

Εφαρμογές του BIM στον Αρχιτεκτονικό Σχεδιασμό

Όλγα Βενετσιάνου

Δρ. Αρχιτέκτων - Μηχανικός

2023



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Αρχιτέκτων - Μηχανικός ΕΜΠ

Π.Μ.Σ «Ψηφιακές Μορφές Τέχνης» ΑΣΚΤ

Διδάκτωρ Τμήματος Αρχ. Μηχ. Πανεπιστημίου Θεσσαλίας

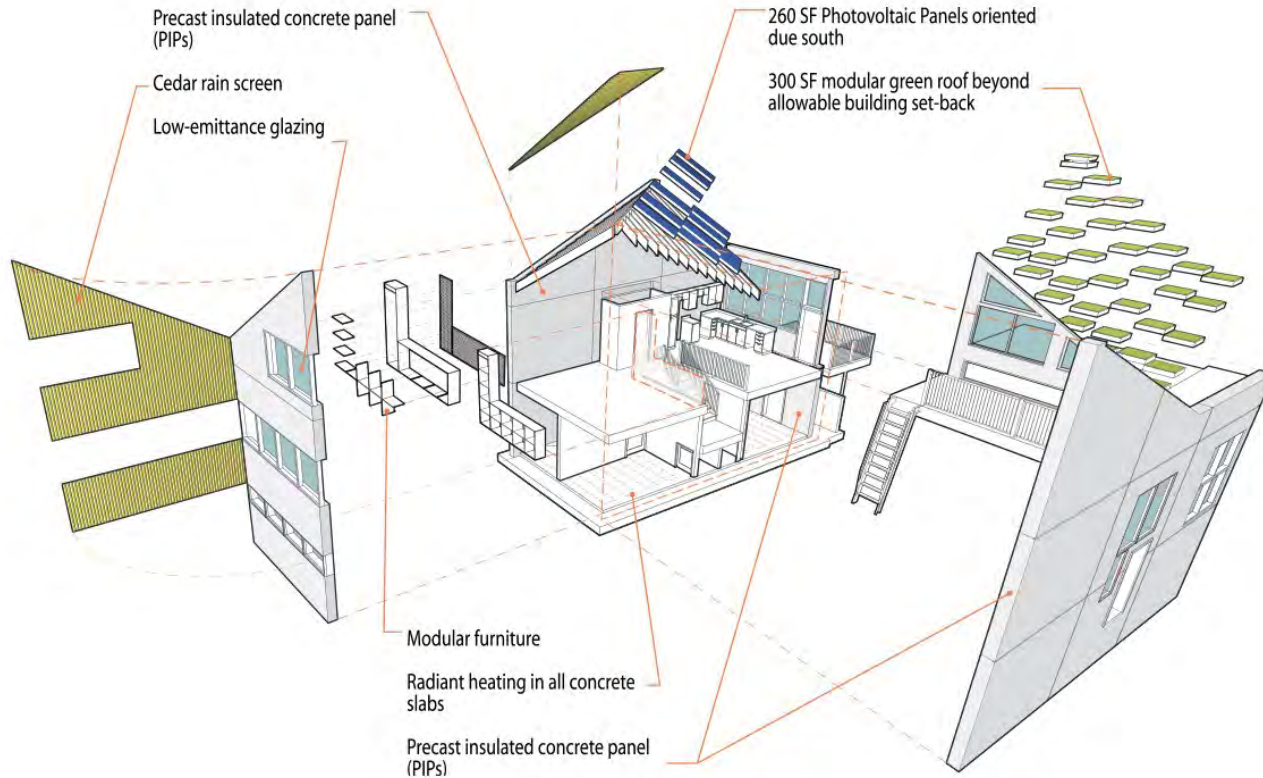
Εκπρόσωπος ΤΕΕ και ΣΑΔΑΣ-ΠΕΑ στο BIM workgroup του Συμβουλίου Αρχιτεκτόνων της Ευρώπης (Architects' Council of Europe)

www.olgavenetsianou.info

LinkedIn

1. BIM – Βασικές Έννοιες

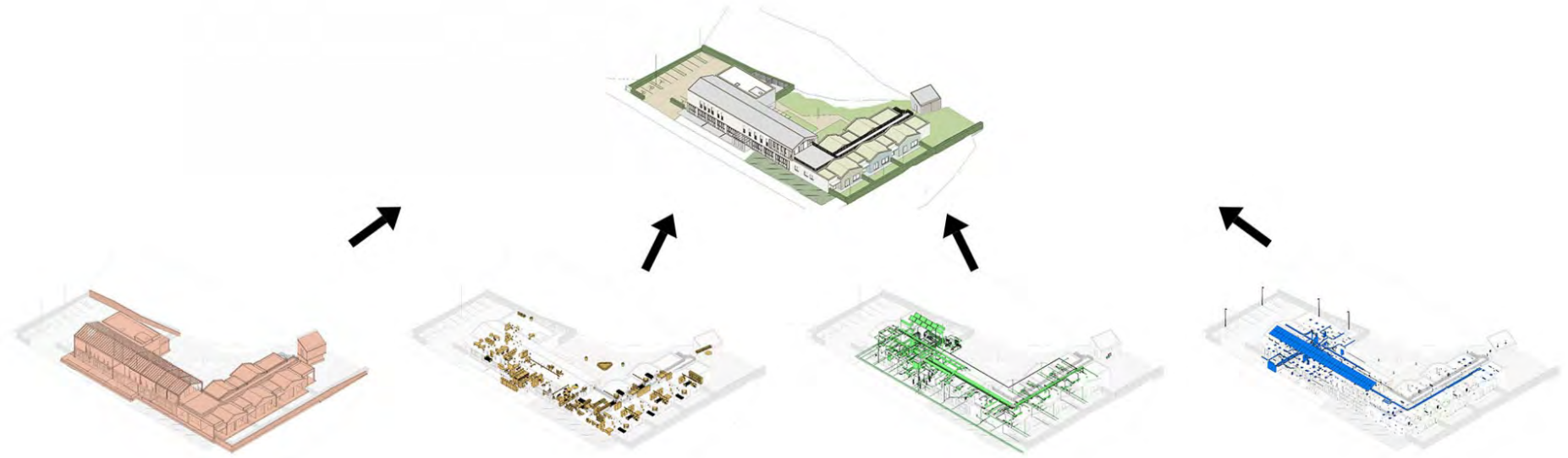
Μελέτη σε ψηφιακό 3d μοντέλο



Διαχείριση της πληροφορίας σε όλες τις φάσεις του κύκλου ζωής ενός κτιρίου



Federated model



BIM execution plan

ISO 19650-1

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - **information management using building information modelling**

Part 1: Concepts and principles



International
Organization for
Standardization

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ISO 19650-2

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - **information management using building information modelling**

Part 2: Delivery phase of assets



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ISO 19650-3

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - **information management using building information modelling**

Part 3: Operational phase of assets



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ISO 19650-4

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - **information management using building information modelling**

Part 4: Information exchange



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ISO 19650-5

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - **information management using building information modelling**

Part 5: Security-minded approach to information management



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Standardization

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ISO 19650-6

In Development



International
Organization for
Standardization

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ARCHITECTS' COUNCIL OF EUROPE AN INTRODUCTION TO BIM

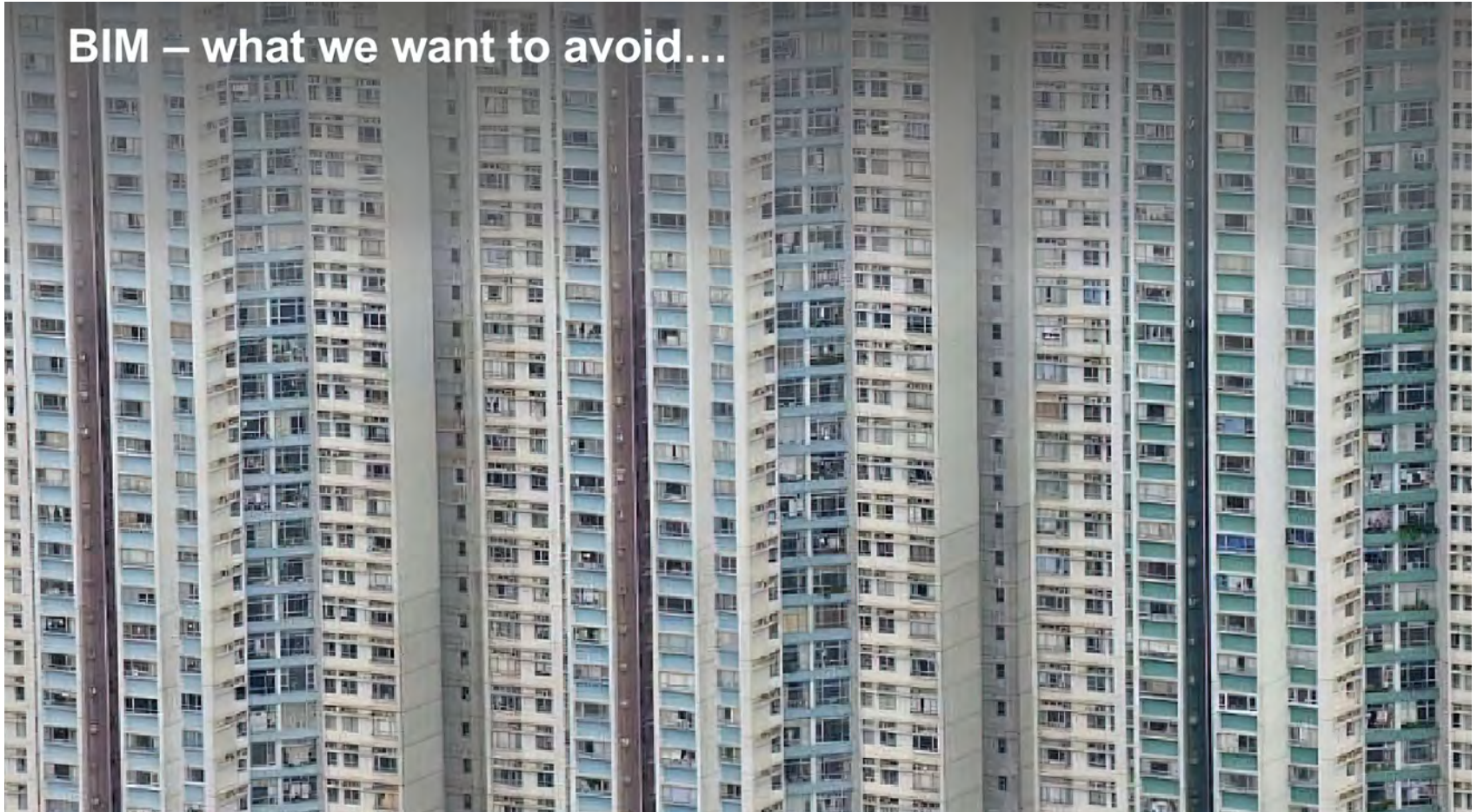
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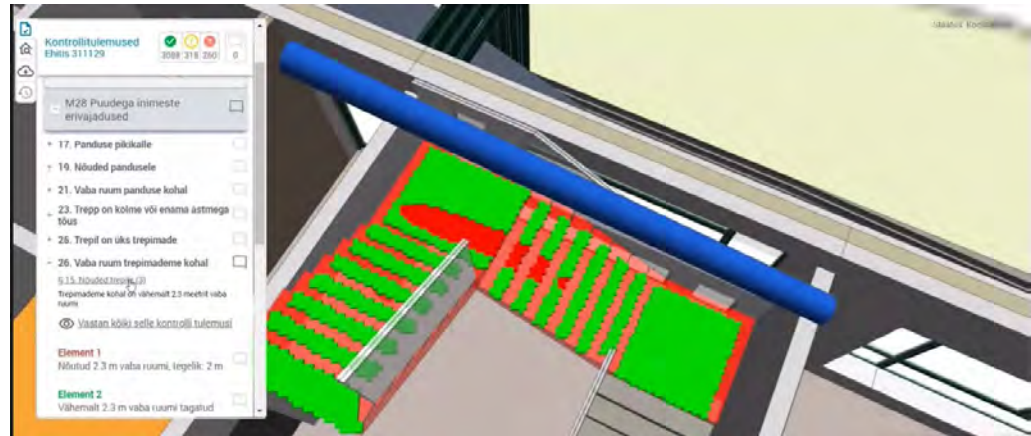
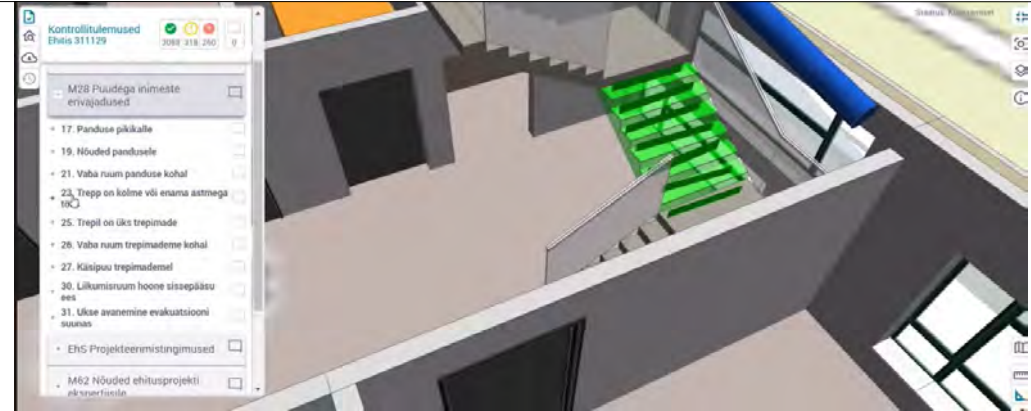
BIM – what we hope to achieve...



