Hospital Frankfurt Höchst

The long Haul: Interoperability, Information Management and Workflows Through Different Project Phases

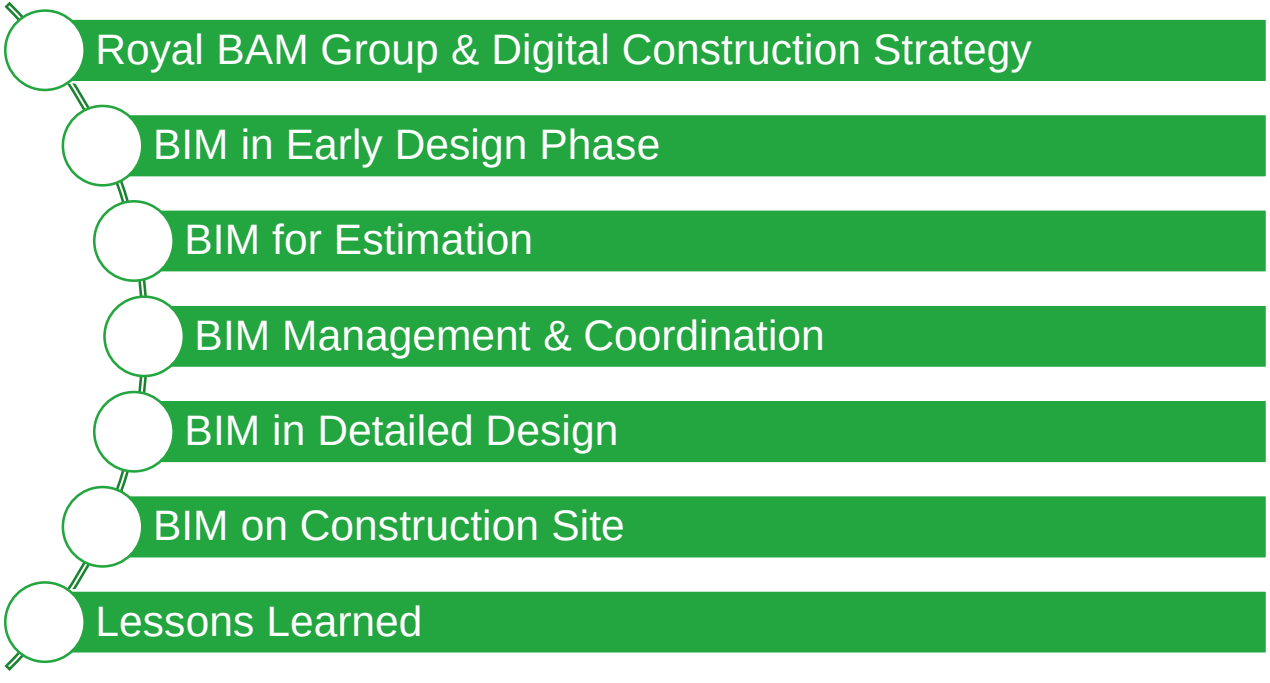
bam Deutschland

Constance, May 15th 2018

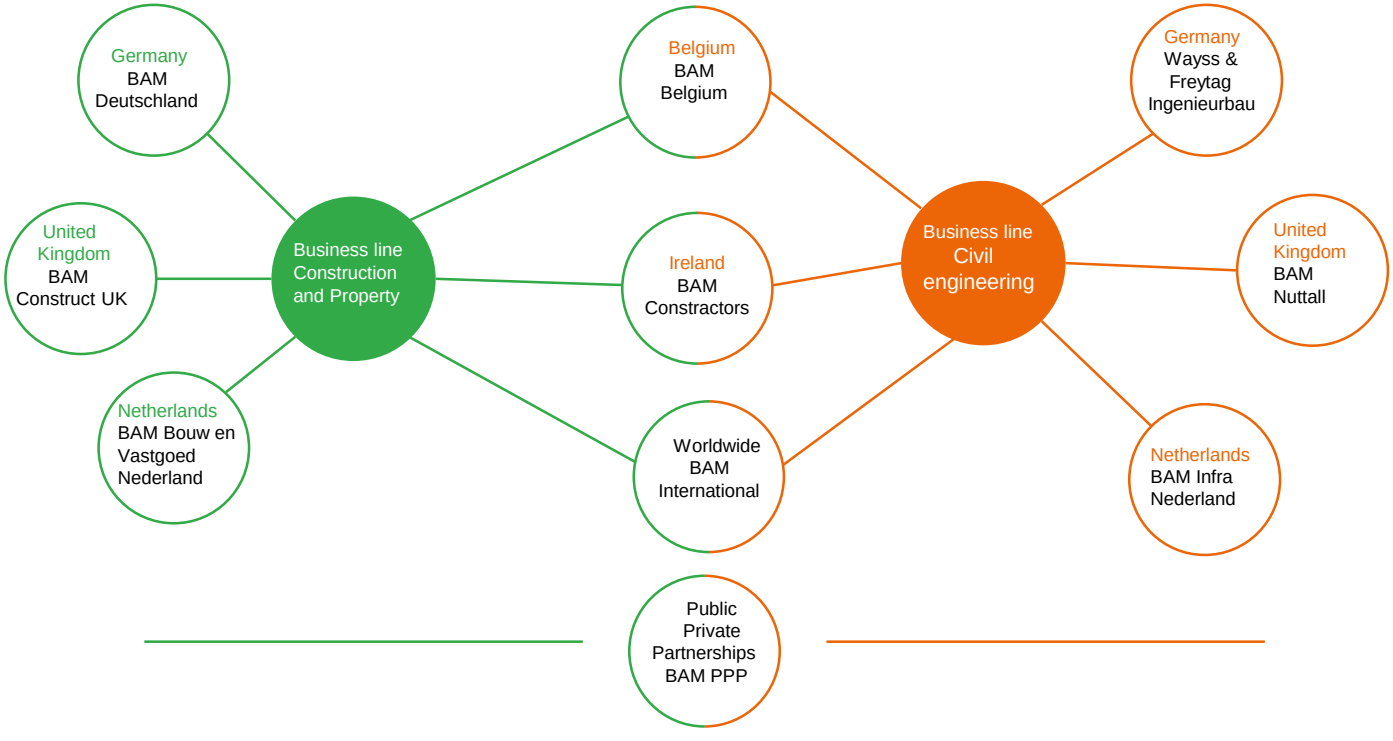
Royal BAM & BAM Deutschland AG Digital Construction Strategy

Martin Rüdt
Member of the Management Board
Technical Project Director - BAM Deutschland AG

AGENDA

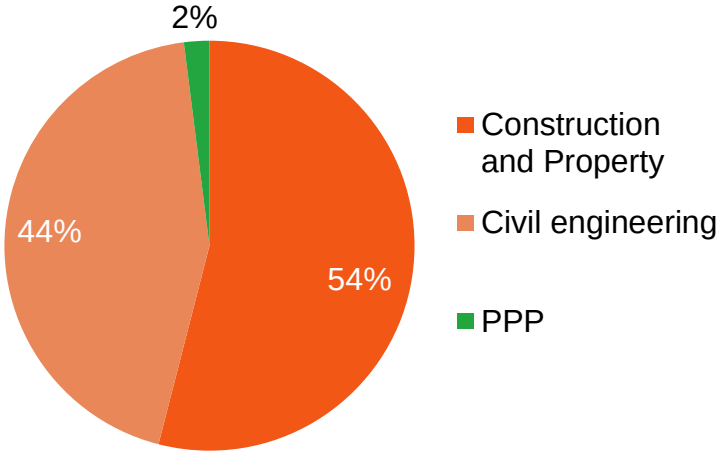

Royal BAM Group & Digital Construction Strategy
BIM in Early Design Phase
BIM for Estimation
BIM Management & Coordination
BIM in Detailed Design
BIM on Construction Site
Lessons Learned

Organisational Structure

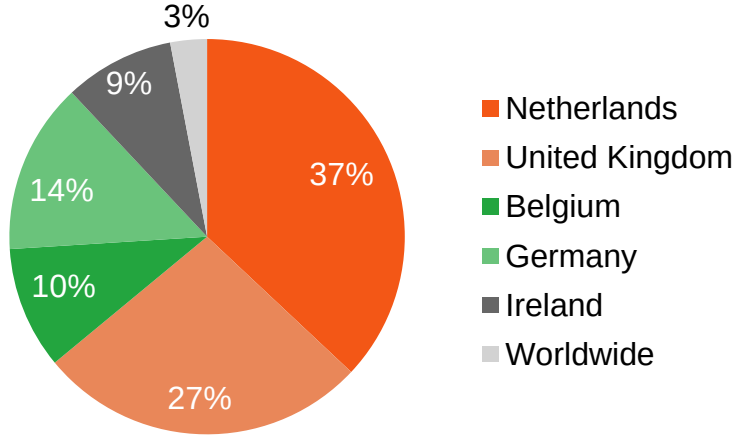


Revenue Sector / Geography
% of gross total revenue 2017

Revenue per sector
(in %)



Revenue geographical
(in %)



