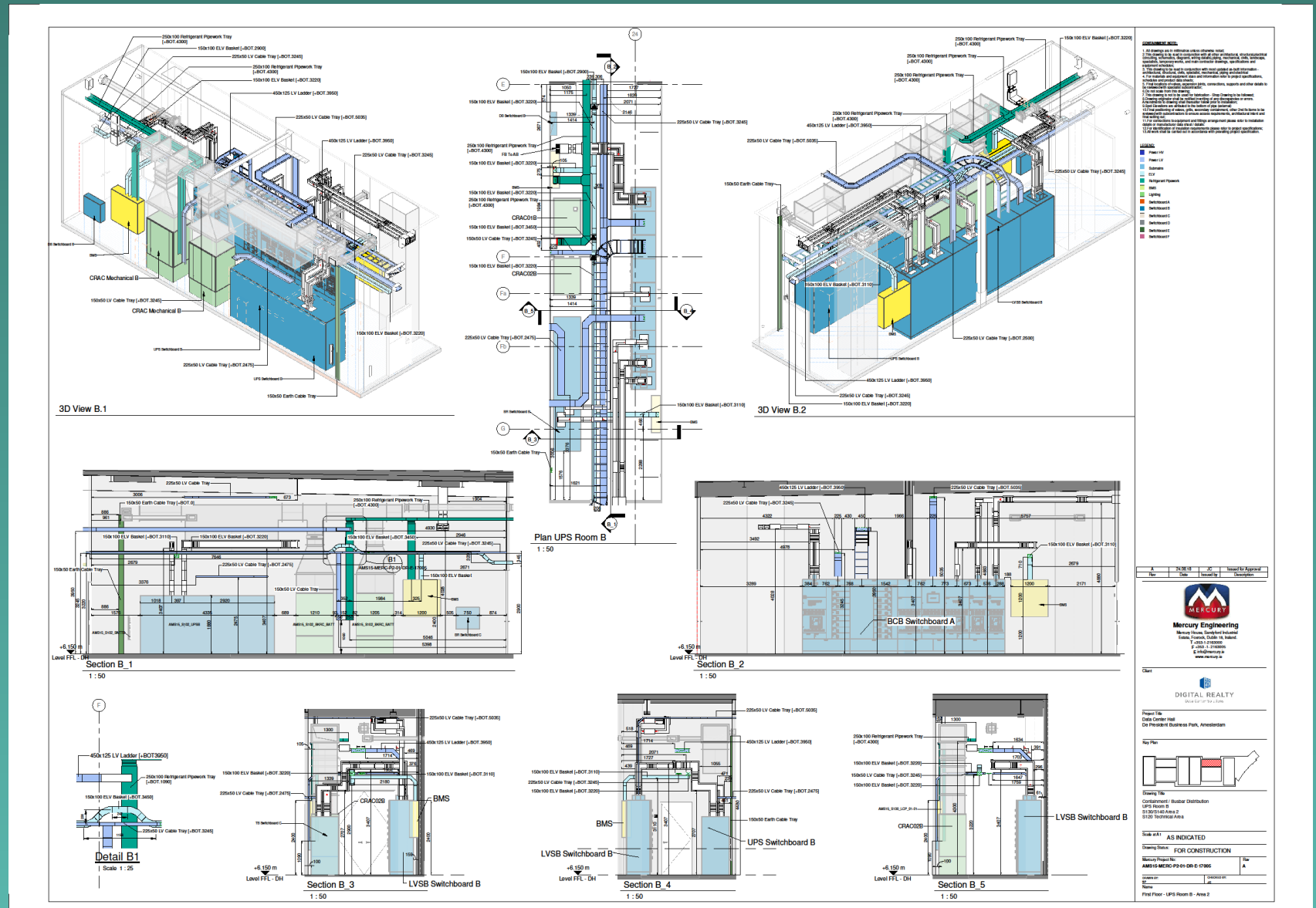
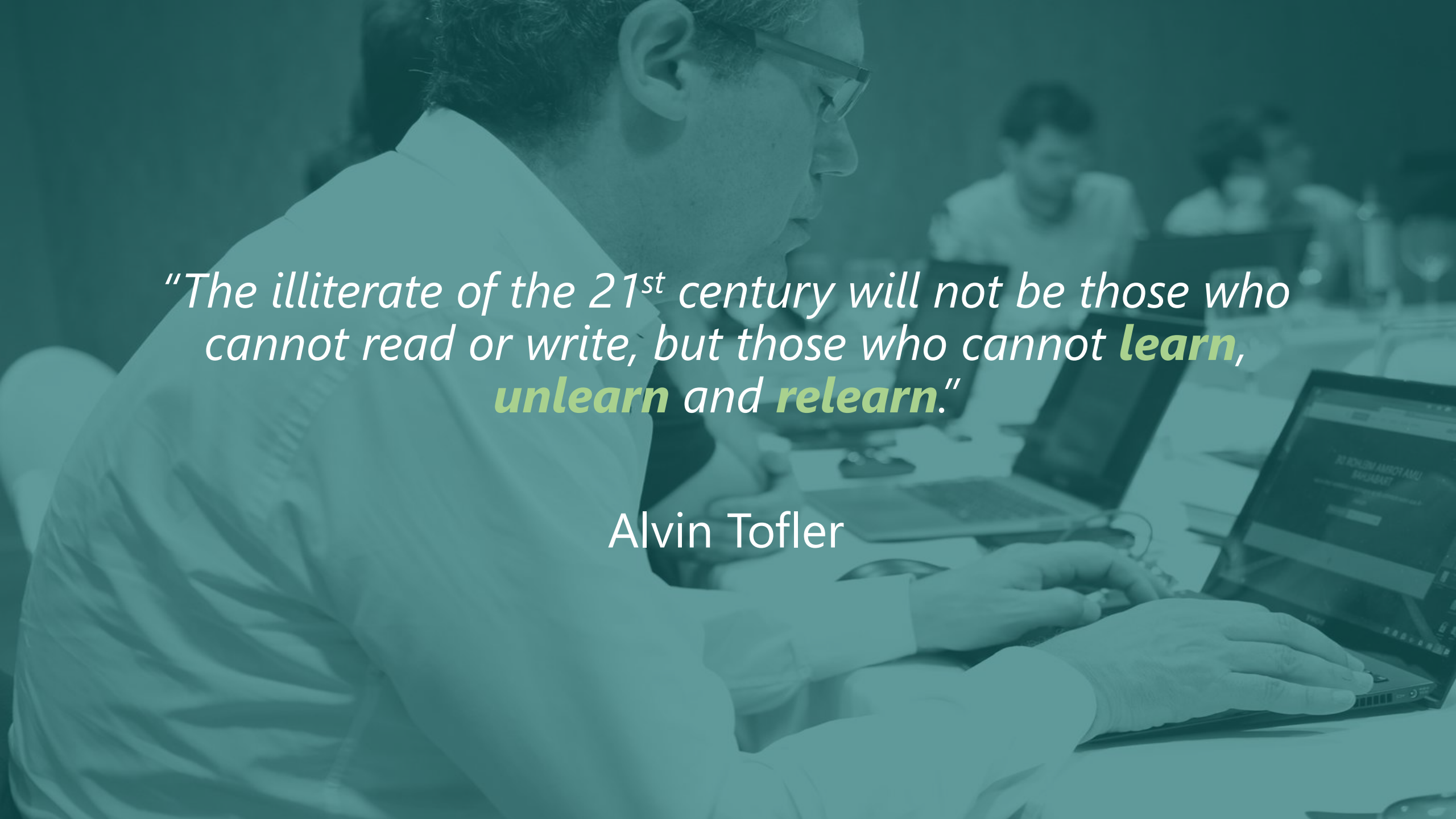


CONCLUSIONS

- Shop Drawings were really the main goal ;-)


"The illiterate of the 21st century will not be those who cannot read or write, but those who cannot learn, unlearn and relearn."
Alvin Tofler

A Era BIM

2º Seminário Internacional

sinaenco
SINDICATO DA ARQUITETURA E DA ENGENHARIA

BIM na Prática

Adequação da abordagem aos requisitos do cliente

@José Carlos Lino

CB

BIMMS BUILDING INFORMATION MODELING & MANAGEMENT SOLUTIONS