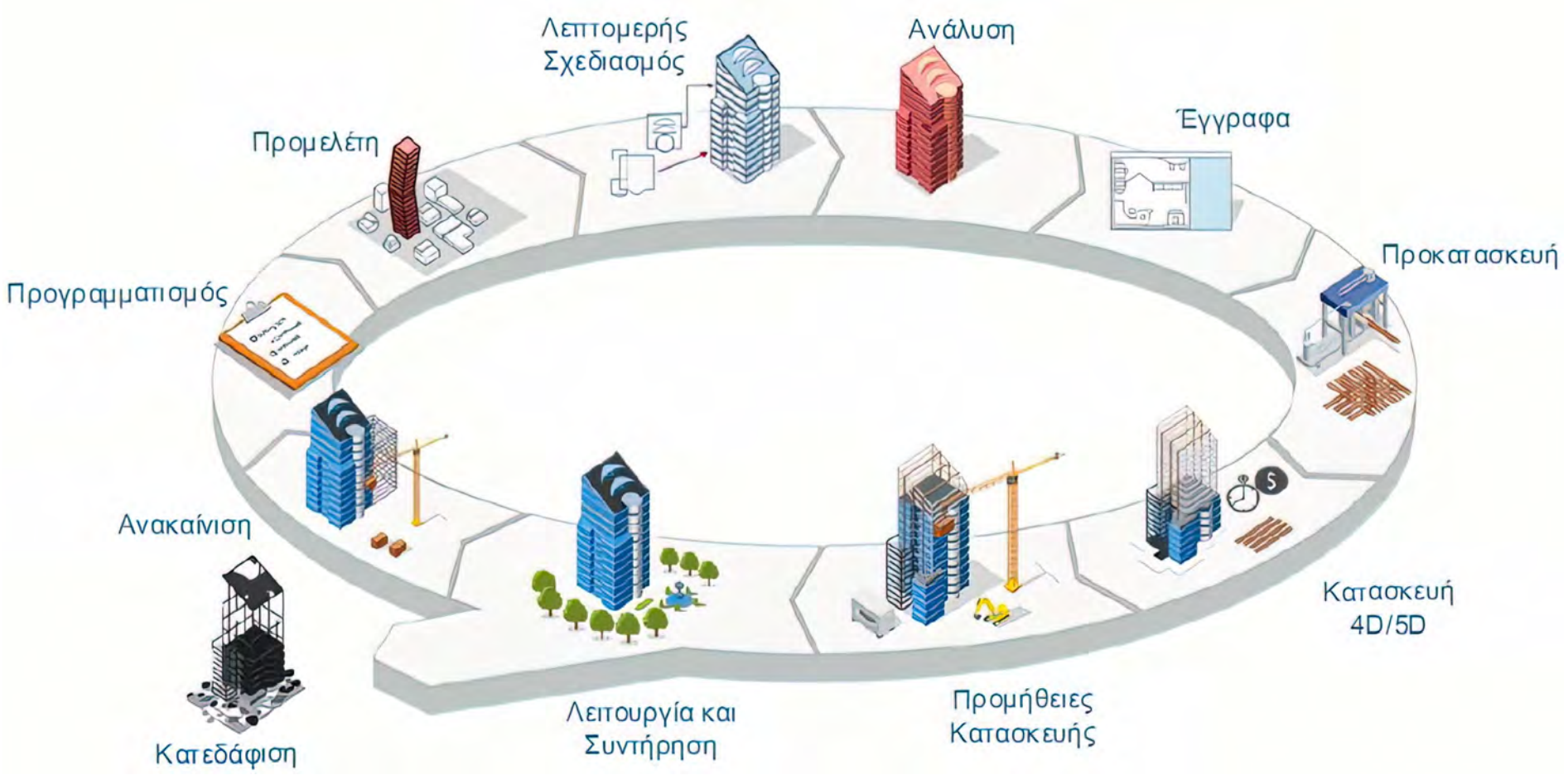
BIM – what we want to avoid...



Έλεγχος / Αδειοδότηση με BIM, Εσθονία



2. Πλεονεκτήματα Μελέτης με BIM



Χωρικός συντονισμός (Clash detection)

STR VS MEP	Tolerance	Clashes	New	Active	Reviewed	Approved	Resolved	Type	Status
	0.050m	50	49	1	0	0	0	Hard	OK

Image	Clash Name	Status	Distance	Grid Location	Description	Date Found	Assigned To	Clash Point	Item 1				Item 2				Comments
									Item ID	Layer	Item Name	Item Type	Item ID	Layer	Item Name	Item Type	
	Clash1	Active	-0.300	T-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16	TOM	x:530141.220, y:183282.171, z:61.981	Element ID: 2865321	09 - NINTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 13212004	Ninth Floor Services Datum	Cable Tray with Fittings	Line	#0 - macalis - 2017/1/31 22:36.14 Assigned to TOM _____ PLEASE CREATE OPENING IN WALL FOR TRAY
	Clash2	New	-0.285	J-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16		x:530143.257, y:183296.040, z:64.462	Element ID: 4228318	10 - TENTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 5358274	Roof Services Datum	Cable Tray with Fittings	Line	
	Clash3	New	-0.253	T-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16		x:530141.102, y:183293.476, z:64.490	Element ID: 4228319	10 - TENTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 5360025	Roof Services Datum	Cable Tray with Fittings	Line	
	Clash4	New	-0.247	J-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16		x:530143.195, y:183294.657, z:64.437	Element ID: 4228318	10 - TENTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 5358346	Roof Services Datum	Cable Tray with Fittings	Line	
	Clash5	New	-0.223	T-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16		x:530144.953, y:183282.001, z:63.845	Element ID: 2954527	10 - TENTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 13139150	10 - Roof	Metal - Aluminium Extract	Line	
	Clash6	New	-0.223	T-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16		x:530141.732, y:183282.147, z:63.845	Element ID: 2954527	10 - TENTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 13139106	10 - Roof	Metal - Aluminium Extract	Line	
	Clash7	New	-0.223	T-W : - 00 - Absolute Zero	Hard	2017/1/31 22:35.16		x:530144.660, y:183285.168, z:63.936	Element ID: 2956793	10 - TENTH FLOOR	Concrete - Cast In Situ	Solid	Element ID: 13139184	10 - Roof	Metal - Aluminium Extract	Line	

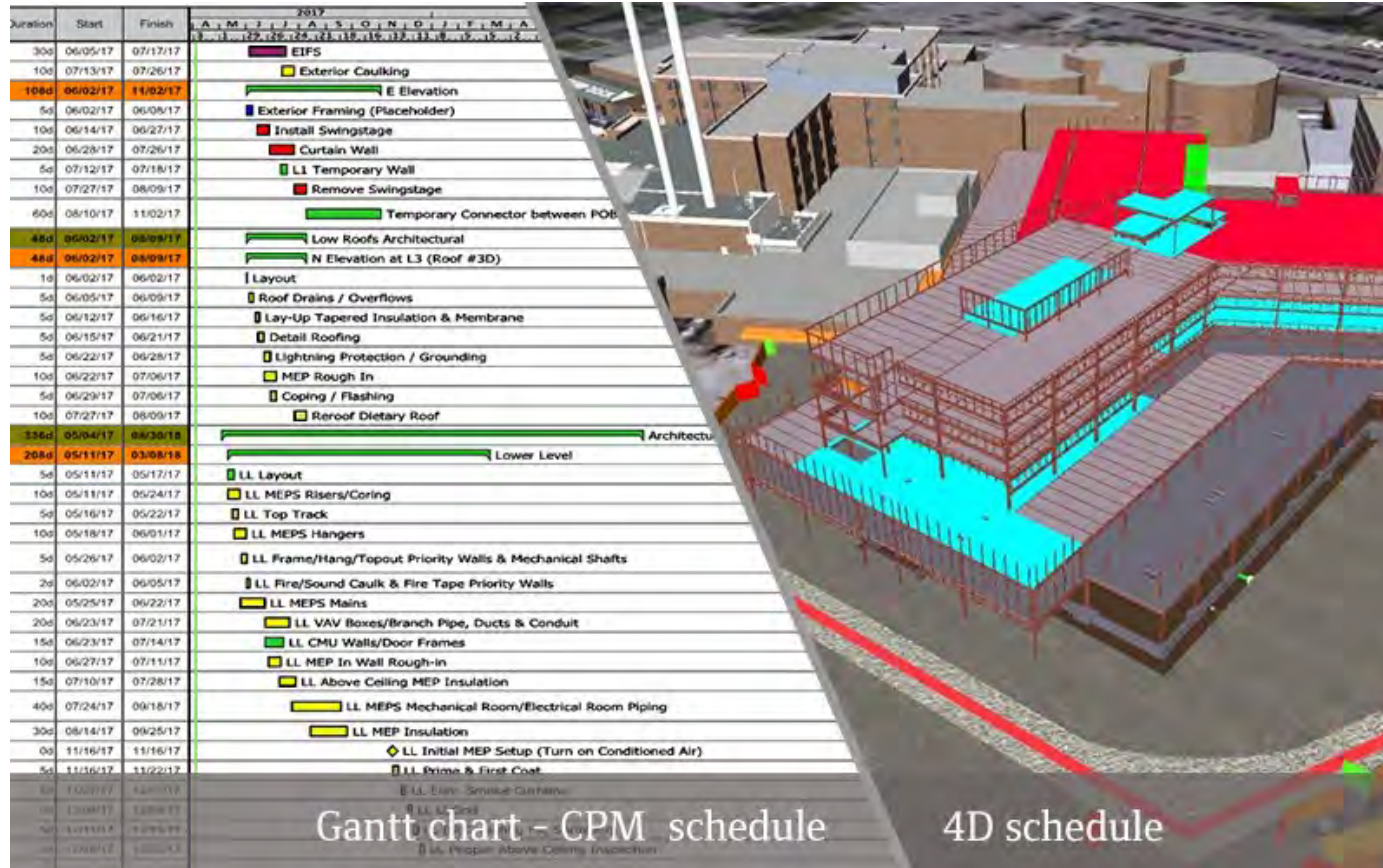
Έλεγχος Κόστους - Προμετρήσεις

The screenshot displays a BIM software interface with a 3D model of a building structure. The walls are highlighted in green. The interface includes a navigation pane on the left, a top navigation bar, and a data table at the bottom.

Table: Wall Measurements and Costs

Object	Aantal	Type	Code	Oppervlakte [m ²]	Lengte [mm]	Hoogte [mm]	Dikte [mm]	Inhoud [m ³]	Opmerking
Wat (18)			242- Niet-dragende binnenmuren	6.819	2841.082	2400.000	122.000	0.832	
IV 2-001 1.9	1	Wat	241-Uitgeroed binnenwanden	12.120	5717.011	2400.000	122.000	1.514	
Dragend	5			44.726	24294.348	12096.000		6.177	
IV 2-004 1.12	1	Wat	242- Niet-dragende binnenmuren	2.561	2002.082	2400.000	122.000	0.360	
IV 2-007 1.15	1	Wat	242- Niet-dragende binnenmuren	6.879	2866.287	2400.000	122.000	0.839	
IV 1-004 0.14	1	Wat	242- Niet-dragende binnenmuren	4.659	1941.082	2400.000	122.000	0.568	
IV 1-005 0.15	1	Wat	242- Niet-dragende binnenmuren	3.504	1493.100	2400.000	122.000	0.428	
IV 2-005 1.14	1	Wat	242- Niet-dragende binnenmuren	6.819	2841.082	2400.000	122.000	0.832	
IV 2-006 1.16	1	Wat	242- Niet-dragende binnenmuren	4.435	2161.619	2400.000	122.000	0.509	
IV 1-006 0.16	1	Wat	242- Niet-dragende binnenmuren	3.564	2599.100	2200.000	122.000	0.430	
IV 1-003 0.13	1	Wat	242- Niet-dragende binnenmuren	4.564	2841.082	2400.000	122.000	0.564	
IV 2-009 1.17	1	Wat	242- Niet-dragende binnenmuren	1.344	560.000	2400.000	122.000	0.164	
IV 1-007 0.17	1	Wat	242- Niet-dragende binnenmuren	1.344	560.000	2400.000	122.000	0.164	
IV 2-010 1.18	1	Wat	242- Niet-dragende binnenmuren	3.504	1493.100	2400.000	122.000	0.428	
IV 2-005 1.13	1	Wat	242- Niet-dragende binnenmuren	6.819	2841.082	2400.000	122.000	0.832	
IV 1-008 0.10	1	Wat	242- Niet-dragende binnenmuren	6.819	2841.082	2400.000	122.000	0.832	
Niet dragend	13			57.804	27454.693	31000.000		6.999	
Totaal	18			102.431	51789.041	42096.000		13.176	

Χρονικός Προγραμματισμός - 4D schedule



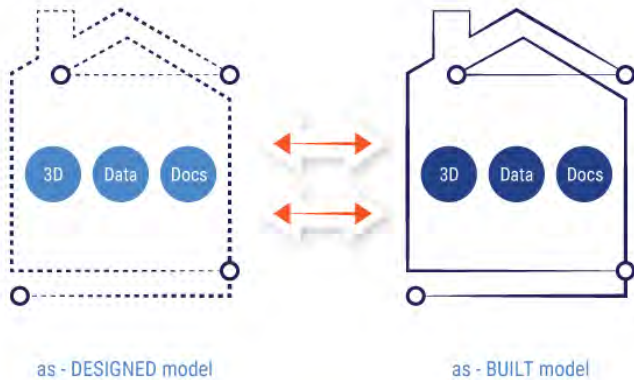
Facility Management



A	B	C	D
Name	CreatedBy	CreatedOn	Category
Pre-planted vegetation blanket	info@ABCArchitecture.com	2017-04-05	Pr_45_57_91_65 : Pre-planted vegetation blanket
Rootball securing assembly	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_72 : Rootball securing frames
Stakes	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_84 : Stakes
Tree grilles	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_87 : Tree grilles
Tree guards	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_88 : Tree guards
Corrosion inhibitor chemicals for	info@ABCArchitecture.com	2017-04-05	Pr_60_55_96_15 : Corrosion inhibitor chemicals
Scale inhibitor chemicals for open	info@ABCArchitecture.com	2017-04-05	Pr_60_55_96_77 : Scale inhibitor chemicals
Dosing pots	info@ABCArchitecture.com	2017-04-05	Pr_60_55_97_07 : Biocide dosing pots ; Pr
Gas fired condensing boilers	info@ABCArchitecture.com	2017-04-05	Pr_60_60_08_34 : Gas fired condensing boilers
Storage water heaters, gas fired	info@ABCArchitecture.com	2017-04-05	Pr_60_60_96_34 : Gas-fired storage water heaters
Immersion heaters	info@ABCArchitecture.com	2017-04-05	Pr_60_60_96_42 : Immersion heaters
Low temperature hot water heaters	info@ABCArchitecture.com	2017-04-05	Pr_60_65_37_47 : Low temperature hot water heaters
PVC-U solid wall below ground	info@ABCArchitecture.com	2017-04-05	Pr_65_52_07_88 : Unplasticized polyvinyl chloride
Covers and gratings for floor gullies	info@ABCArchitecture.com	2017-04-05	Pr_65_52_24_30 : Floor gully covers and gratings
Floor gullies	info@ABCArchitecture.com	2017-04-05	Pr_65_52_24_31 : Floor gullies
Freestanding grease traps and catchers	info@ABCArchitecture.com	2017-04-05	Pr_65_52_25_32 : Free-standing grease traps and catchers
Pressure gauges	info@ABCArchitecture.com	2017-04-05	Pr_65_52_34_66 : Pressure gauges
Temperature gauges	info@ABCArchitecture.com	2017-04-05	Pr_65_52_34_88 : Temperature gauges
Instruction	Contact	Facility	Floor / Space / Zone
Type	Component	System	Assembly / Connection

Ψηφιακό Αντίγραφο (Digital Twin)