BAM Deutschland AG
Key Features

VALUES

Profit - Safety
Client Satisfaction

EMPLOYEES
≈ 900

BUSINESS UNITS

BAM SWISS
BAM ID
BAM SPORTS

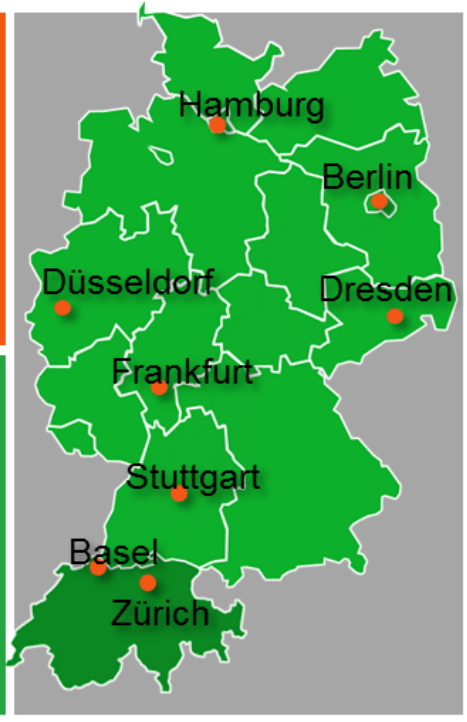
REVENUE
0.5 BILLION €

Projects

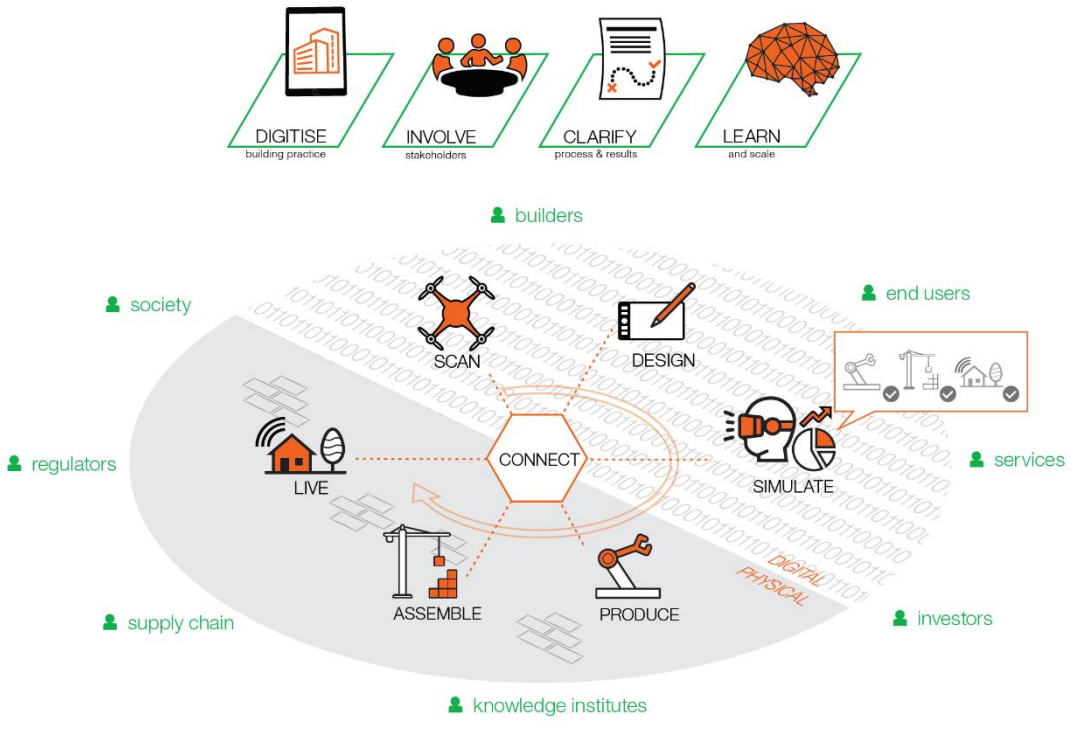
Healthcare
Sport Facilities
Building for Justice
Commercial buildings

SERVICES

Building Construction
Real Estate Management



BAM‘s Digital Transformation



Our mission and vision underpin the strategy … ‘Building the present, creating the future’

Leading in performance, innovation, sustainability

Mission

Why are we in business?

We create sustainable environments that enhance people’s lives
by enabling the right people to capitalise on state-of-the-art knowledge, resources and digital technologies,
providing solutions across the total construction life cycle for our customers and clients,
and generating maximum value for our stakeholders.

Vision

Where do we want to be in 2020?

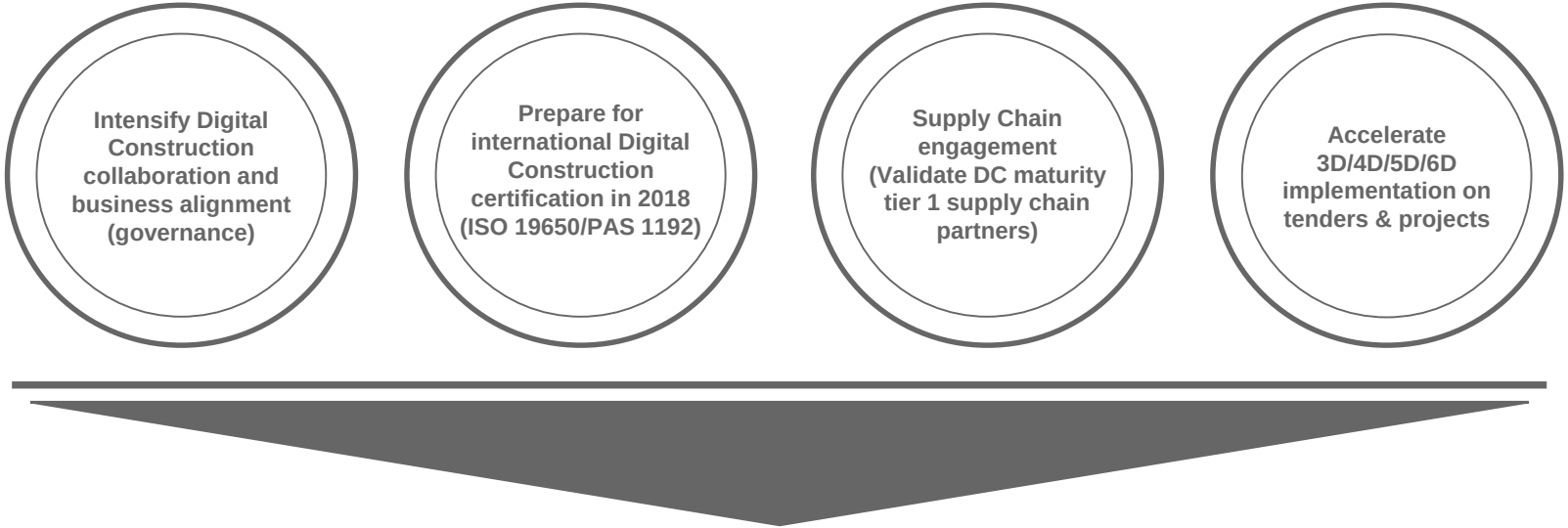
By 2020 we are recognised as one of Europe’s leading sustainable and innovative construction businesses,

with healthy profits and a strong balance sheet,

active across the total construction life cycle

in European home markets and in selected growing economies.

Priorities Digital Construction 2018



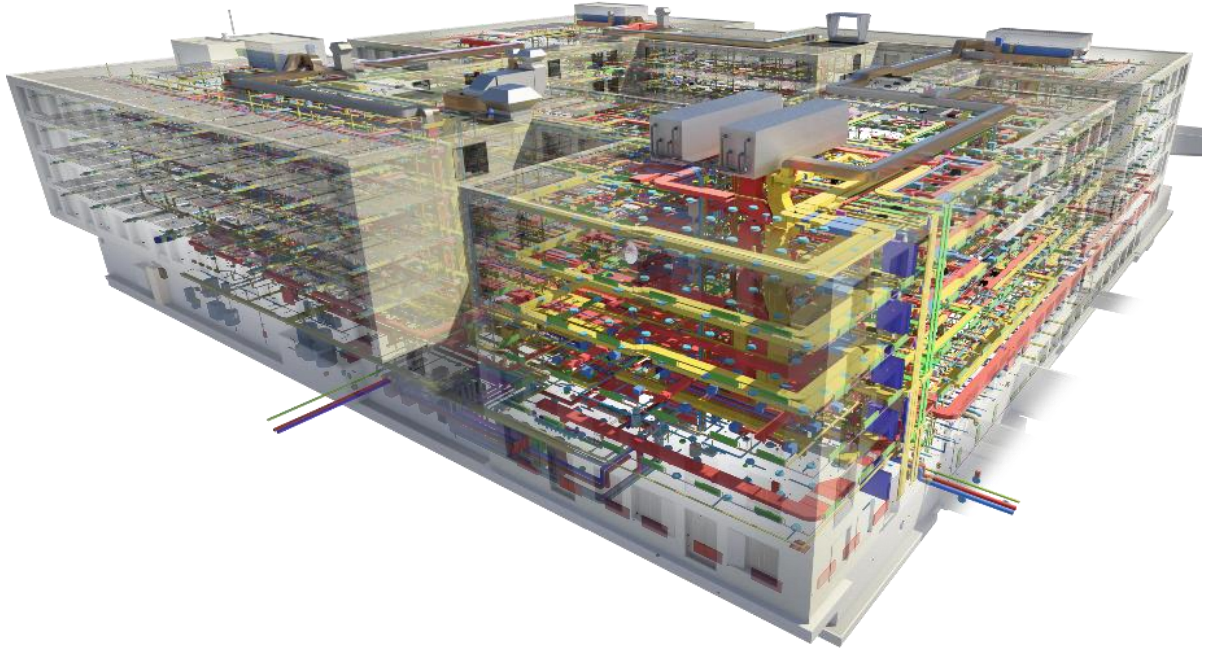
BAM as leader in Digital Construction

Museum V&A Dundee
BAM Construct UK

Museum of the Future, Dubai
BAM International and BAM Ireland

Museum of the Future, Berlin
BAM Germany

Open BIM Prizes
Felix Platter Spital



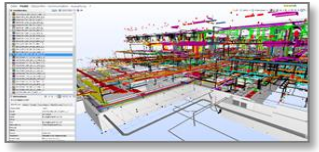
buildingSMART International home of openBIM

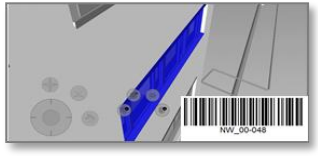
Award 2016

Operation & Maintenance Using Open BIM

BIM CLUSTER STUTTGART

Open BIM Prizes
Klinikum Frankfurt Höchst





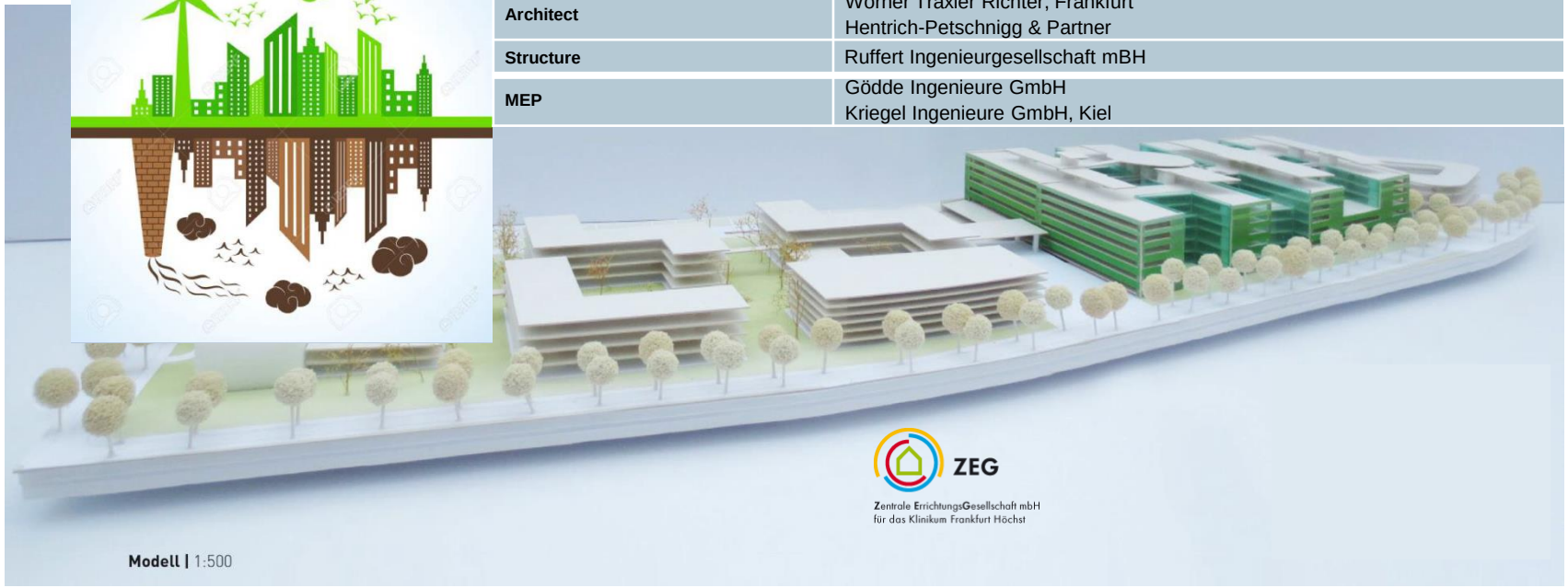
buildingSMART International home of openBIM

Award 2017

Construction Using Open Technology

Hospital Frankfurt Höchst
First Passive House Hospital in Europe

Client	Zentrale ErichtungsGesellschaft mbH (ZEG)
Contractor	BAM Germany & Max Bögl
Architect	Wörner Traxler Richter, Frankfurt Hentrich-Petschnigg & Partner
Structure	Ruffert Ingenieurgesellschaft mbH
MEP	Gödde Ingenieure GmbH Kriegel Ingenieure GmbH, Kiel



BIM in early Design Phase

STEPHANIE LOREY
Member of the Management Board
wörner traxler richter planungsgesellschaft mbh

PROFILE

wörner traxler richter

wörner traxler richter is one of Germany's leading architectural practices for health care.