BIM DIGITAL WORLD



DIGITAL TWIN DIGITAL WORLD + PHYSICAL WORLD

STRUCTURED INTEROPERABLE DATA



CONCEPT DESIGN

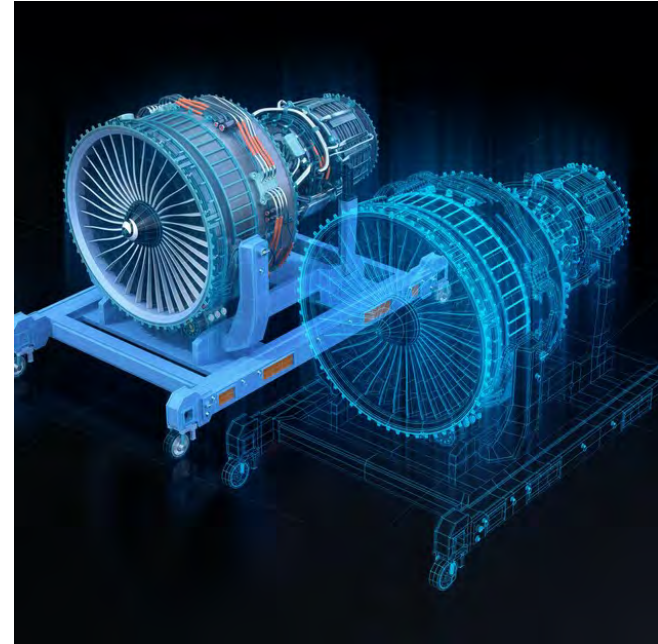
DESIGN

CONSTRUCTION

OPERATION AND MAINTENANCE

END OF LIFE

Ψηφιακό Αντίγραφο (Digital Twin)



- Ψηφιακή αναπαράσταση ενός φυσικού αντικειμένου
- Διαφορετική σημασία ανάλογα με την βιομηχανία [industry] που χρησιμοποιείται
- Ψηφιακό στοιχείο [digital asset]: Κτίριο, Εξοπλισμός, Όχημα, Υποδομές, Πληροφορία

Pre-fabrication & modular construction 1

Advanced building materials 2

3D printing & additive manufacturing 3

Autonomous construction 4

Augmented reality & virtualization 5

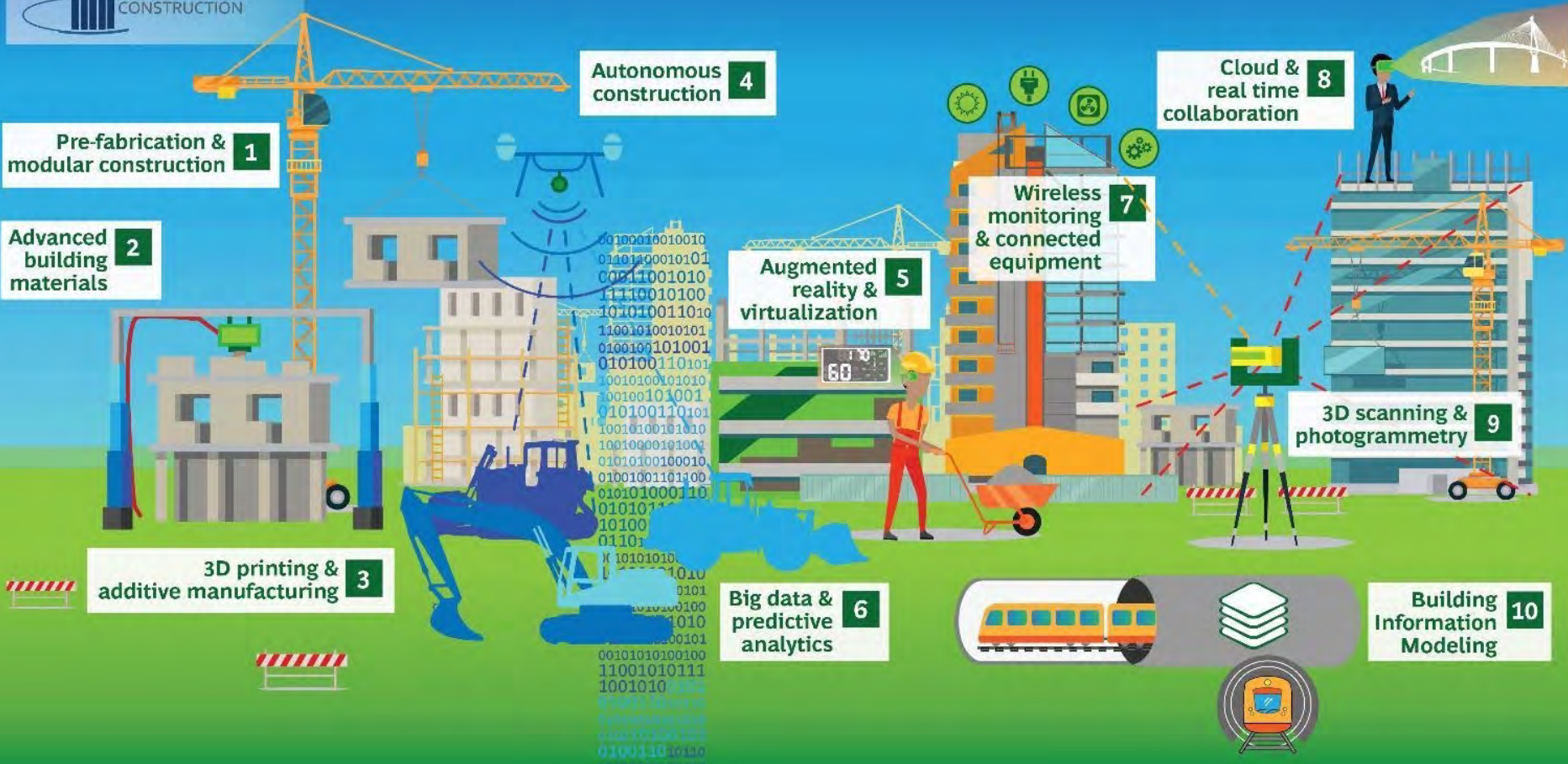
Big data & predictive analytics 6

Wireless monitoring & connected equipment 7

Cloud & real time collaboration 8

3D scanning & photogrammetry 9

Building Information Modeling 10



◀ Airport

📍 Things near Pivot ×



FRONT

Light.001



EnergyM.001



CCTV.001



Gate D5



FCU.001



✕



FCU.001
Fan Coil Unit

Status OFF

Return Air Temp 20 C

Fan Speed 50

Temp Setpoint 25 C


Op Status

✕

CCTV.001
Live Stream




✕

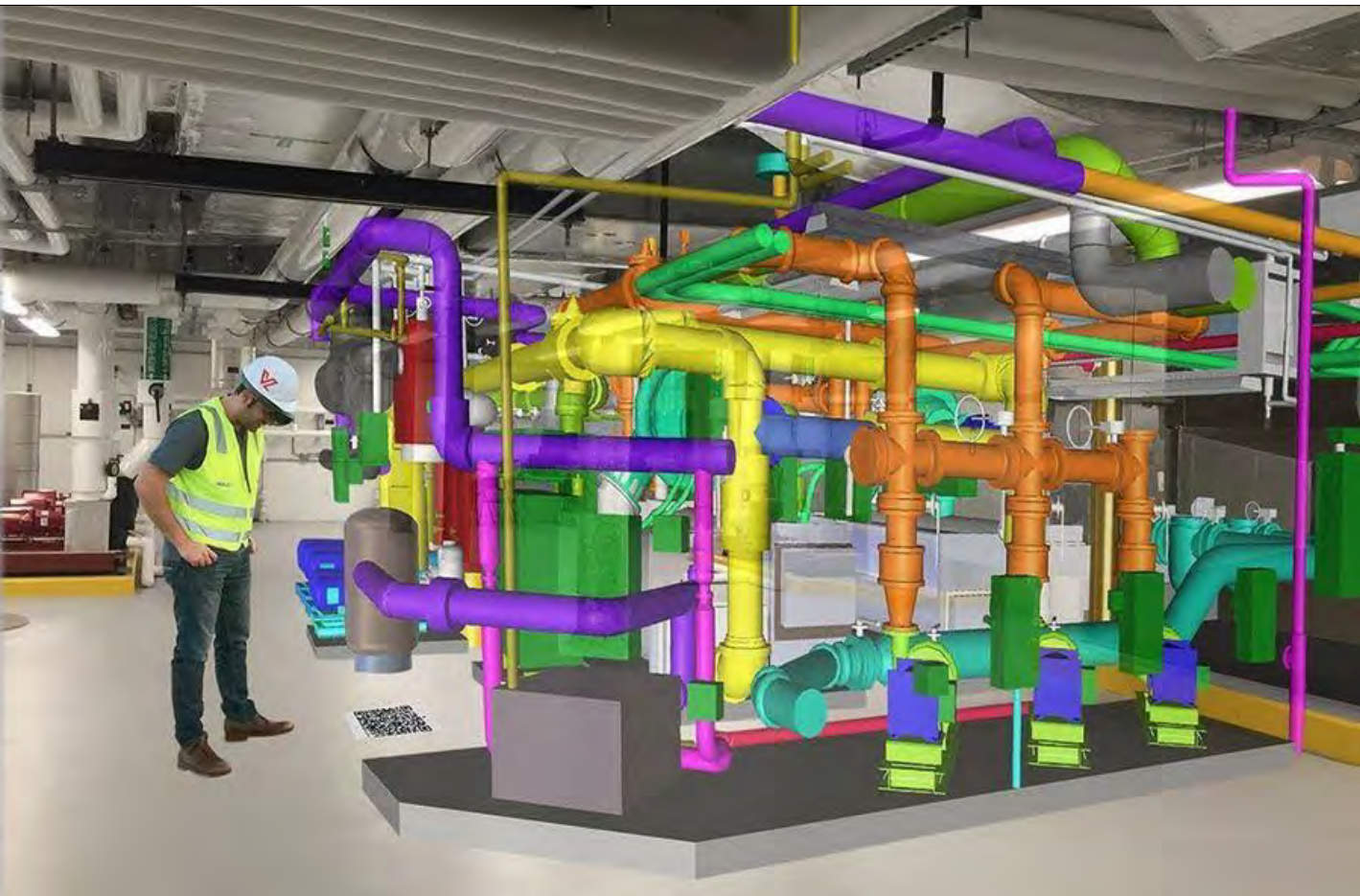


EnergyM.001
Energy Usage

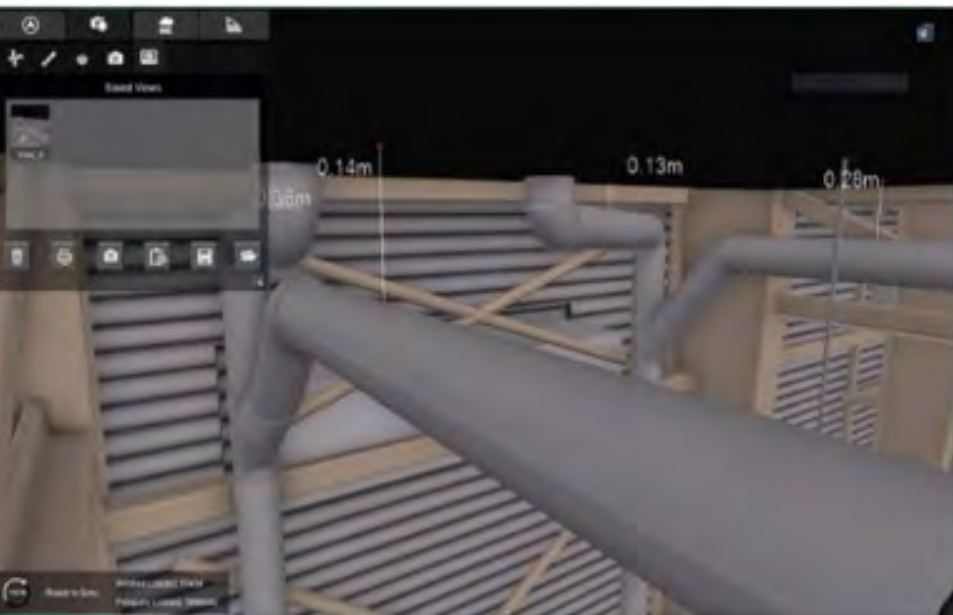
Current Usage 198 W




Μέθοδοι Αναπαράστασης AR/VR



Μέθοδοι Αναπαράστασης AR/VR



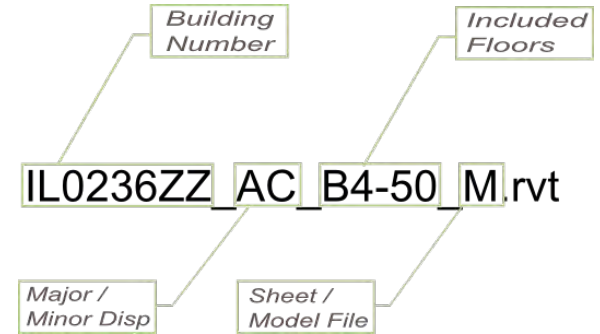
Scan to BIM



3. Στάδια Μελέτης με BIM

Οργάνωση του έργου / BIM execution plan

- Design Responsibility matrix (οργάνωση της ομάδας / key activities)
- Ονομασία και κωδικοποίηση αρχείων
- Οργάνωση κτιριακού έργου σε ενότητες
- Παραδοτέα κάθε φάσης
- Απαιτούμενο Επίπεδο πληροφορίας (LOD)
- Μεθοδολογία ελέγχου του μοντέλου (Project Audit)
- CDE (Common Data Environment)



LOD / Level of Development



LOD100

(Όγκοπλασία)



LOD200

(Προμελέτη)



LOD300

(Οριστική Μελέτη)



LOD400

(Μελέτη Εφαρμογής)



LOD500

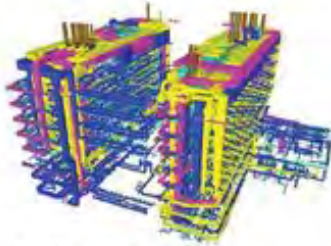
(Ως κατασκευάσθη- As Built)