Founded in 1971 by the architect Heinrich Wörner,
the practice worked towards the principle that good architecture improves recovery, work ethics and society.

Besides health care wörner traxler richter covers a very broad spectrum of expertise including architecture, master-planning, urban design, interior design and project design.

The Felix-Platter Spital in Basel was one of the first BIM projects within the office. Based on this experience, about 80% of wtr's turnover is now generated in 3D-based or BIM projects.

LOCATIONS

wörner traxler richter
is located at four offices in germany

FRANKFURT +

DRESDEN +

MÜNCHEN +

HAMBURG +

STEPHANIE LOREY

Dipl.-Ing. Architektin
Member of the Management Board
wörner traxler richter planungsgesellschaft mbh

Stephanie Lorey, born in 1979 in Wiesbaden, is responsible for the early planning stages as well as digital planning methods within the office.

After studying architecture at the EPFL Lausanne and the Technical University Darmstadt she worked for Foster + Partners in London.

Since 2009 she is working for wörner traxler richter, first as project architect and later on as job captain. She is member of the Management Board since 2015.

15.05
2018

Hospital Frankfurt Höchst
BIM – Design Phase

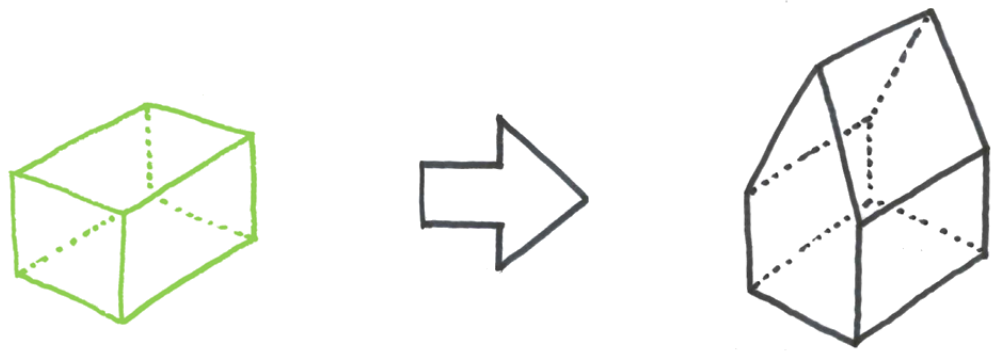
wörner traxler richter

LAKE CONSTANCE
5D-CONFERENCE2018

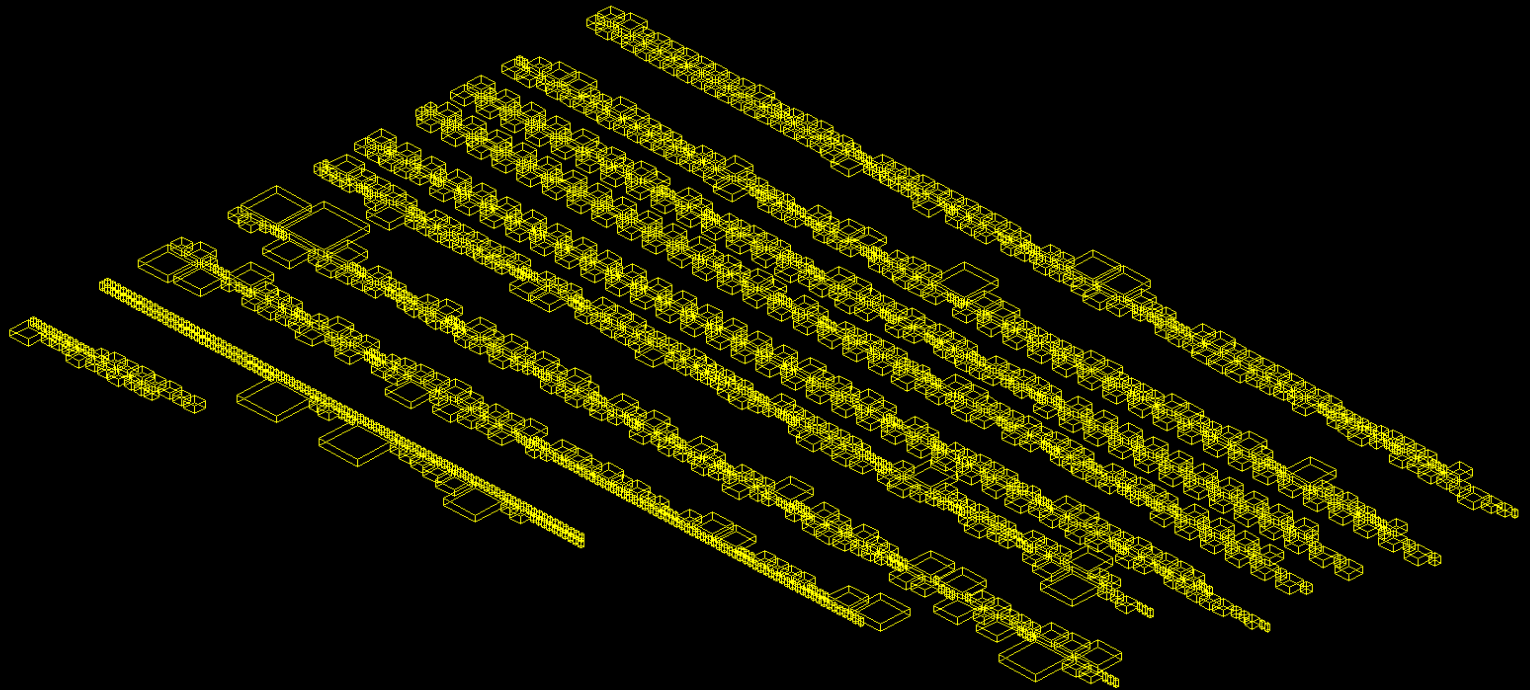
Hospital Frankfurt Höchst
BIM – Design Phase

Maximum Care Hospital
Planning 2010 - 2014 | LPH 02 - 04

Passive house standards (patient wards)
664 beds , 10 ORs
34.500m² NFA | 78.900m² GFA
3000 spaces

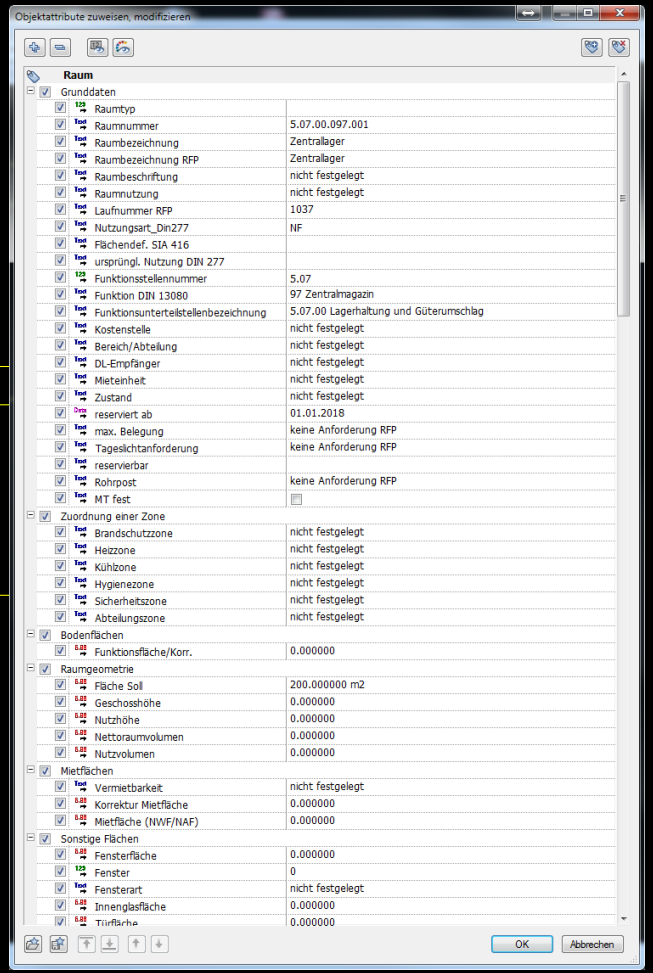


It all started with a space....



of the project brief.....

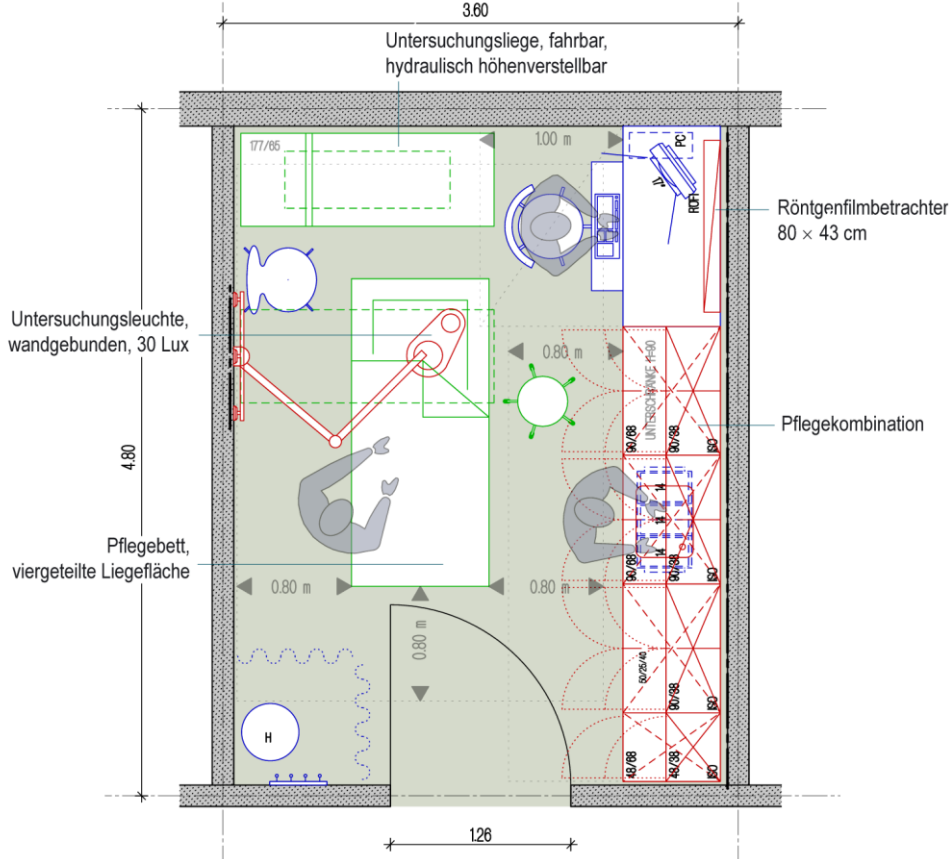
with properties....



Standard units, Standard details

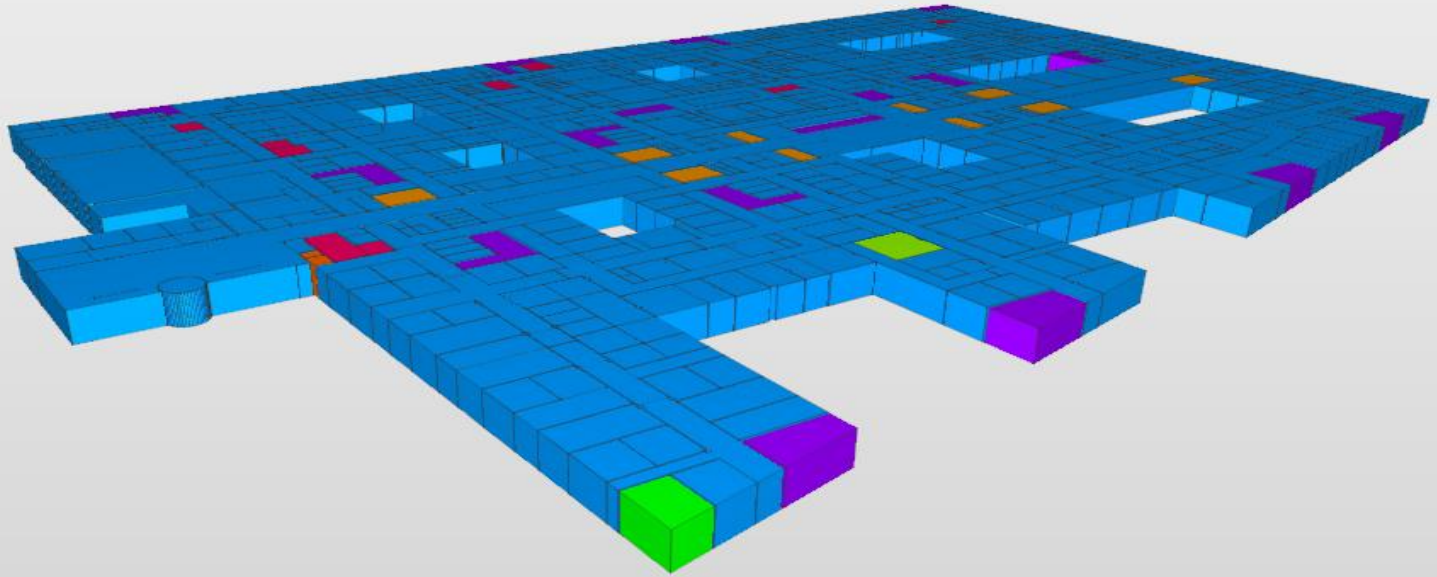
- Establishing standard geometries for units / uses
- Determining standard units throughout the planning
- Detailed and transparent definition of cost relevant issues within the preliminary planning
- Execution planning during the schematic design
- Early cost security / hospital-wide standards
- Improving planning quality / reducing planning time

As a result, 70% - 100% of all rooms are represented by standard units

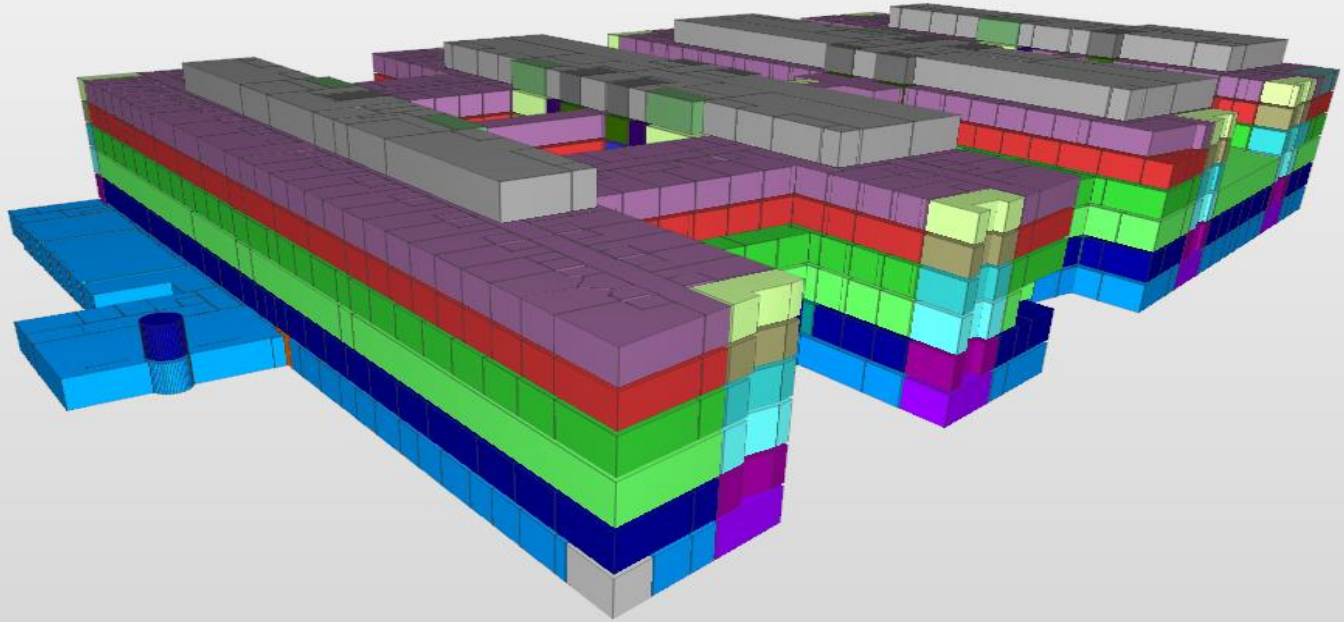


U+B - Raum allgemein, bettengängig

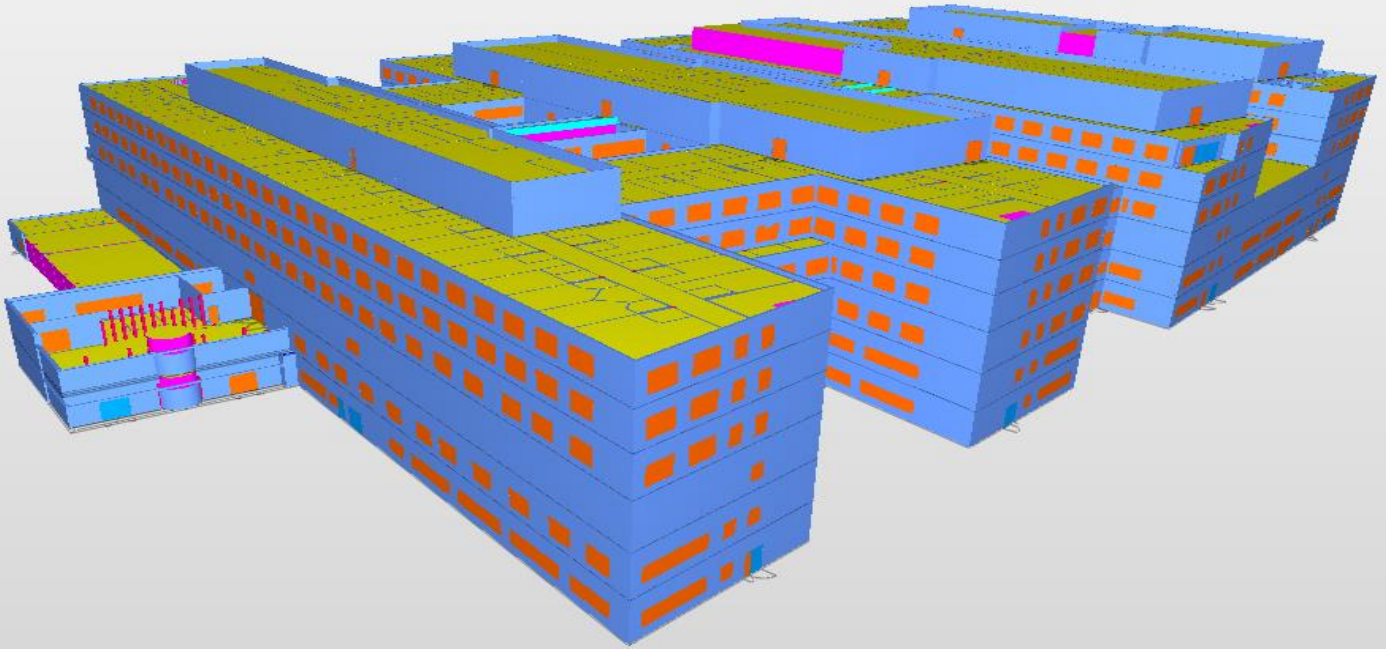
A single space....



...floor layout....

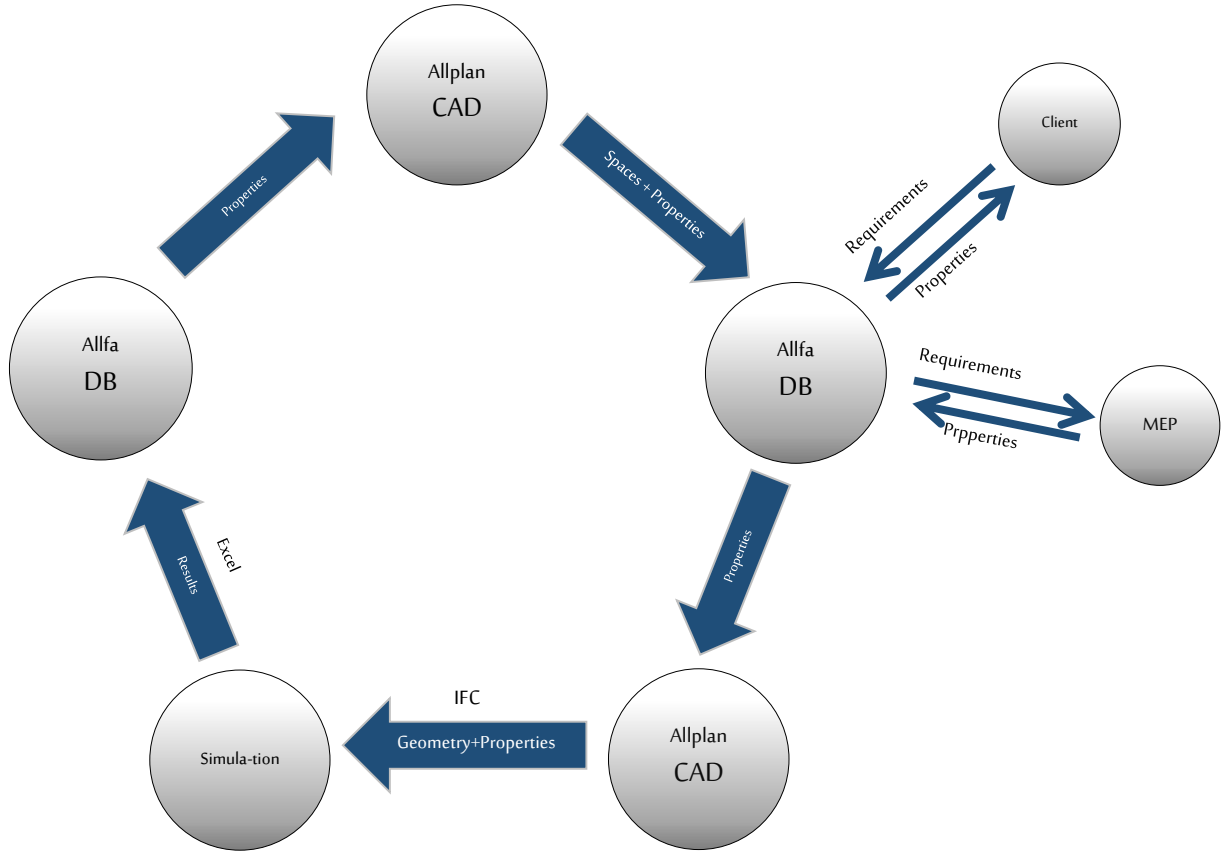


...space modell....