Architectural Model



Structural Model



Mechanical Model



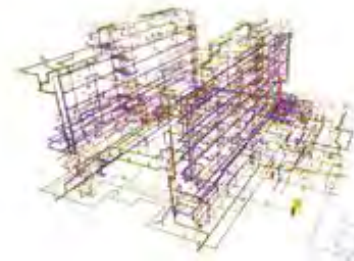
Federated Model



Fire Protection Model

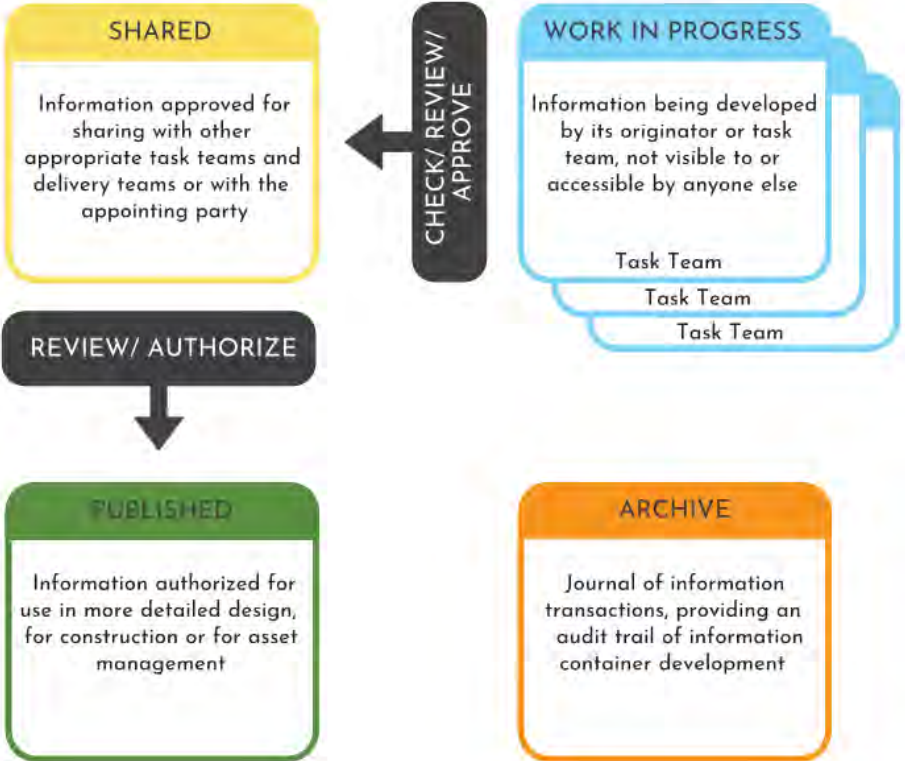


Electrical Model



Plumbing Model

Common Data Environment



Code	Description/ Requirement	Purpose
<p>2 Concept design What is typical for concept stage?</p>	<p>Visual information to provide general principles of the design. Showing arrangement of system with their relationship to internal and external context, and key project criteria to suit client brief.</p> <p>General descriptions would be expected to communicate principles of materiality, scope, colour and context. Expect strategic coordination with other professions to show general principles of the design.</p>	<p>To provide a visual indication of proposals at a concept stage and support general spatial coordination, identifying key requirements such as access and maintenance zones for primary systems.</p>
<p>3 Spatial coordination What is typical as the design develops?</p>	<p>Visual information to provide developed principles of the design to a greater level of detail. Developed coordination between all professions. Visual development showing coordination for general size and primary relationships between different elements of the construction.</p> <p>Can form a brief for a specialist subcontractor or fabricator to progress with their technical design, fabrication and installation. This would be expected to include critical dimensional coordination, performance requirements and qualities of finish.</p>	<p>To provide a visual representation of proposals at a Design Development stage and to allow greater spatial coordination, confirming brief for Technical Design stage.</p>
<p>4 Technical design What is typical as for technical design?</p>	<p>Visual information to provide fixed principles of the design supporting procurement. Developed coordination between all professions. Visual representations showing coordination for general size and relationships between different elements of the construction.</p> <p>Dimensionally accurate graphical representation of system, indicating primary performance characteristics.</p> <p>Graphical information represented may alter, dependent on visual information to be produced, e.g. scope of work drawings, setting out, floor loading, etc.</p> <p>Typical installation details separately produced, linked to model element and adjacent constructions.</p>	<p>To provide a visual representation of proposals at a Technical Design stage supporting full spatial coordination.</p>
<p>5 Construction What has been constructed?</p>	<p>Visual information to provide full information to support construction/ installation. Developed coordination between all professions.</p> <p>Visual representations showing final coordination for size and relationships between different elements of the construction.</p> <p>Dimensionally accurate graphical representation of system, indicating primary performance characteristics and sufficient information to support installation.</p> <p>Typical installation details separately produced, linked to model element and adjacent constructions.</p>	<p>To provide sufficient information for construction/ installation of the required products.</p> <p>To be updated during the construction process to reflect final decisions.</p>

Ss_25_60_35 - Glazing systems

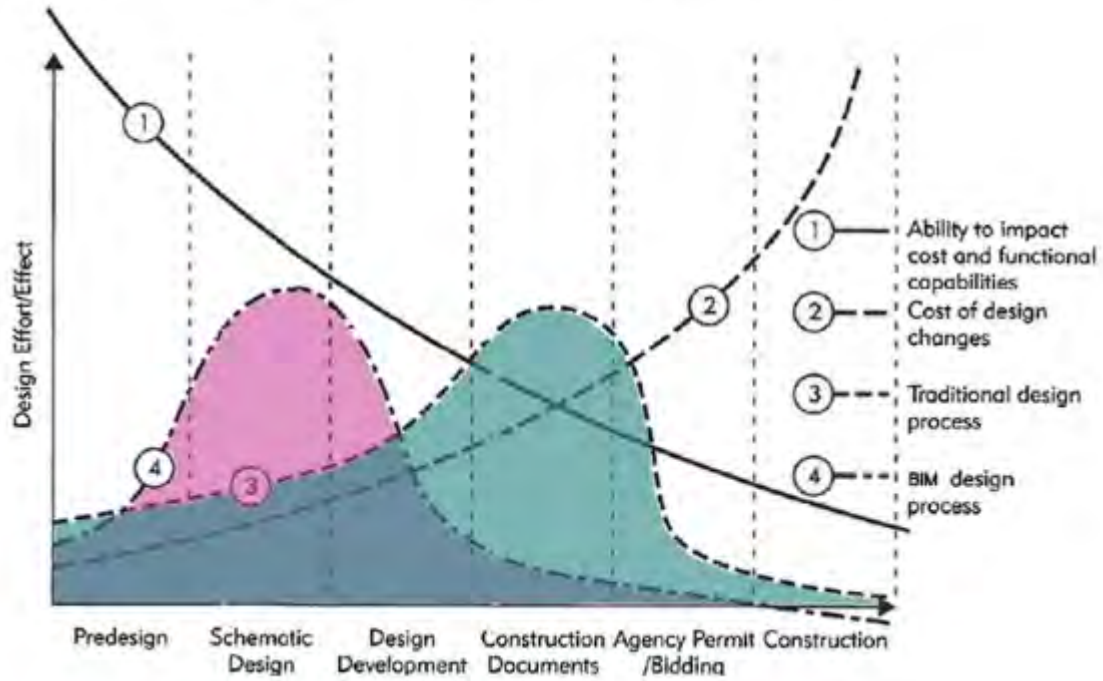
The images below are typical to illustrate visual representations for the system Ss_25_60_35_06 - Bead-fixed insulating glazing systems at selected LOD bandings

LOD	Model	Plan	Elevation	Section
2				
3			 <p> 11, 11A, 11B, 12, 14 G, G1, F </p>	

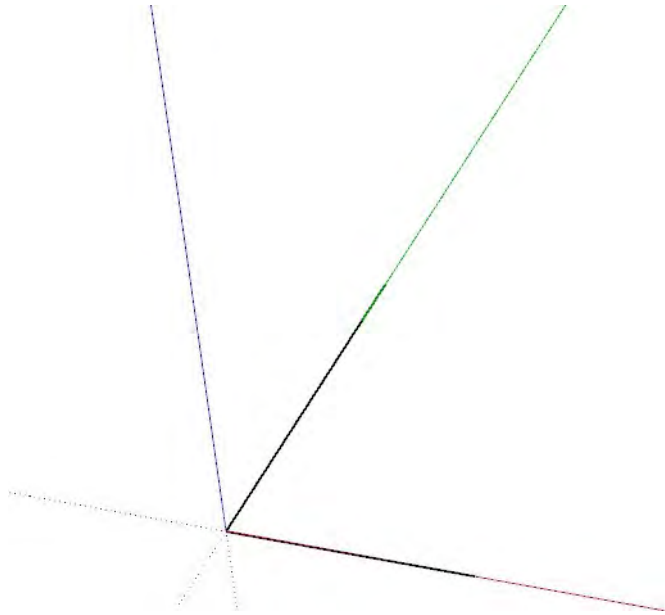
4. Μοντελοποίηση

Μετάβαση από CAD σε BIM

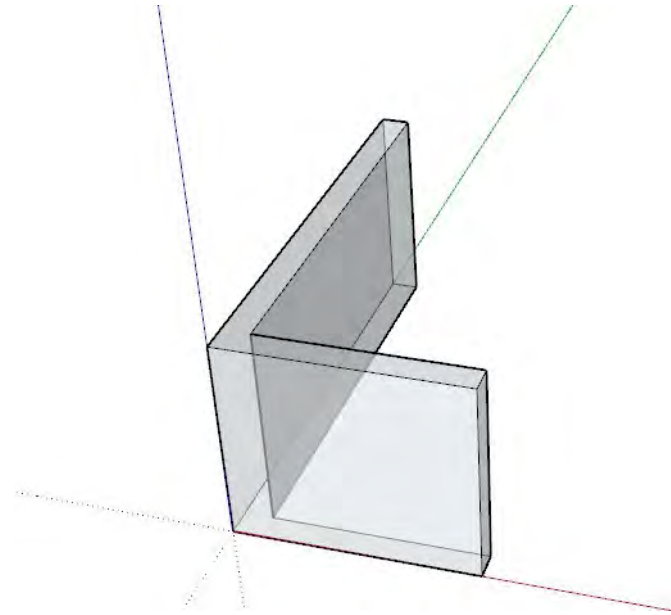
W. Lu et al. / Building and Environment 82 (2014) 317–327



Μετάβαση από CAD σε BIM

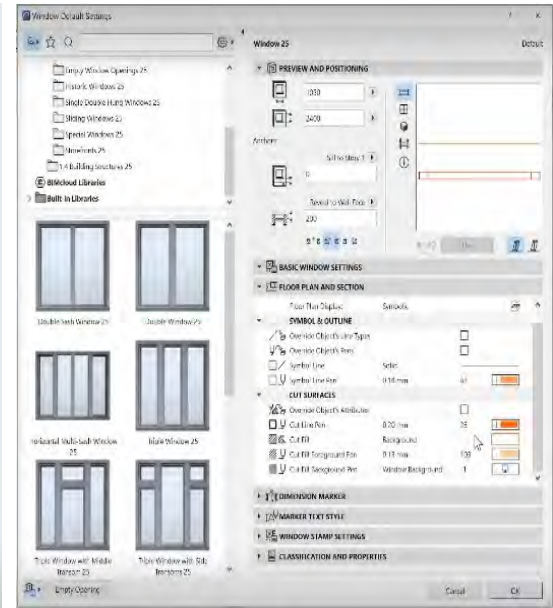
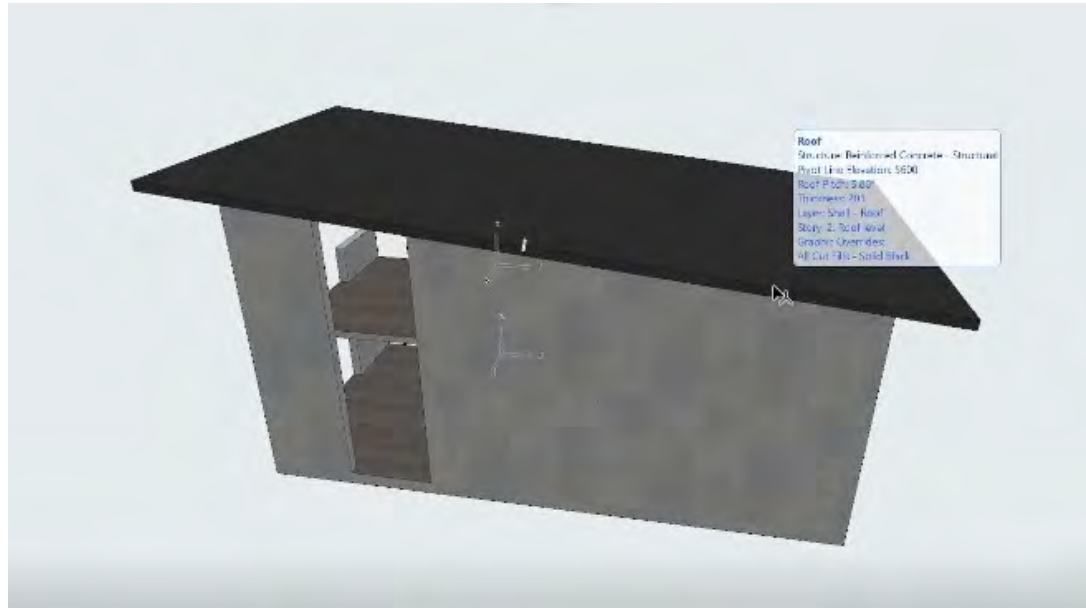


Γραμμές (2d)