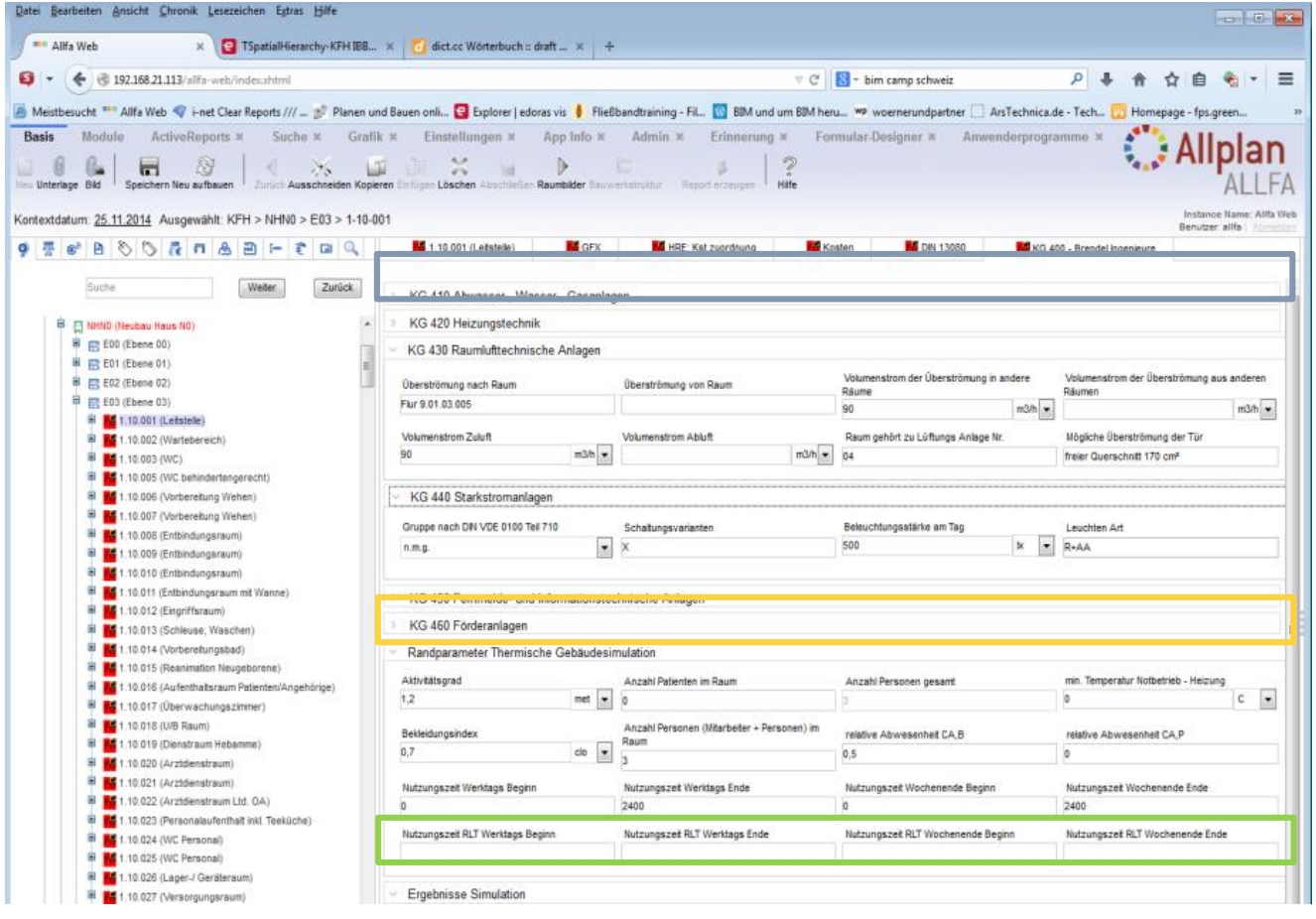
...building model....

Data base / CAD workflow



wörner traxler richter
LAKE CONSTANCE
5D-CONFERENCE2018
INVISCO tec

Data Base interface – entering parameters



User interface CAFM-Systems
Nemetschek Allfa-Web Browser

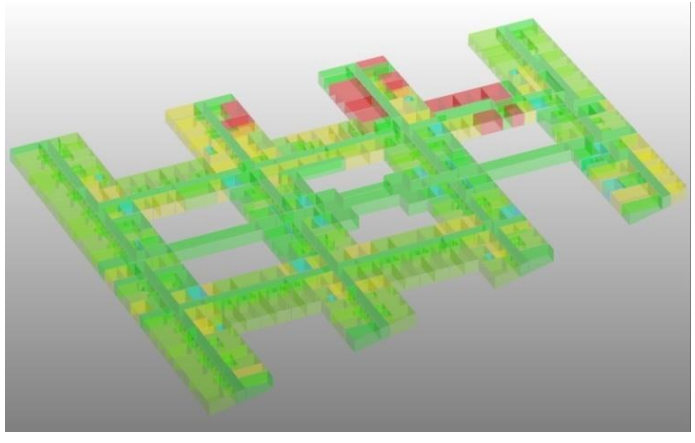
Room data sheets accompanying the planning

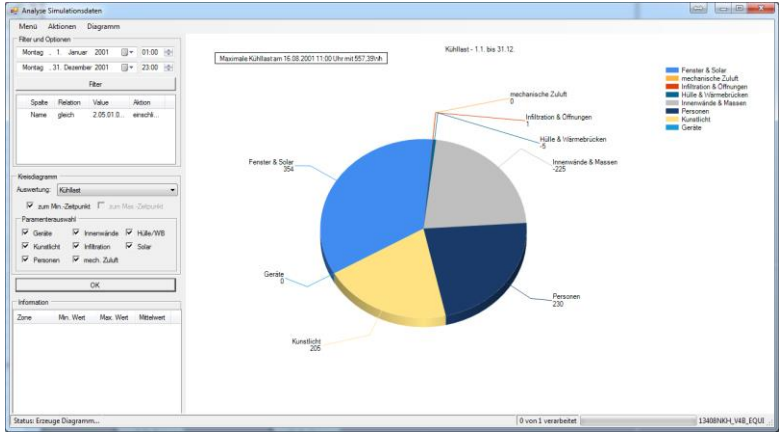
Enter planning results by the responsable Planer (e.g. MEP)

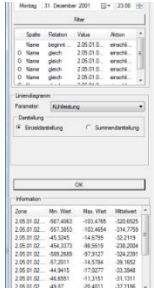
Enter parameters for thermal buliding simulation

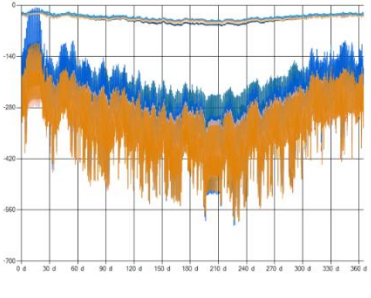
Enter simulation results

Visualising data and results









- Designing the heating and cooling system
- Pipe network analysis based on the anticipated heating and cooling system
- 3D pipe + radiator layout
- IFC export 3D pipe + radiator layout including all properties.

Thank you for your attention!