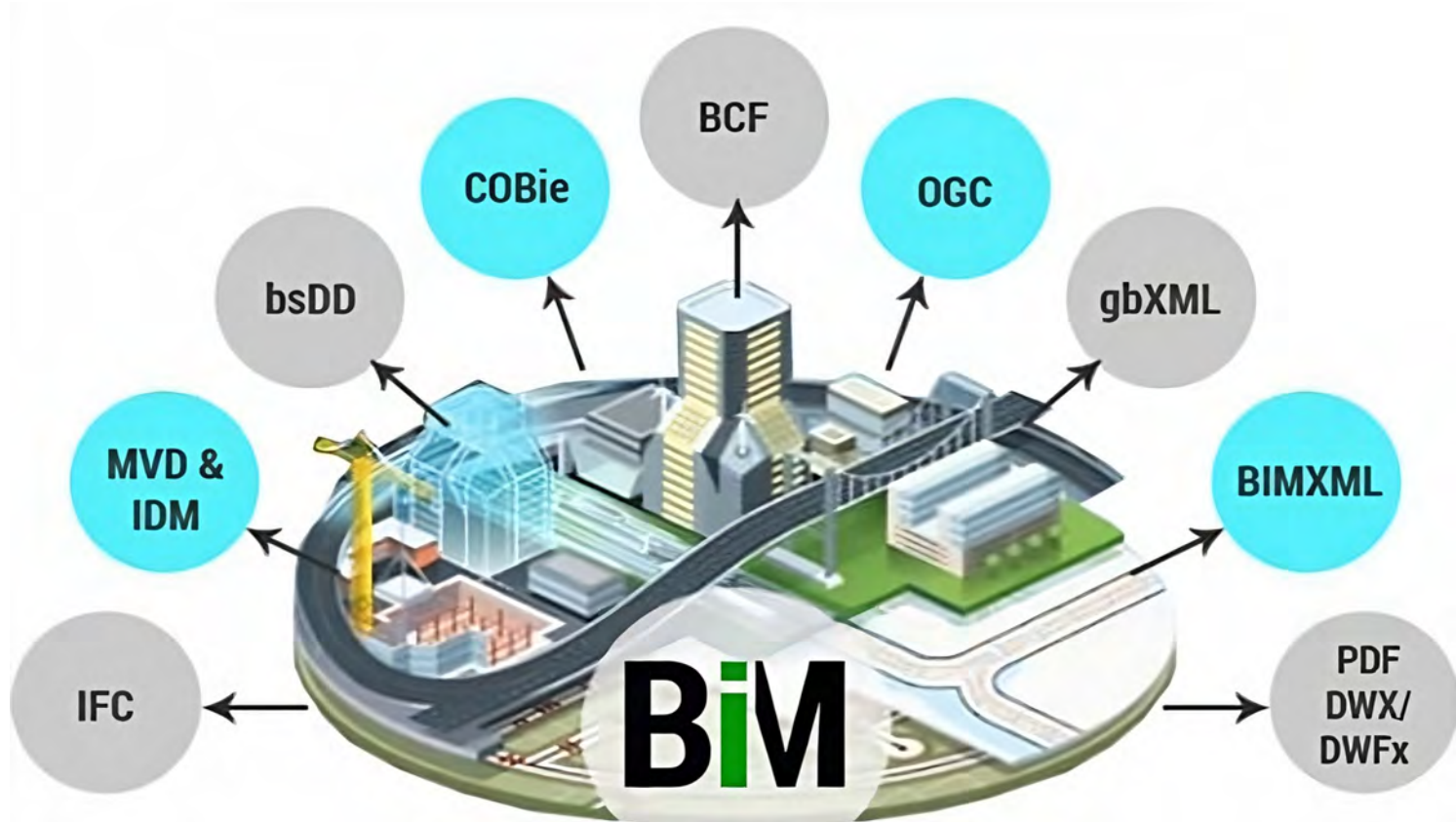


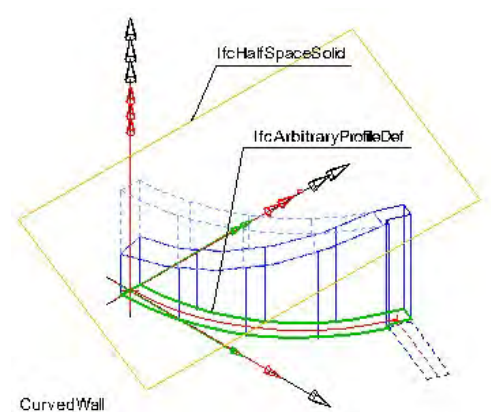
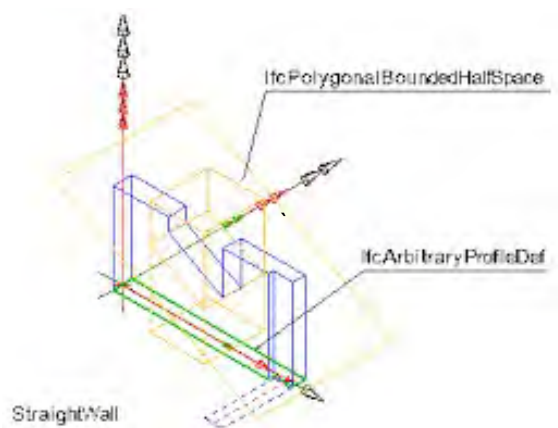
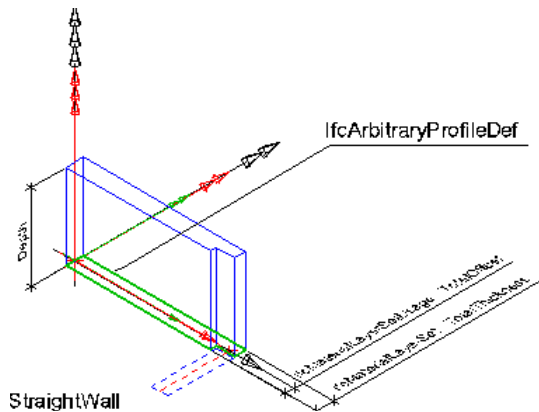
Επιφάνειες / όγκοι (3d)

Μετάβαση από CAD σε BIM

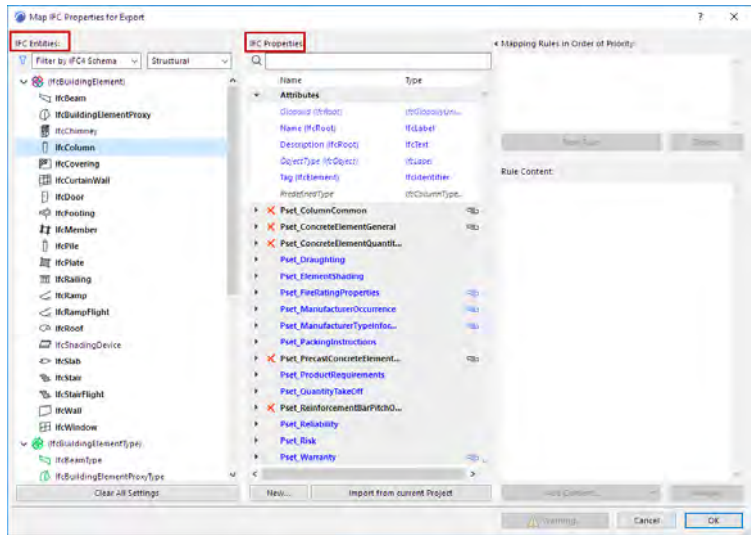


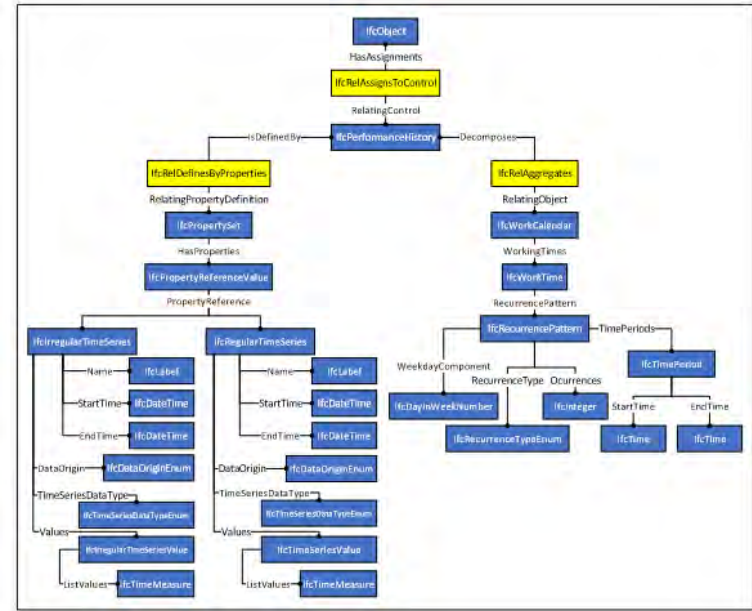
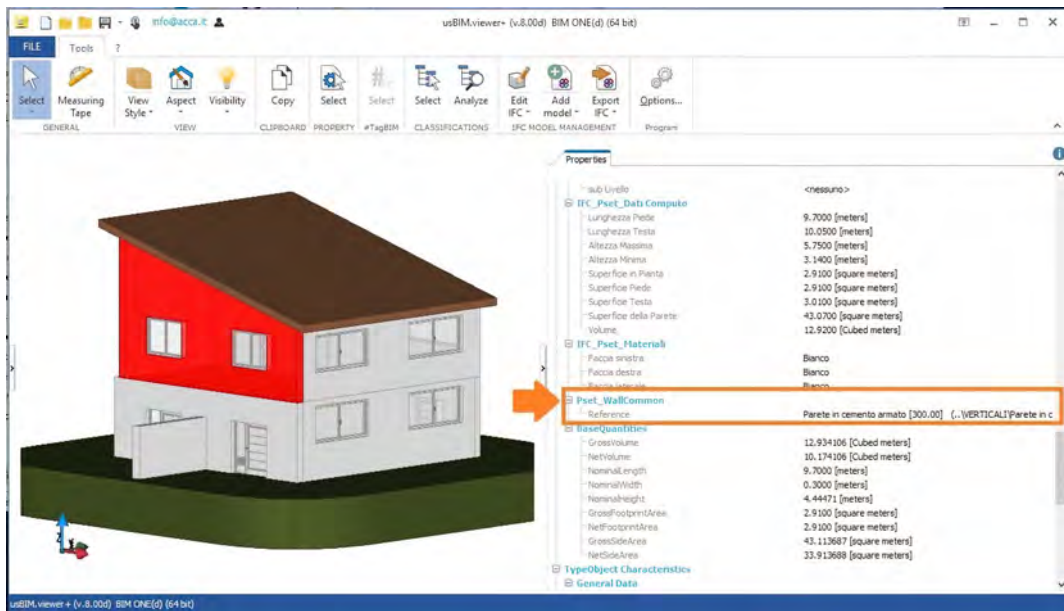
Αντικείμενα (3d)





Name	Description	Value Type
NominalLength	Total nominal (or average) length of the wall along the wall path. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityLength
NominalWidth	Total nominal (or average) width (or thickness) of the wall perpendicular to the wall path. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityLength
NominalHeight	Total nominal (or average) height of the wall along the wall path. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityLength
GrossFootprintArea	Area of the wall as viewed by a ground floor view, not taking any wall modifications (like recesses) into account. It is also referred to as the foot print of the wall. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
NetFootprintArea	Area of the wall as viewed by a ground floor view, taking all wall modifications (like recesses) into account. It is also referred to as the foot print of the wall. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
GrossSideArea	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall modifications (such as openings). The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
NetSideArea	Area of the wall as viewed by an elevation view of the middle plane. It does take into account all wall modifications (such as openings). The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
GrossSideAreaLeft	Area of the wall as viewed by an elevation view of the left side (when viewed along the wall path orientation). It does not take into account any wall modifications (such as openings). The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
NetSideAreaLeft	Area of the wall as viewed by an elevation view of the left side (when viewed along the wall path orientation). It does take into account all wall modifications (such as openings). The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
GrossSideAreaRight	Area of the wall as viewed by an elevation view of the right side (when viewed along the wall path orientation). It does not take into account any wall modifications (such as openings). The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
NetSideAreaRight	Area of the wall as viewed by an elevation view of the right side (when viewed along the wall path orientation). It does take into account all wall modifications (such as openings). The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityArea
GrossVolume	Volume of the wall, without taking into account the openings and the connection geometry. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityVolume
NetVolume	Volume of the wall, after subtracting the openings and after considering the connection geometry. The exact definition and calculation rules depend on the method of measurement used.	IfcQuantityVolume