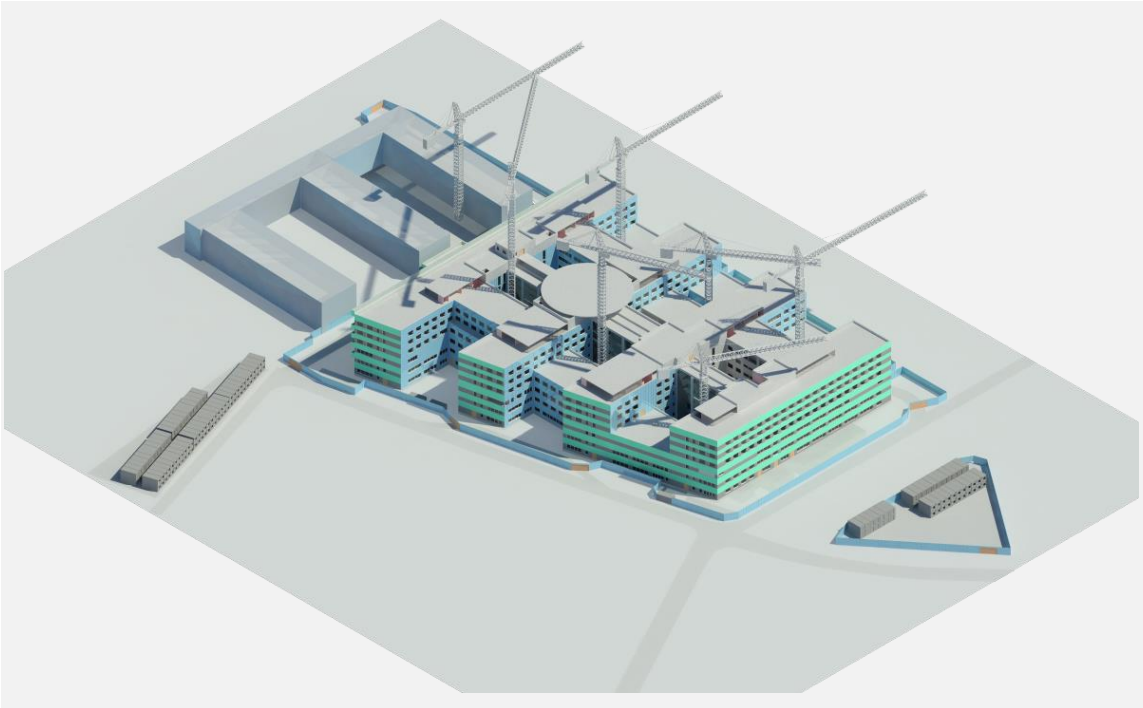
BIM for Estimation

Greef Jan Paul
Team Leader BIM for Estimation
BAM Deutschland AG

Project Hospital Frankfurt Höchst
BIM-Tender Phase

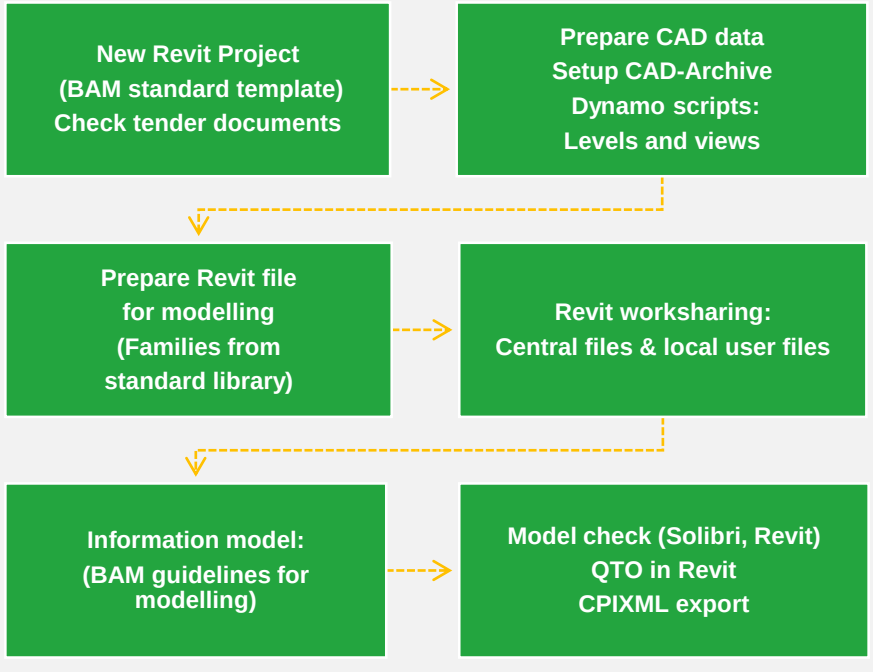
- Project tasks
- Information model in Revit
- QTO & BoQ in iTWO 5D
- Live presentation iTWO 5D

Project Hospital Frankfurt Höchst
Project tasks

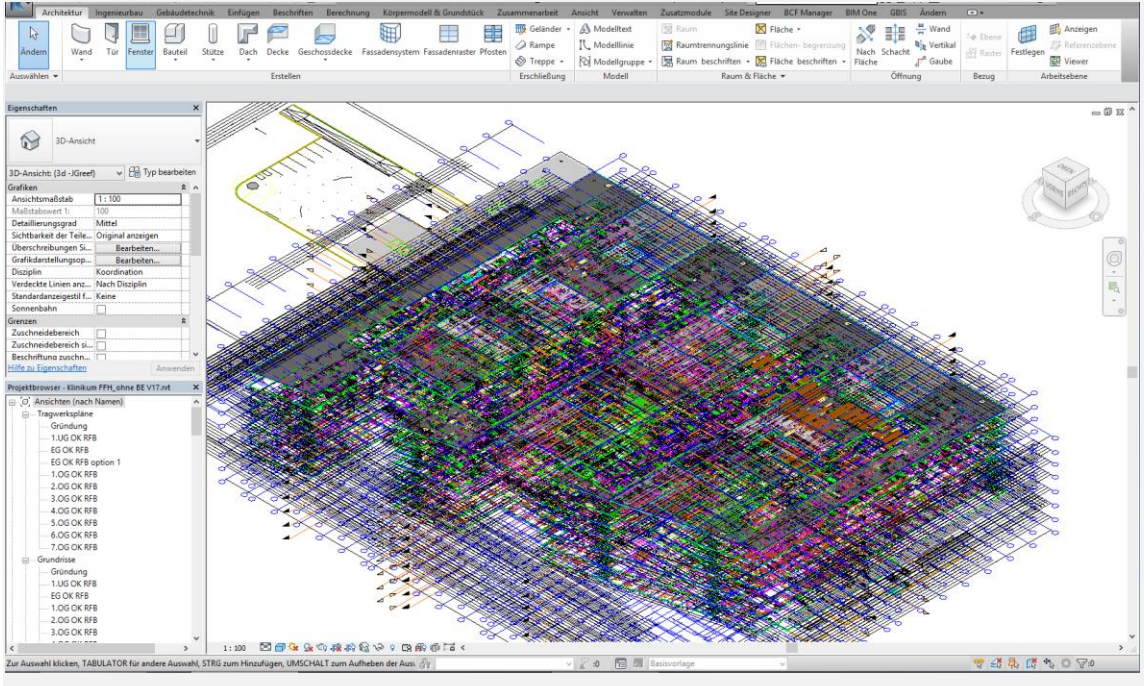


Key figures	
BGF	79.000 m²
BRI	349.000 m³
Length	ca. 143 m
Width	ca. 86-121 m
Height	ca. 33 m
Scope of work	Shell & core, internal walls
Version	2015

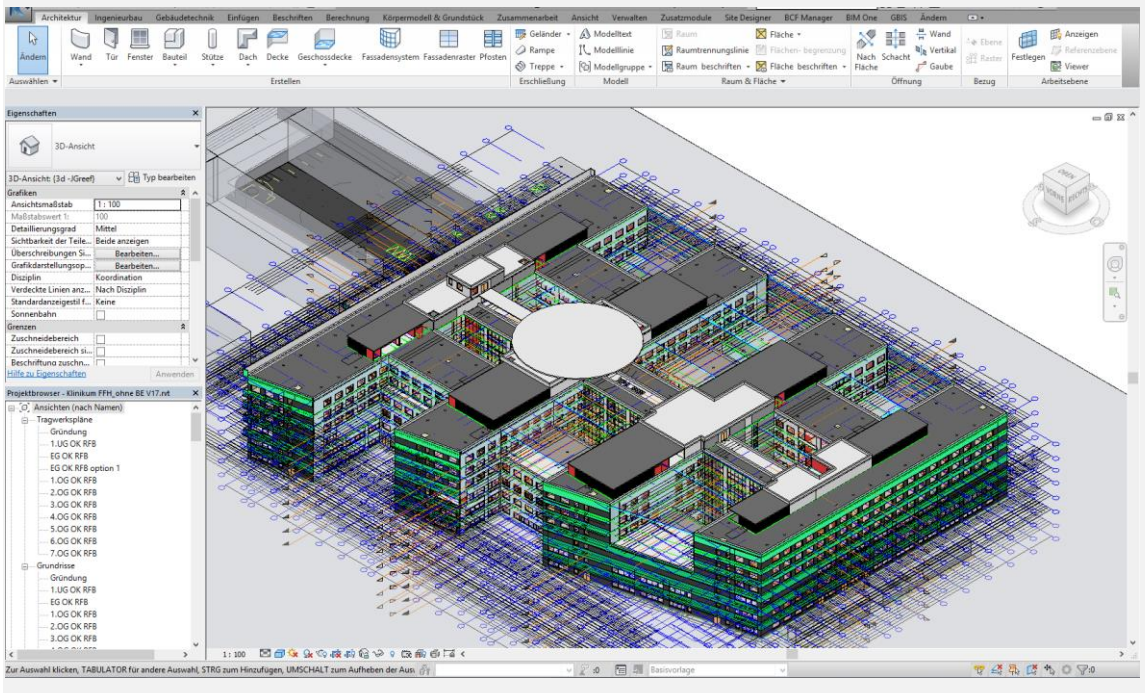
Information model
Workflow Revit modelling



Information model
CAD files and grids in Revit

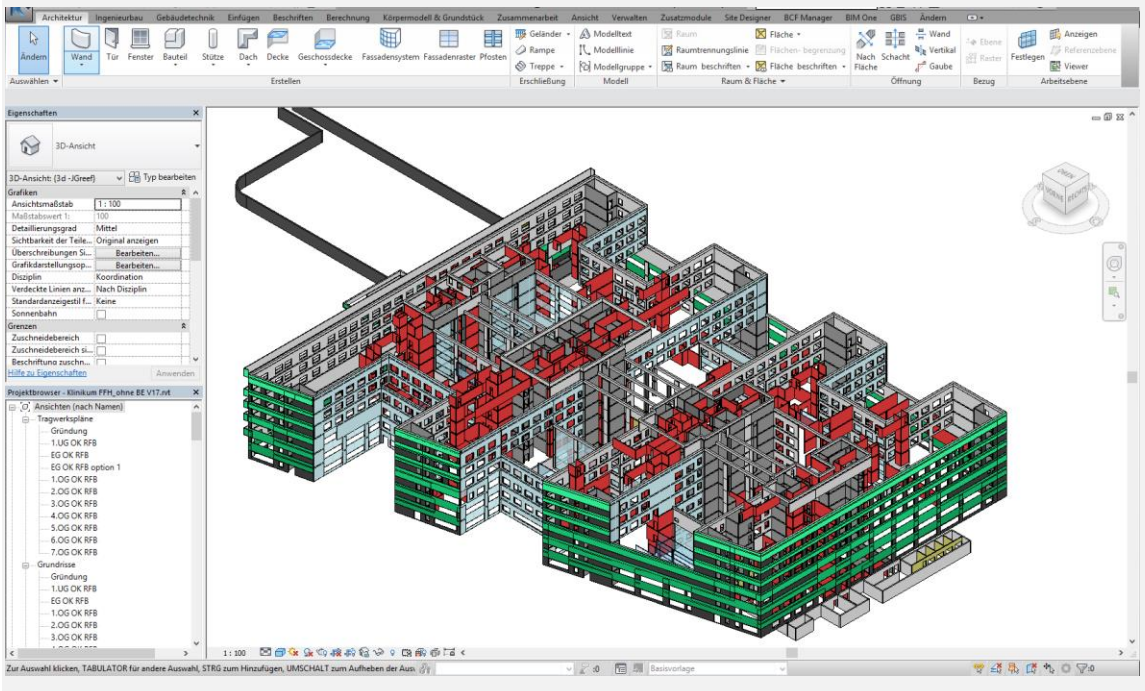


Information model
CAD files and grids in Revit



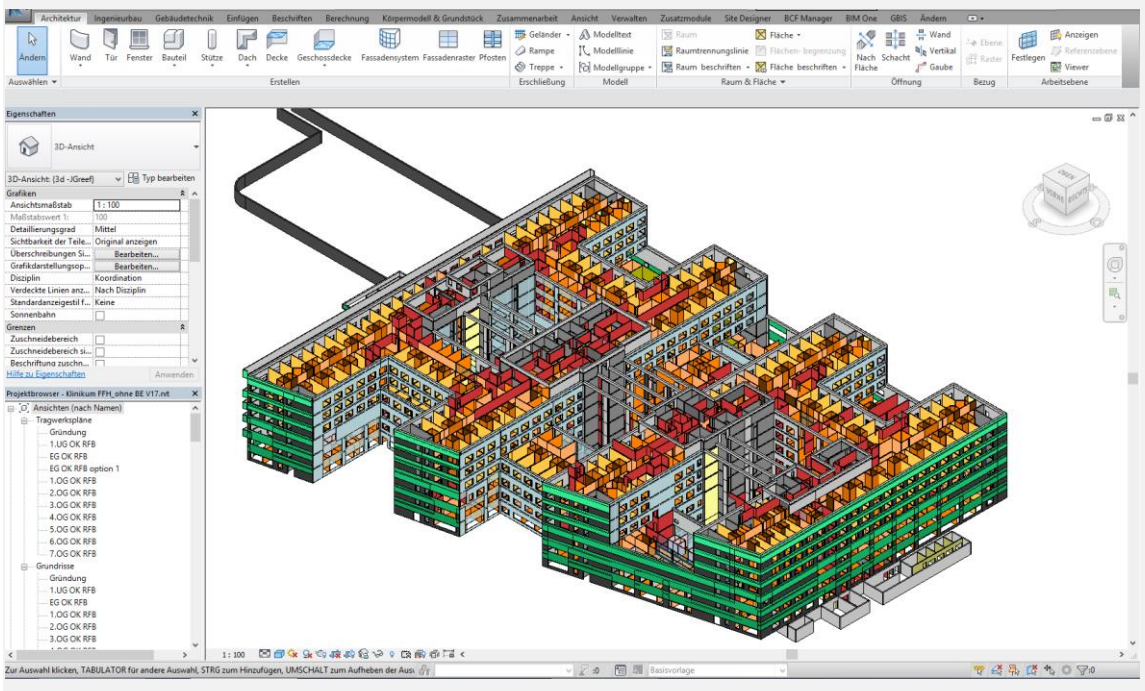
Revit family types
Foundation
Slabs
Walls (concrete, masonry, plasterboard)
Columns
Beams

Information model
Shell & Core + Masonry



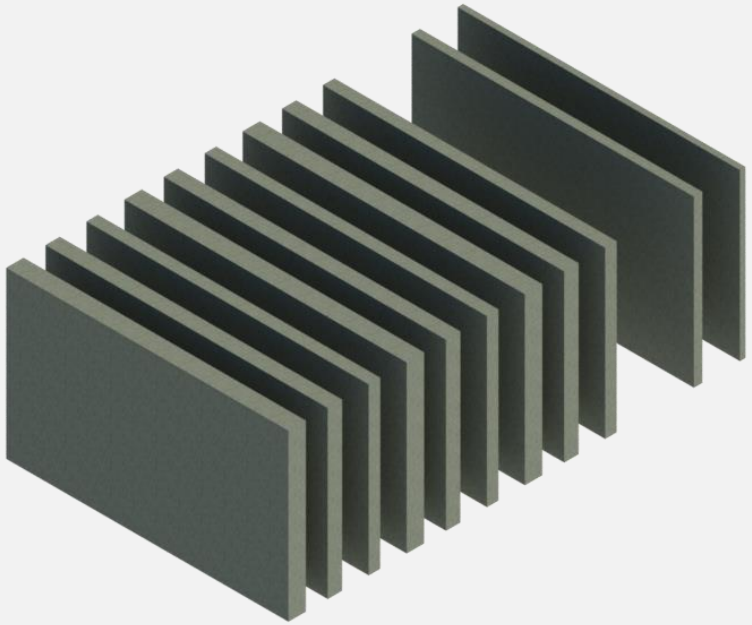
Location	Wall type
External	Concrete walls
External	Concrete core walls
Internal	Concrete walls
Internal	Concrete core walls
Internal	Masonry

Information model
Internal wall types



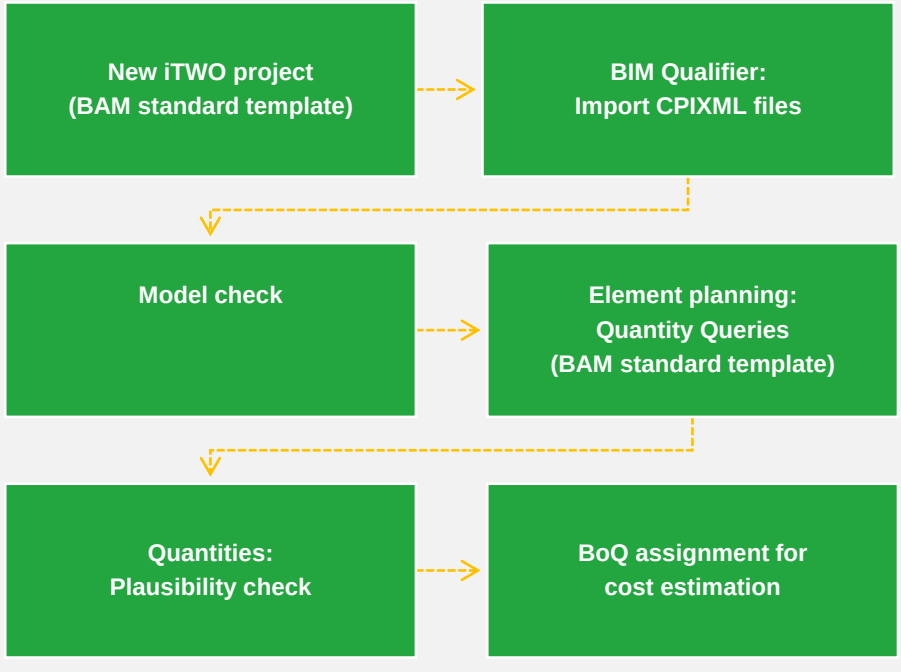
Location	Wall type
Internal	Plasterboard (various wall types)
Internal	Partition walls (various wall types)

Information model
Attributes for structural wall types

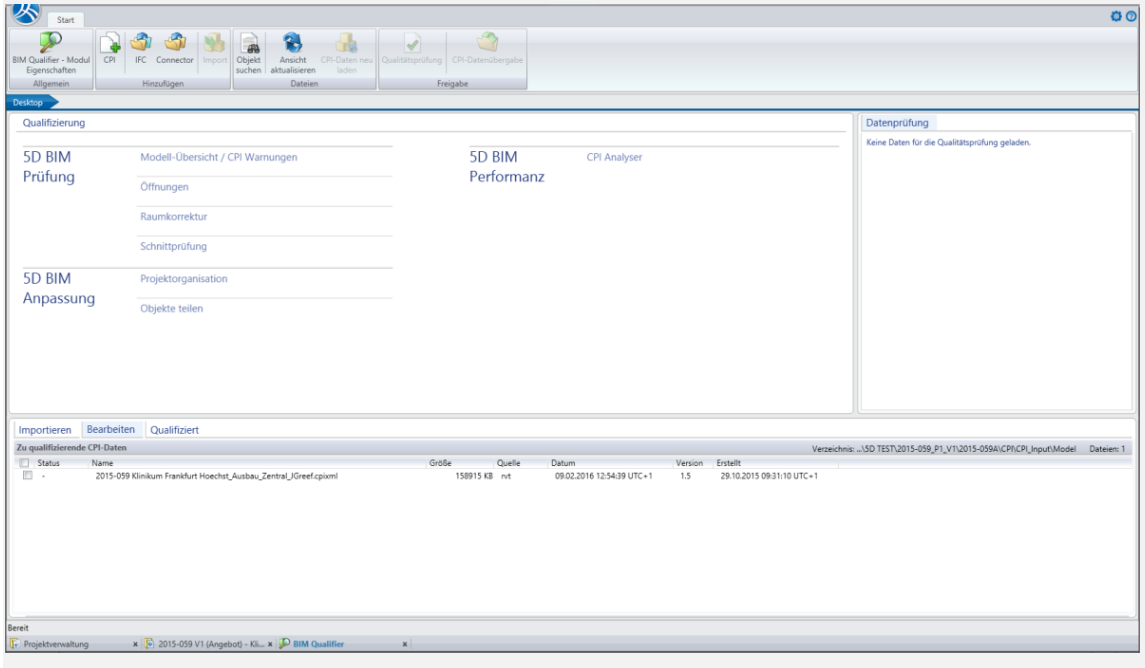


Attribute		Property (example)
Revit	Component	Wall
Revit	Geometry	Length, width, height
BAM	Type	Core wall
BAM	Material	C30/37
BAM	Steel	140 Kg/m³
BAM	Location	External / Internal
BAM	Formwork	Double-sided
BAM	Level	Ground Floor
BAM	Thermal	Fire protection