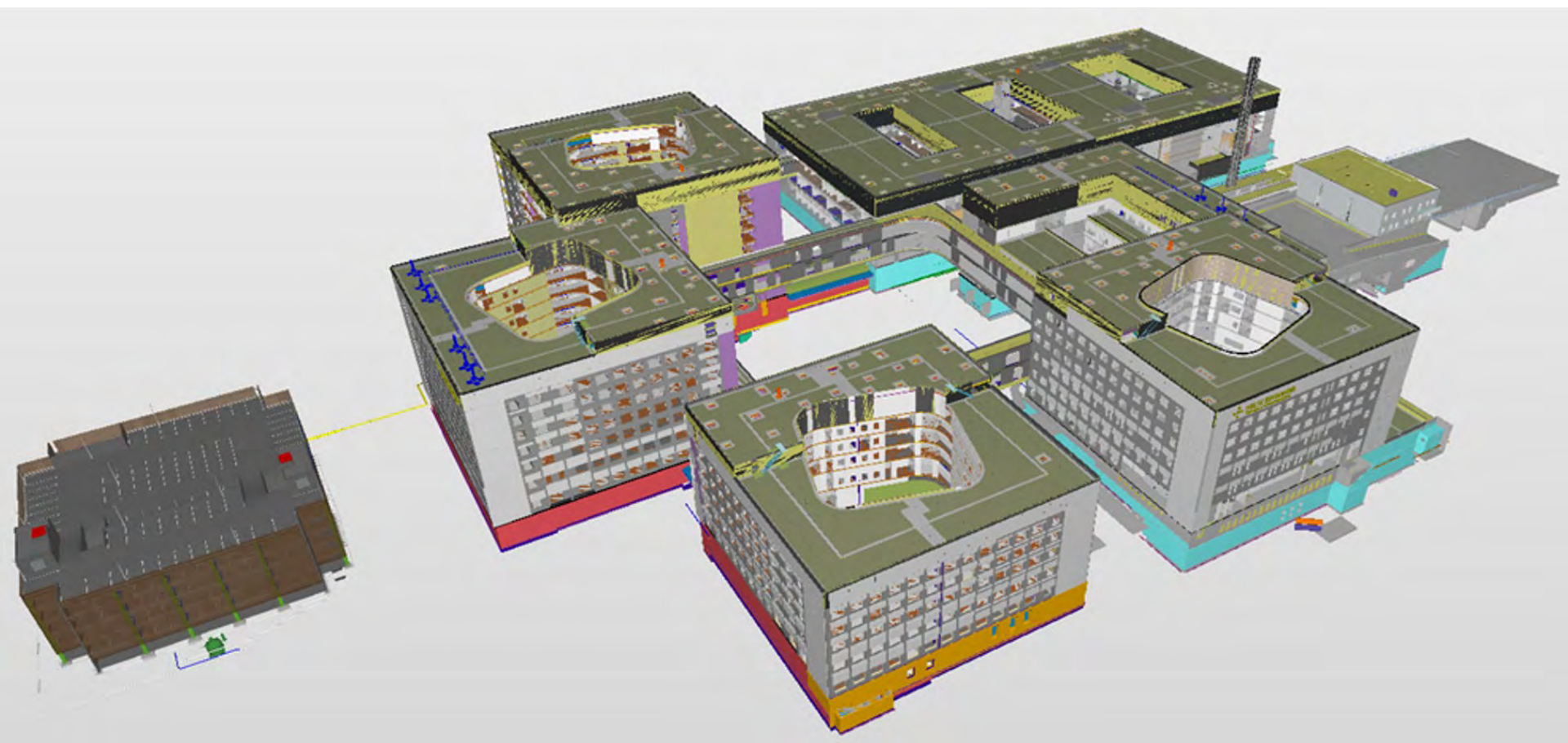




5. Case studies

New Stavanger University Hospital, Νορβηγία





H-Modul

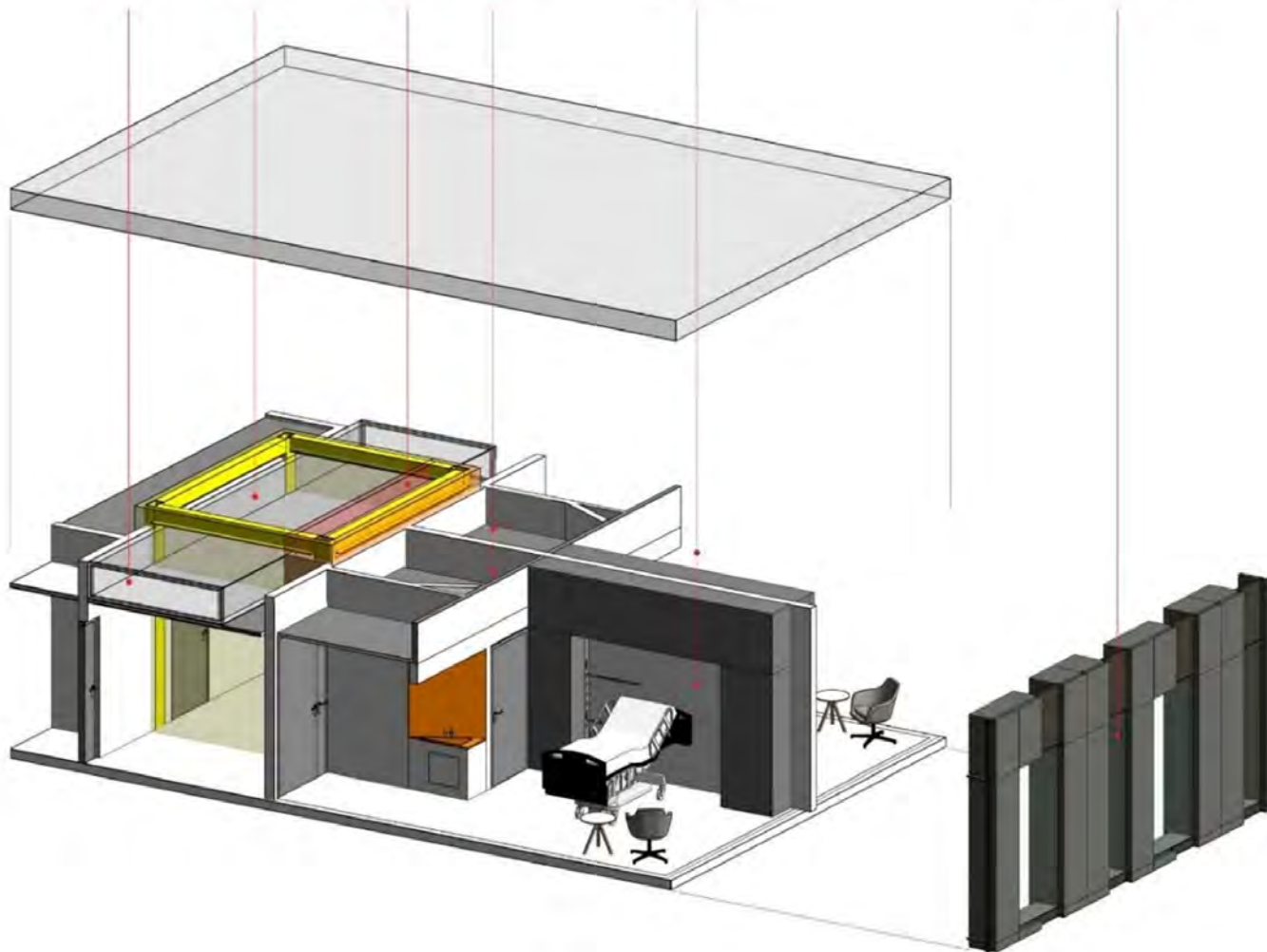
Sjaktrom

V-Modul
i Sjaktrom

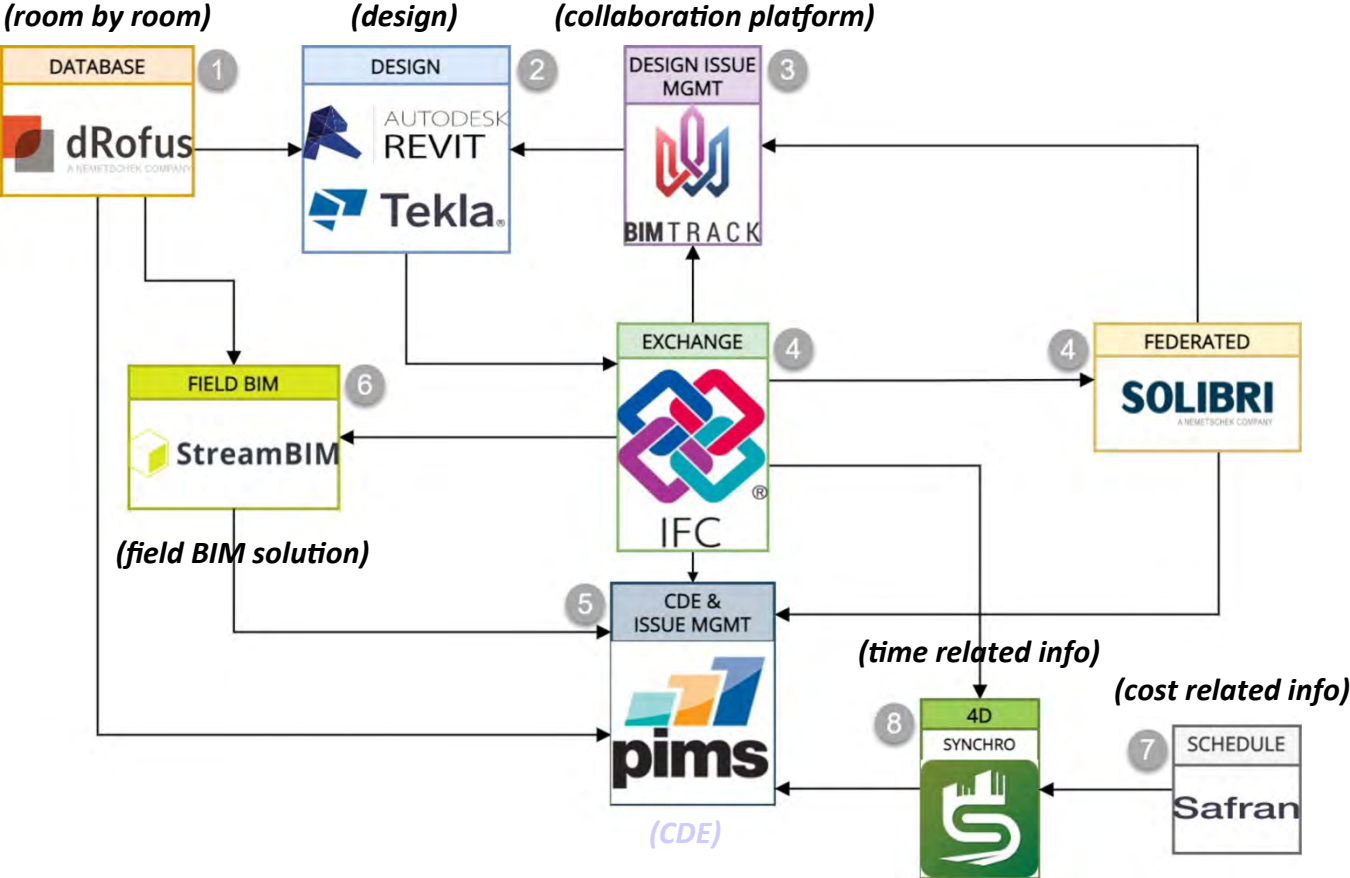
Vätrom

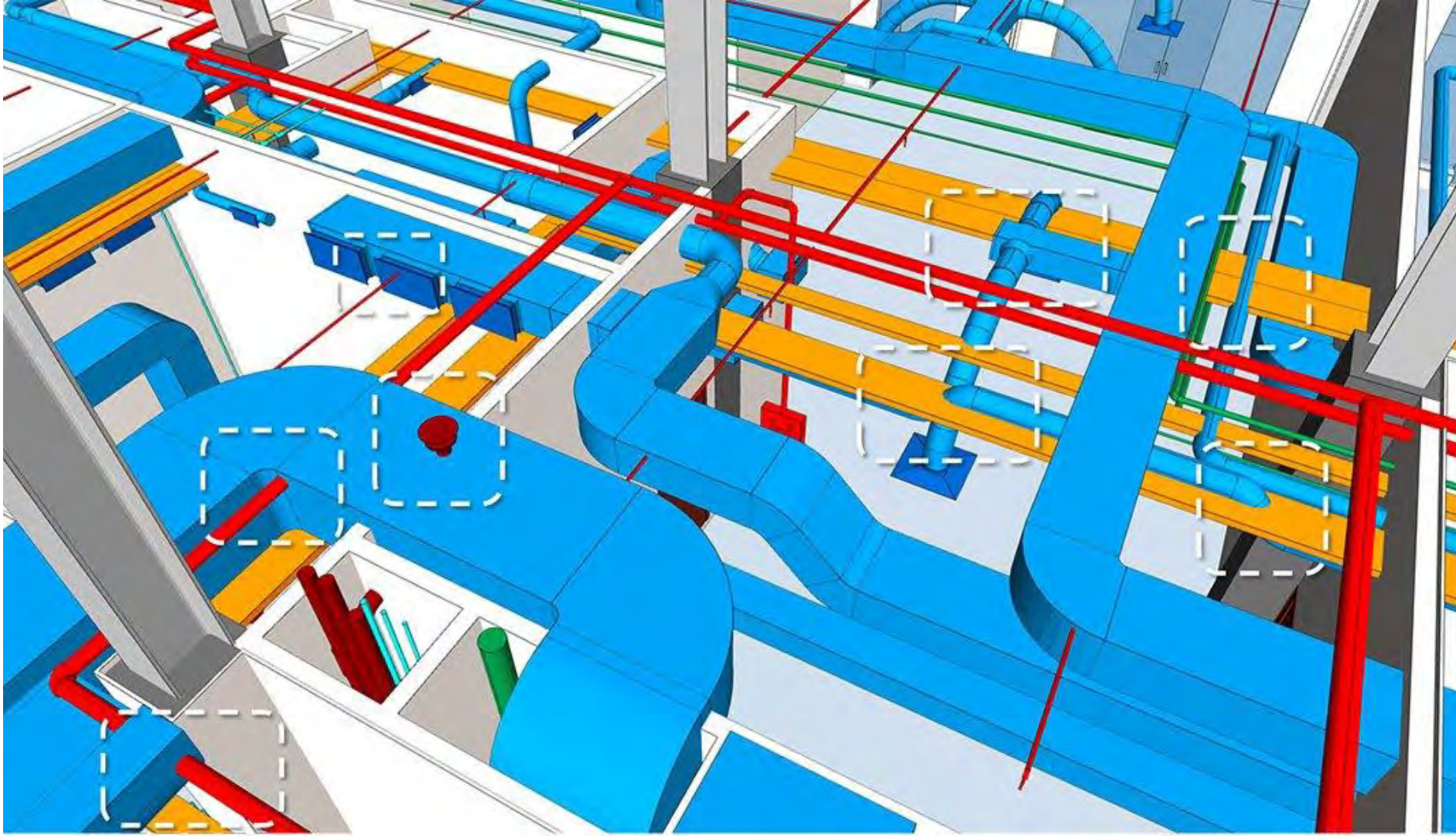
Sengerom

Fasade Modul



Software workflow





BYGGEKIOSKEN.NO





- Dashboard
- Lokasjoner
- Field 4
- Box Light
- Oppsett
- Hjelp



☰ 🔍

Rectangular Horizontal
00.04.71.0011
🔍 - 🟢 2022-01-05

Rectangular Horizontal
00.04.71.0012
🔍 - 🟢

Rectangular Horizontal
00.04.71.0401 Korridor, 71.0402
🔍 - 🟢 2022-01-05

Rectangular Horizontal
00.04.71.0402
🔍 - 🟢 2022-01-05

Rectangular Horizontal
00.04.71.0403
🔍 - 🟢 2022-01-05

Rectangular Horizontal
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🔍 - 🟢 2022-01-05

Rectangular Horizontal
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🔍 - 🟢 2022-01-05

Rectangular Horizontal
00.04.71.0011
🔍 - 🟢 2022-01-05

Rectangular Horizontal
00.04.71.0011
🔍 - 🟢 2022-01-05

Rectangular Vertical
00.04.71.0401
🔍 - 🟢 2022-01-05

Rectangular Vertical
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Rectangular Vertical
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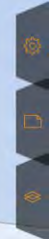
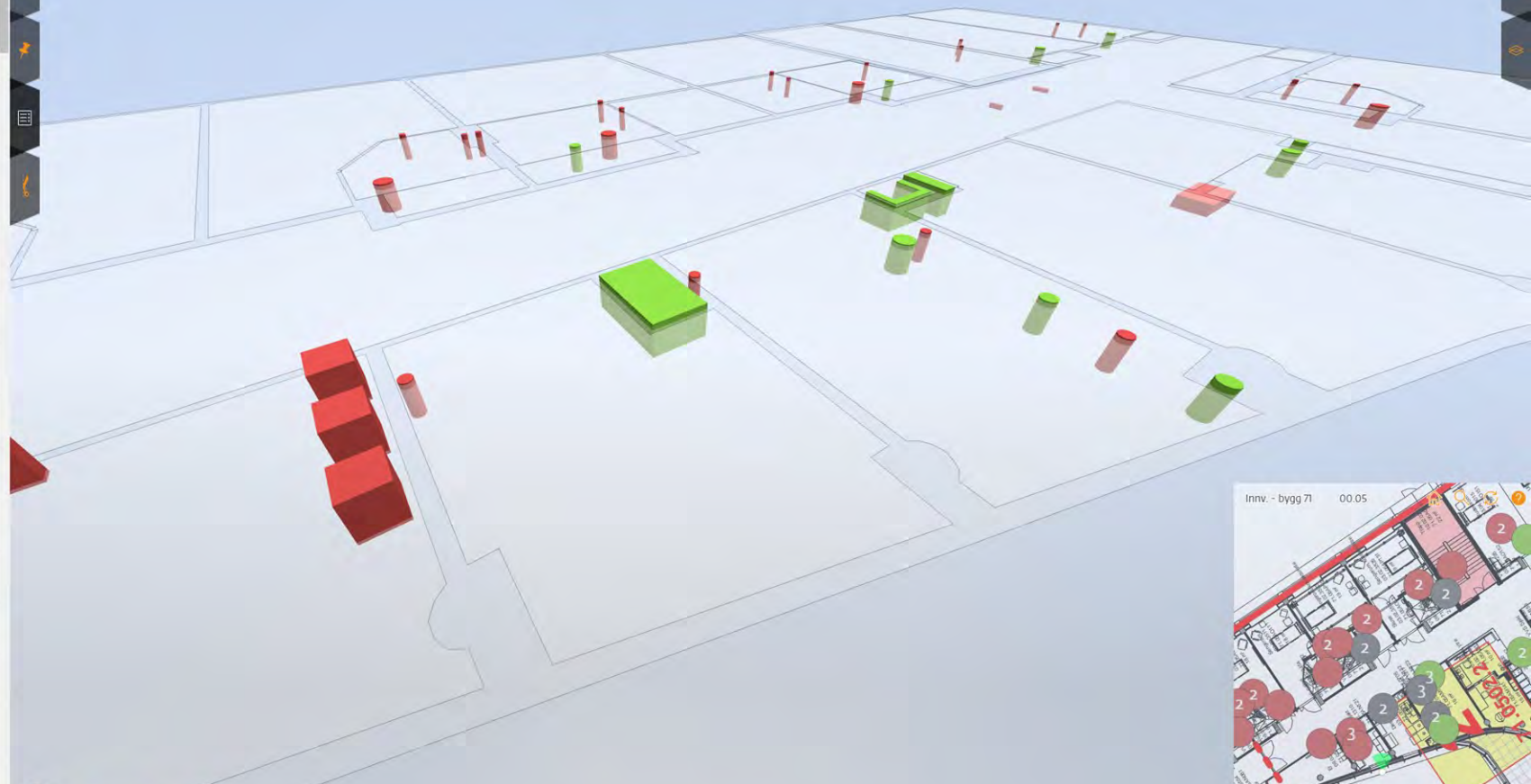
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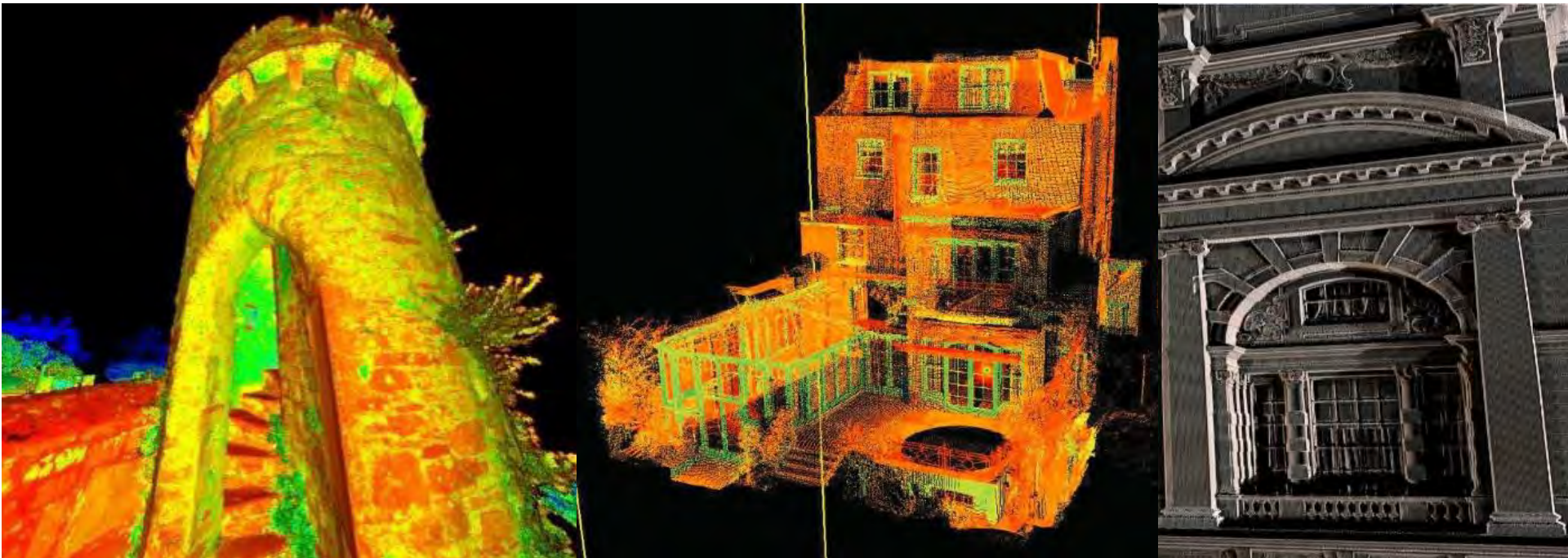
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Rectangular Vertical



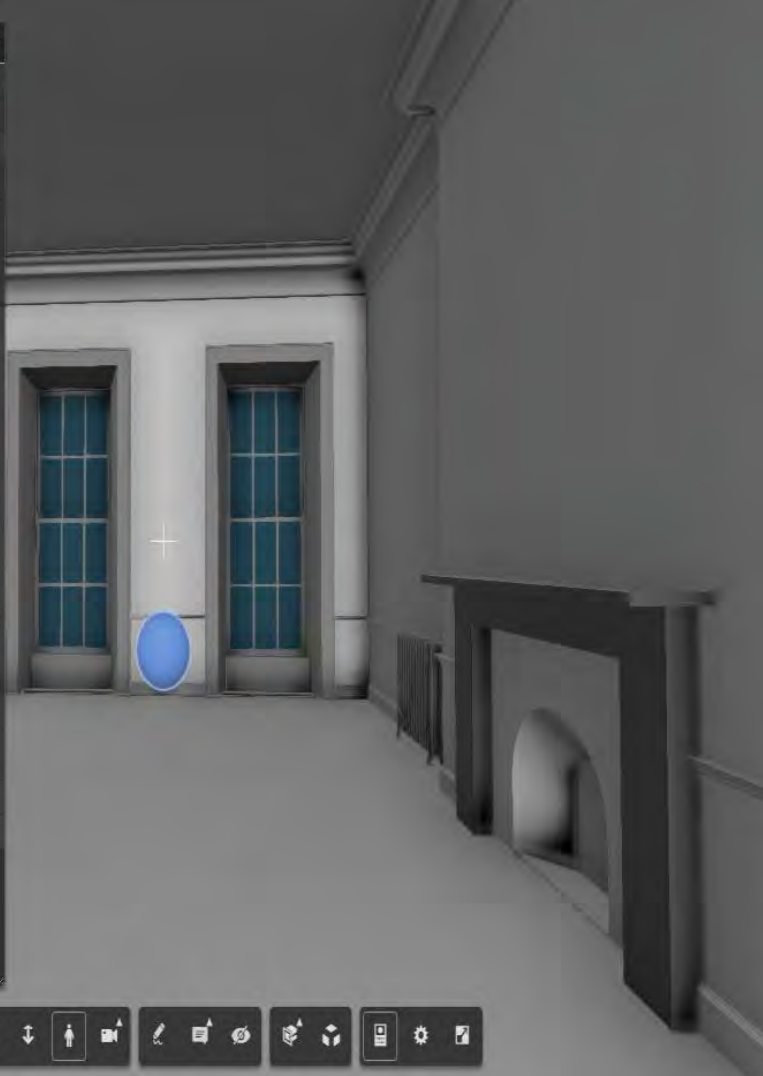
Heritage Building Surveying & Information Modeling





MSL_PHOTOGRAMMETRY_SPHERE [1179261] X

- Constrains
- Dimensions
- ▾ Identity Data
 - Type Name MSL_Phogrammetry_Sphere
 - MSL_Phogrammetry_Point http://bim.murphysurveys.ie/panoramas/16_color_out.html
 - Image
 - Comments
 - Mark
 - Type Image
 - Keynote
 - Model
 - Manufacturer
 - Type Comments
 - URL
 - Description
 - Assembly Code
 - Cost
 - Assembly Description
 - Type Mark
 - OmniClass Number
 - OmniClass Title
- Phasing
- Materials and Finishes







13513-MSL-XX-M3-B-ParnellSquare_Combined-3DView-(3D).fbx

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EU BIM - Building Renovation Competition

Διαγωνισμός στα πλαίσια του ερευνητικού προγράμματος BIM Speed

EU BIM BUILDING RENOVATION COMPETITION
a BIM-SPEED initiative

Join the competition!

- Present a building renovation design project
- Improve the renovation process
- Use BIM-SPEED platform and apply BIM tools and methodologies

Registration Deadline:
21 October 2021

For more info:
➔ bim-speed.eu/competition

Register now!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 820553

BIM-SPEED PLATFORM COLLABORATION PLATFORM OVERVIEW



Document management system



User management



Folder level access right management



Document versioning



Documents comments



Secured file sharing



Simple validation workflow



Online documents viewing



File syncing application



Collaboration services



Discussion threads & chats



Video-conferencing



Task management



Calendar / meetings management application



Central authentication system



KROQJ SERVICES



File naming convention service



Integrated Open BIM application




BIM-SPEED renovation services integration



Κριτήρια Αξιολόγησης

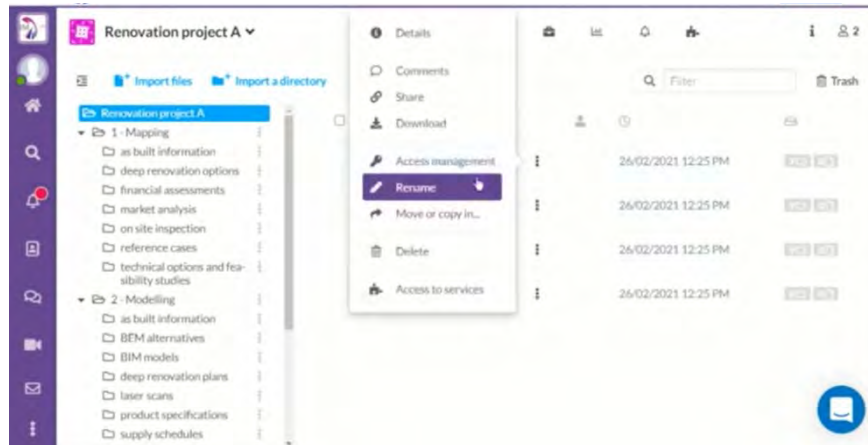
- Εξοικονόμηση χρόνου και κόστους με τη χρήση της πλατφόρμας BIM-SPEED
- Εφαρμογή Αειφορικών στρατηγικών στην ανακαίνιση
- Αντιμετώπιση θεμάτων που σχετίζονται με την υγεία και άνεση των κατοίκων / χρηστών
- Χρήση εργαλείων BIM σε συνδυασμό με τα διαθέσιμα εργαλεία BIM της πλατφόρμας
- Βαθμός συνεργασίας μέσω της πλατφόρμας

HOME NEWS RESULTS PARTNERS DEMONSTRATION CASES COMMUNITY TRAINING MATERIALS COMPETITION



TRAINING MATERIALS

BIM-Speed file name convention tool	Learn More ▶
Multicriteria decision making tool	Learn More ▶
BIM Maturity tool	Learn More ▶
Inhabitants Crowd-Sourcing App	Learn More ▶
BIM-Speed methodology toolkit	Learn More ▶
Methods for surveying and diagnostic of HVAC systems in existing buildings	Learn More ▶
3DASH Tool	Learn More ▶
BACN2BIM Tool	Learn More ▶



Renovation project A

Import files Import a directory

- Renovation project A
 - 1 - Mapping
 - as built information
 - deep renovation options
 - financial assessments
 - market analysis
 - on site inspection
 - reference cases
 - technical options and feasibility studies
 - 2 - Modelling
 - as built information
 - BEM alternatives
 - BIM models
 - deep renovation plans
 - laser scans
 - product specifications
 - supply schedules

Details

Comments

Share

Download

Access management

Resume

Move or copy in...

Delete

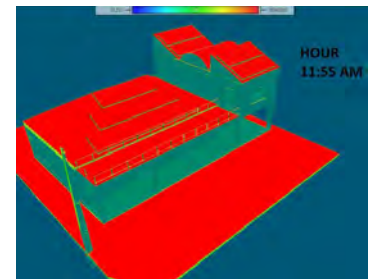
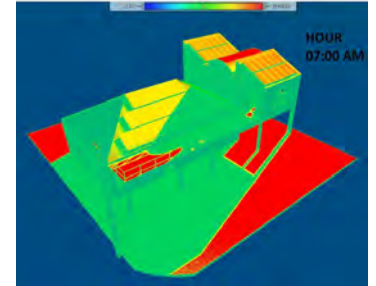
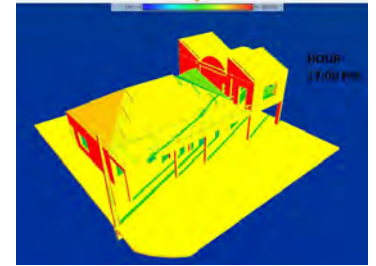
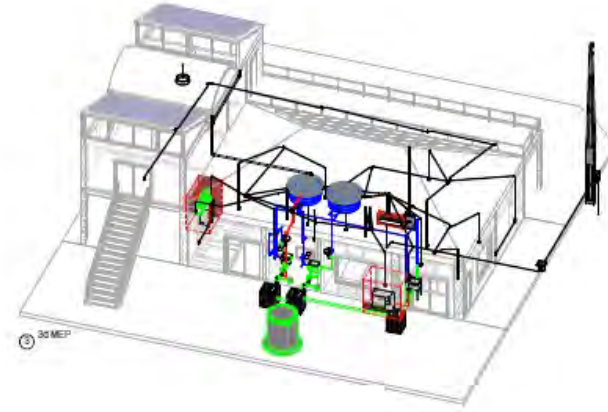
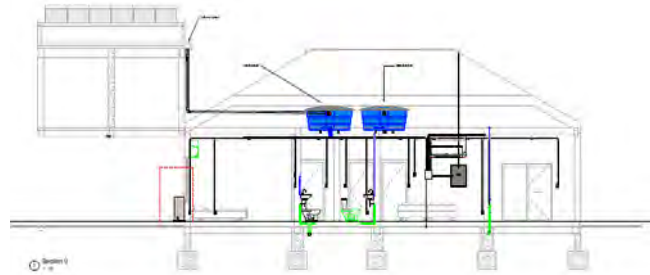
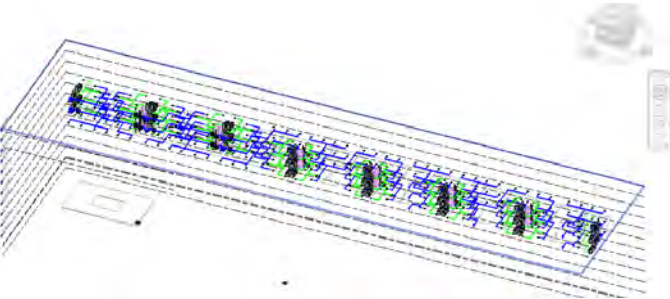
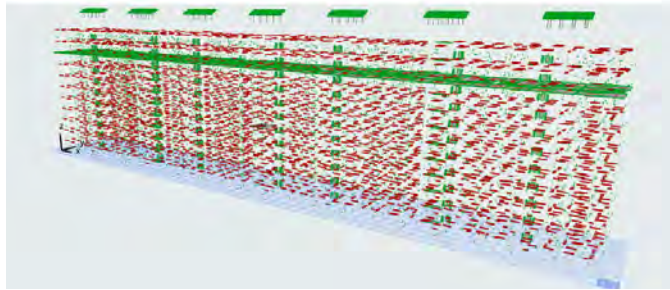
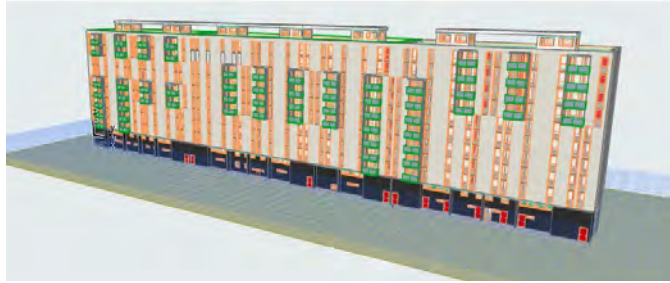
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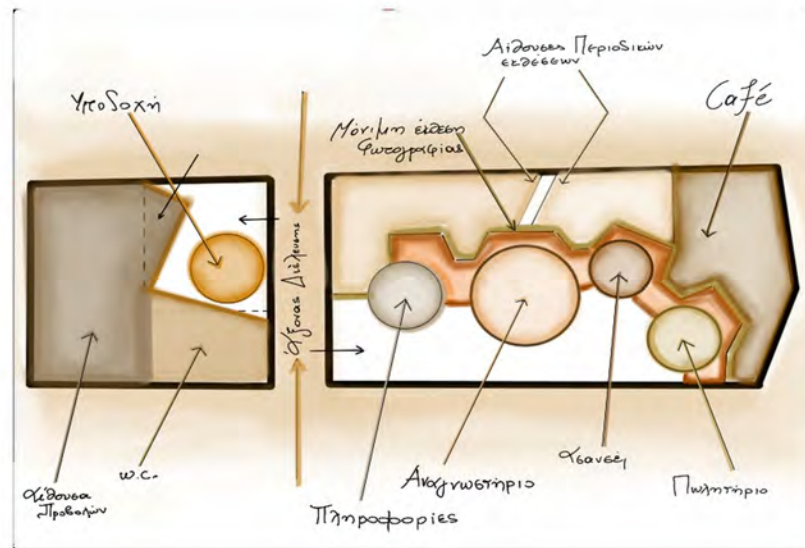
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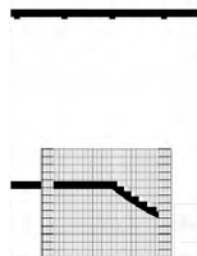
ΤΟΜΗ Α



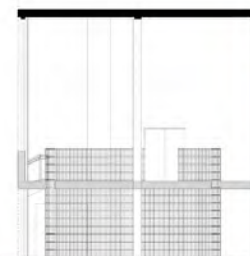
ΤΟΜΗ Β



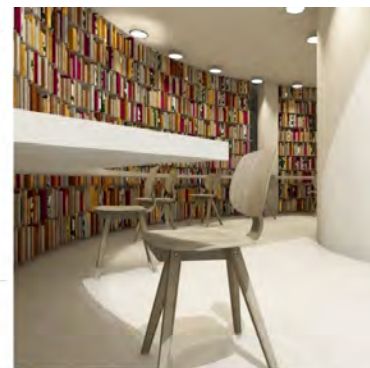
ΧΩΡΟΣ ΑΝΟΙΧΤΟΥ ΠΛΗΘΗΡΙΟΥ



ΤΟΜΗ Α



ΤΟΜΗ Β



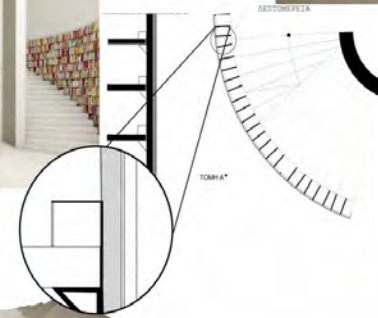
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ΕΜΦΑΝΙΣΗΣ ΠΛΗΡΟΦΟΡΙΩΝ ΤΩΝ ΠΕΡΙΟΔΙΚΩΝ ΕΚΔΟΣΕΩΝ

ΓΕΩΓΕΙΟΣ ΧΩΡΟΣ ΚΥΛΙΝΑΡΟΥ



ΚΕΝΤΡΙΚΟ ΕΠΙΠΛΟ ΤΑΜΕΙΟΥ
(ΓΥΦΟΣΑΝΙΔΑ/ΕΦΕ ΜΙΣΤΟΥ)

ΧΩΡΟΣ ΠΡΩΤΟΥ ΕΠΙΠΕΔΟΥ ΚΥΛΙΝΑΡΟΥ



ΔΕΣΤΟΝΟΡΕΙΑ

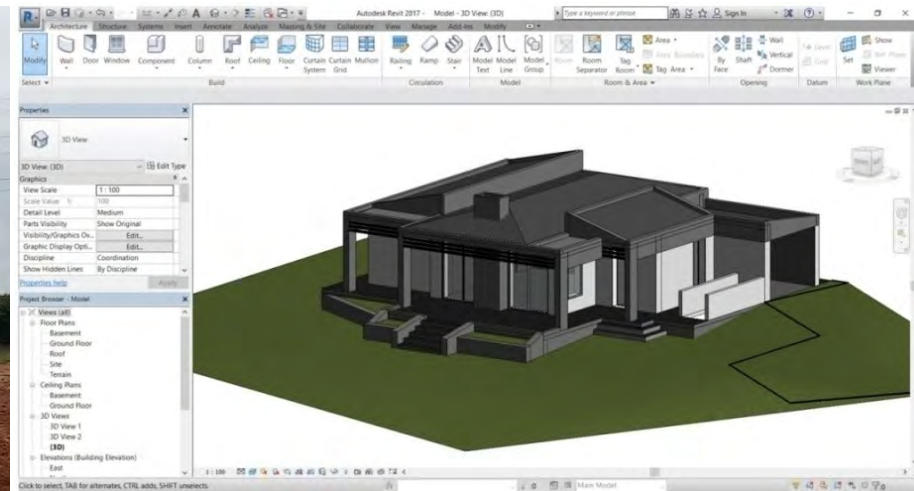
ΤΟΜΗ Α*



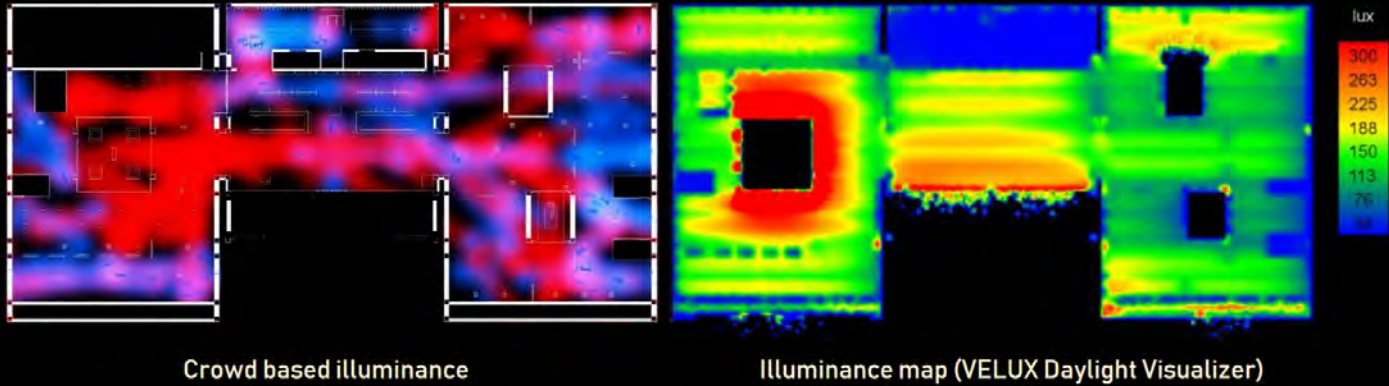
Ελληνικό Ανοικτό Πανεπιστήμιο - Π.Μ.Σ. Σχεδιασμός Φωτισμού

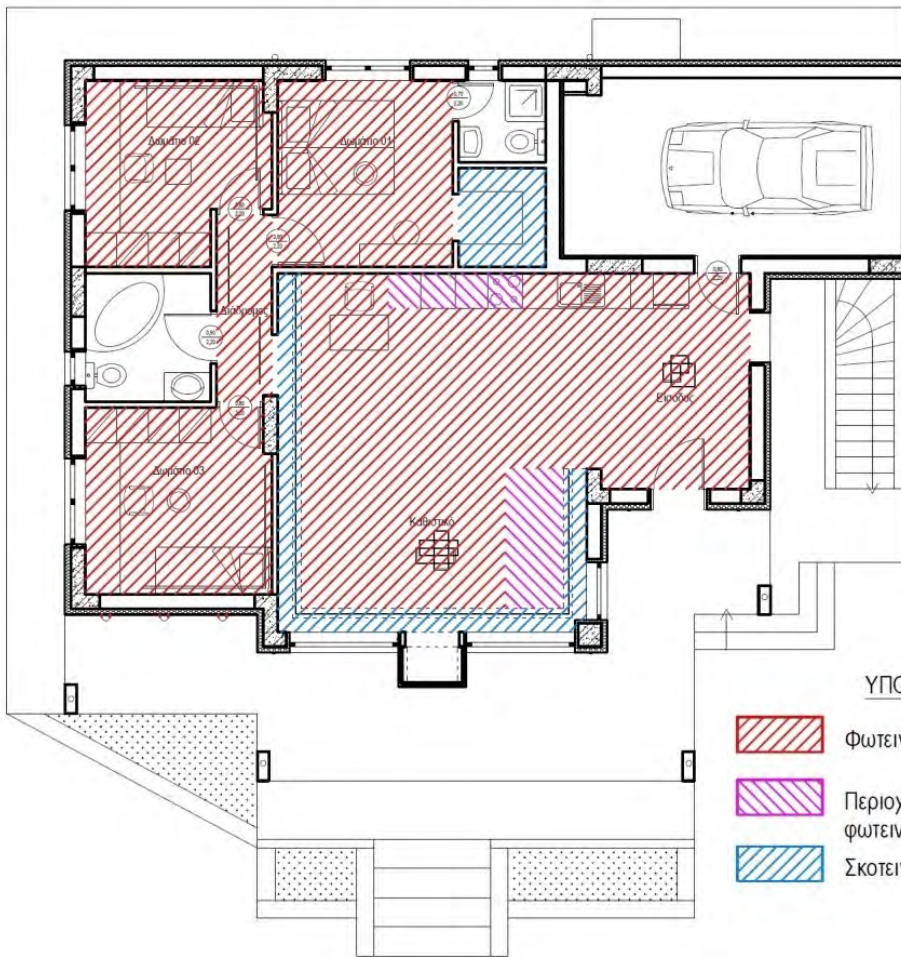
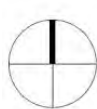
Πτυχιακή εργασία : Βιωματική και διαδραστική μέθοδος μελέτης φωτισμού με τη χρήση BIM και VR

2021-22



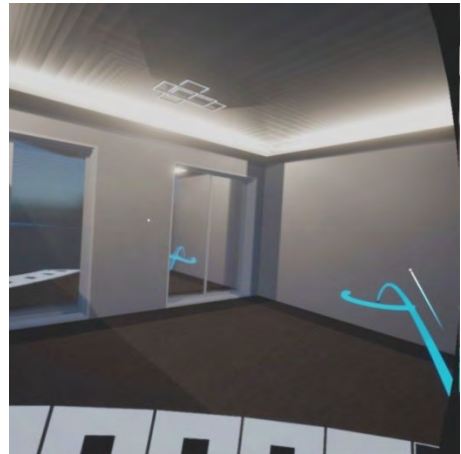
Comparing perception maps to quantitative simulations



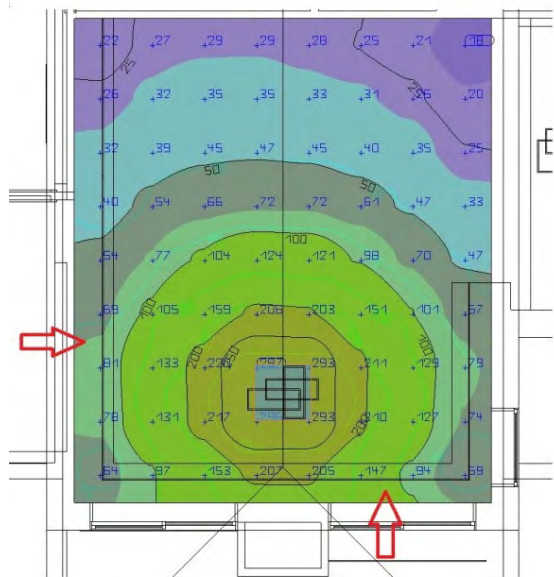


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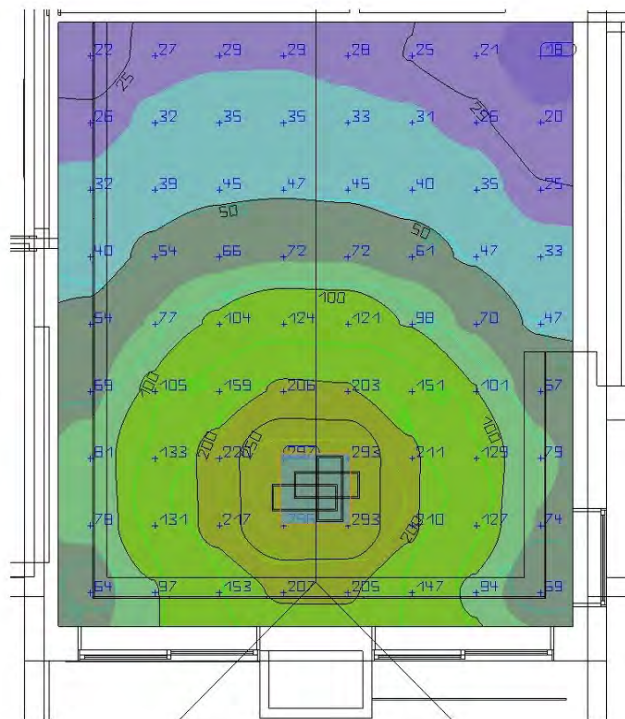
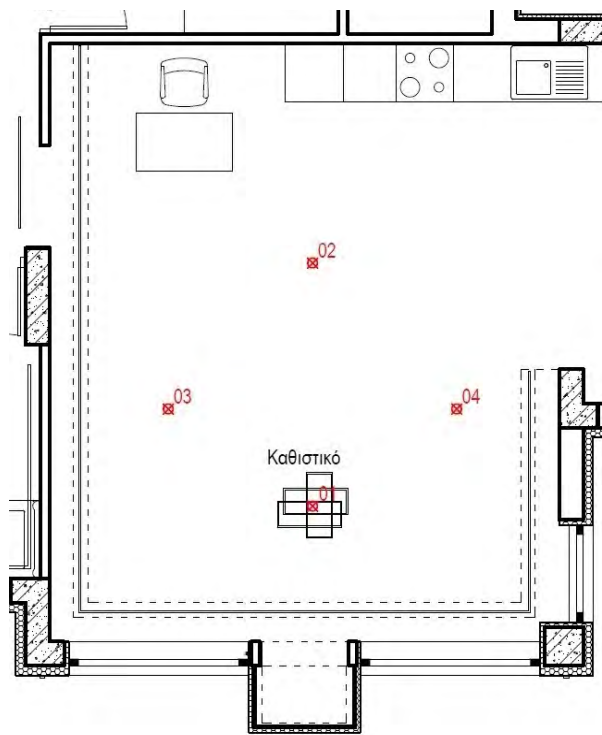
-  Φωτεινές περιοχές
-  Περιοχές ενδιάμεσης φωτεινότητας
-  Σκοτεινές περιοχές



Διάγραμμα βαθμού φωτεινότητας / Περιήγηση σε περιβάλλον Δυνητικής Πραγματικότητας



Αντιπαραβολή διαγράμματος φωτομετρικών υπολογισμών και υλοποιημένου χώρου με το μοντέλο VR



Σημείο μέτρησης	Υπολογιζόμενη ένταση φωτισμού από το DIALux ενο	Μετρούμενη ένταση φωτισμού
	Lux	Lux
01	297	360
02	50	55
03	133	122
04	129	145

Αντιπαραβολή διαγράμματος φωτομετρικών υπολογισμών και επί τόπου μετρήσεων

Πηγές (links)

ACE BIM Guide

Singapore BIM Guide

BIM Forum

NBS

Building Smart

BIM Speed Competition