Quantity take off & Bill of quantity
iTWO workflow

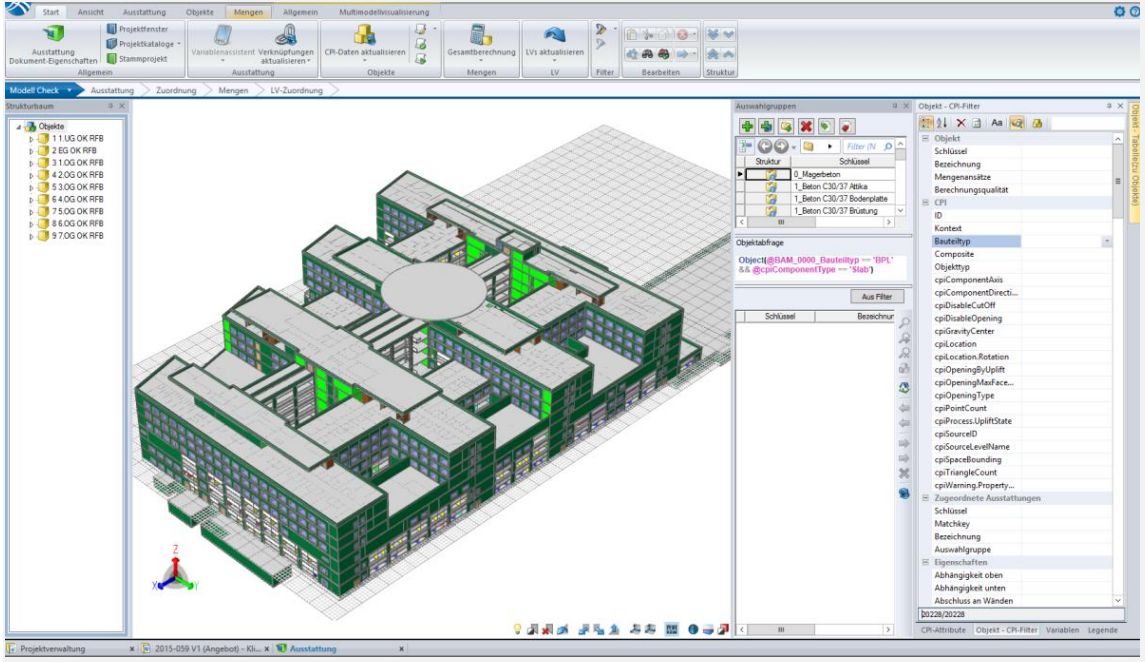


Quantity take off & Bill of quantity in iTWO
BIM Qualifier



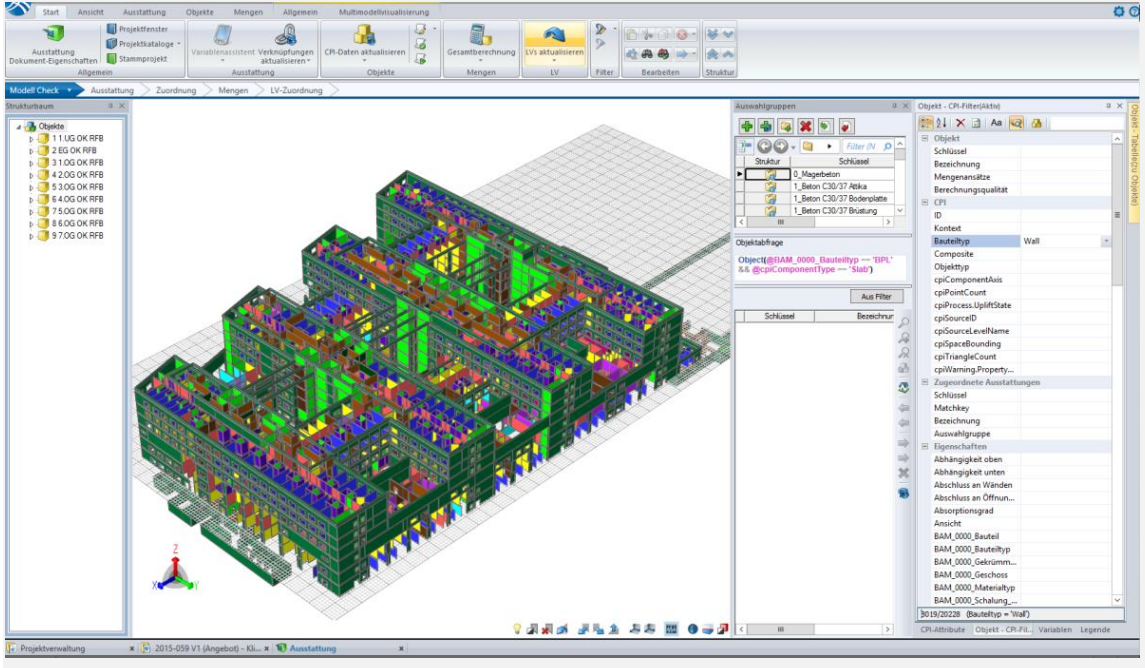
iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

Quantity take off & Bill of quantity in iTWO
Model check



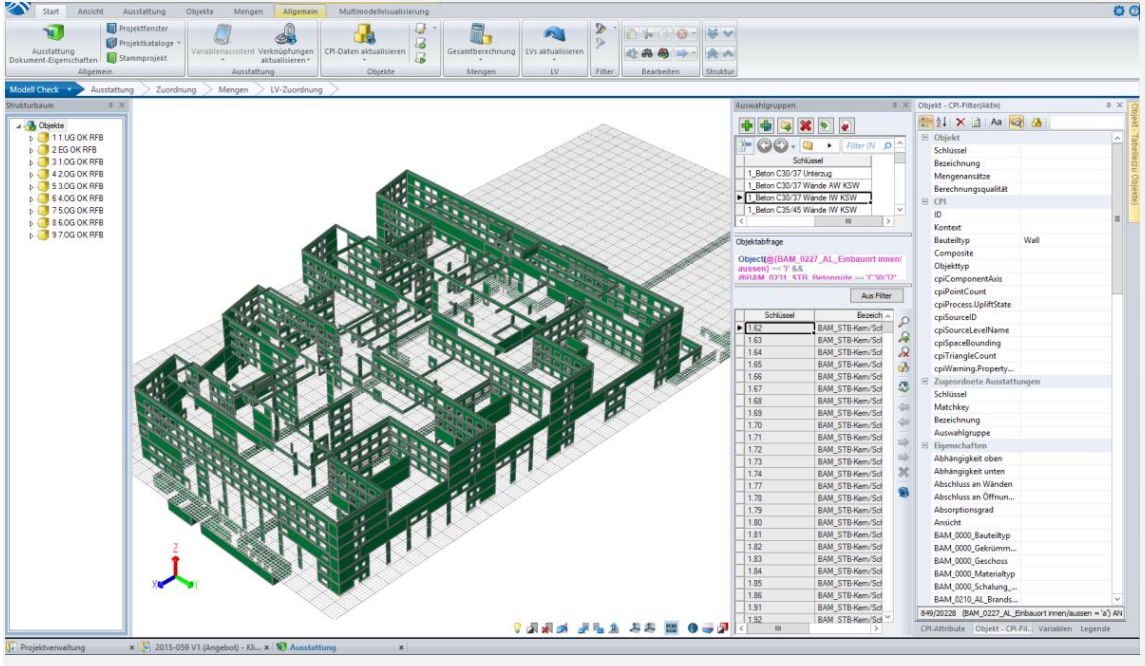
iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

Quantity take off & Bill of quantity in iTWO
Model check



iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

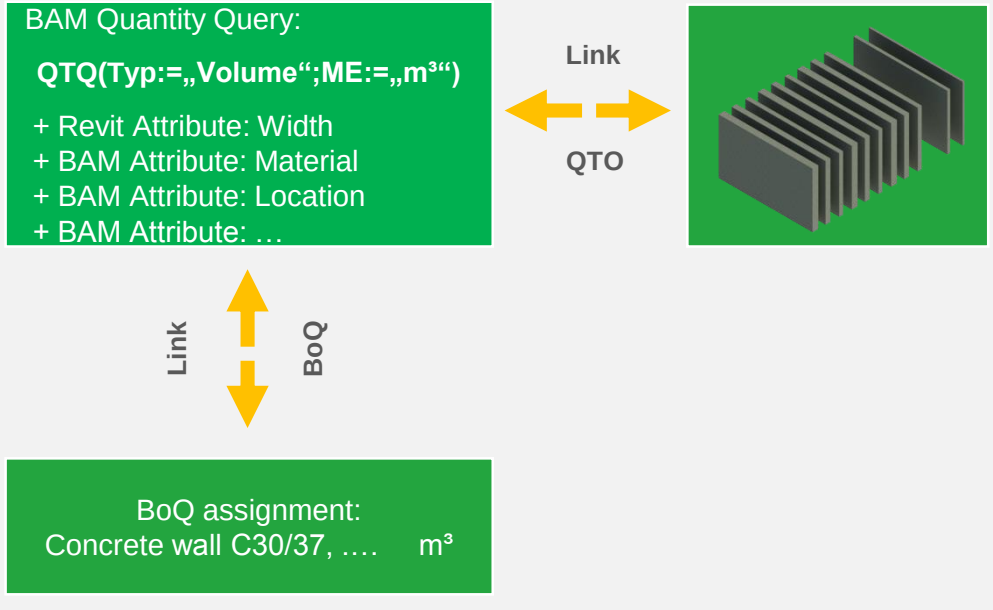
Quantity take off & Bill of quantity in iTWO
Model check



iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

Quantity take off & Bill of quantity in iTWO

Element planning: Quantity Queries



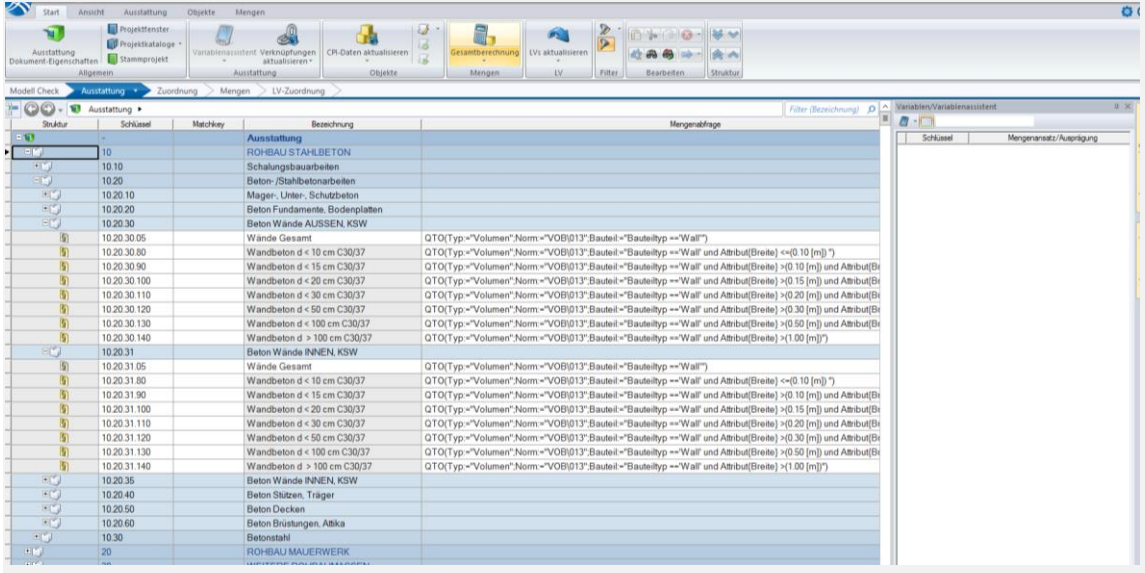
Basic iTWO Query: QTO(Type:="Attribute{Volume}")

Function | Parameter Key | Parameter | Parameter Value

iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

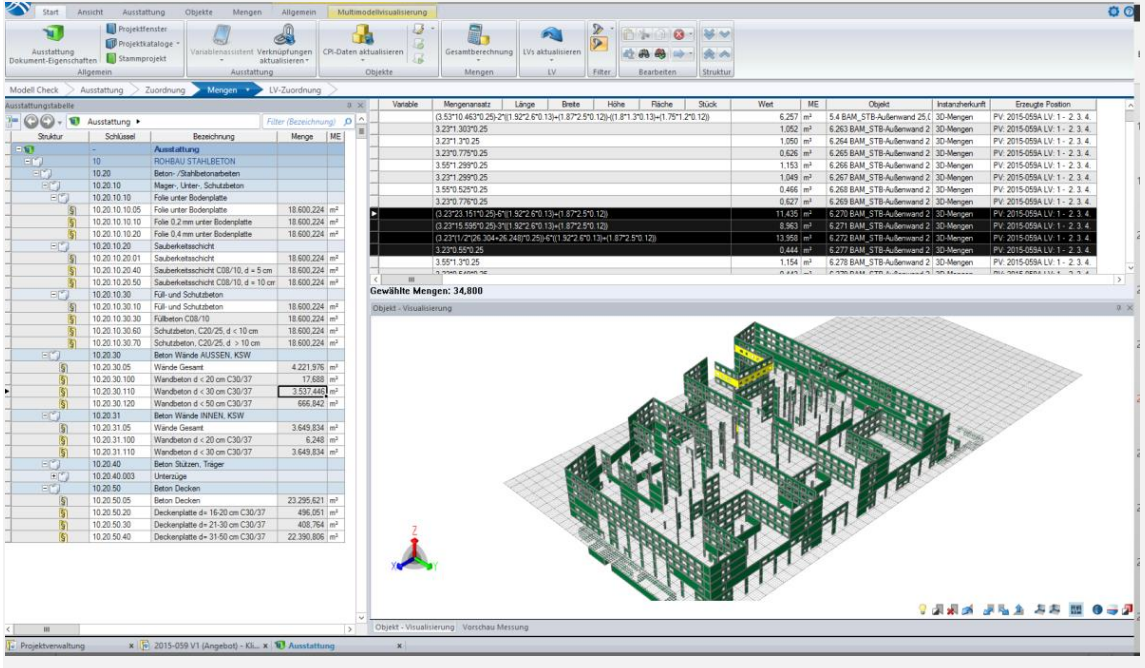
Quantity take off & Bill of quantity in iTWO

Element planning: Quantity Queries



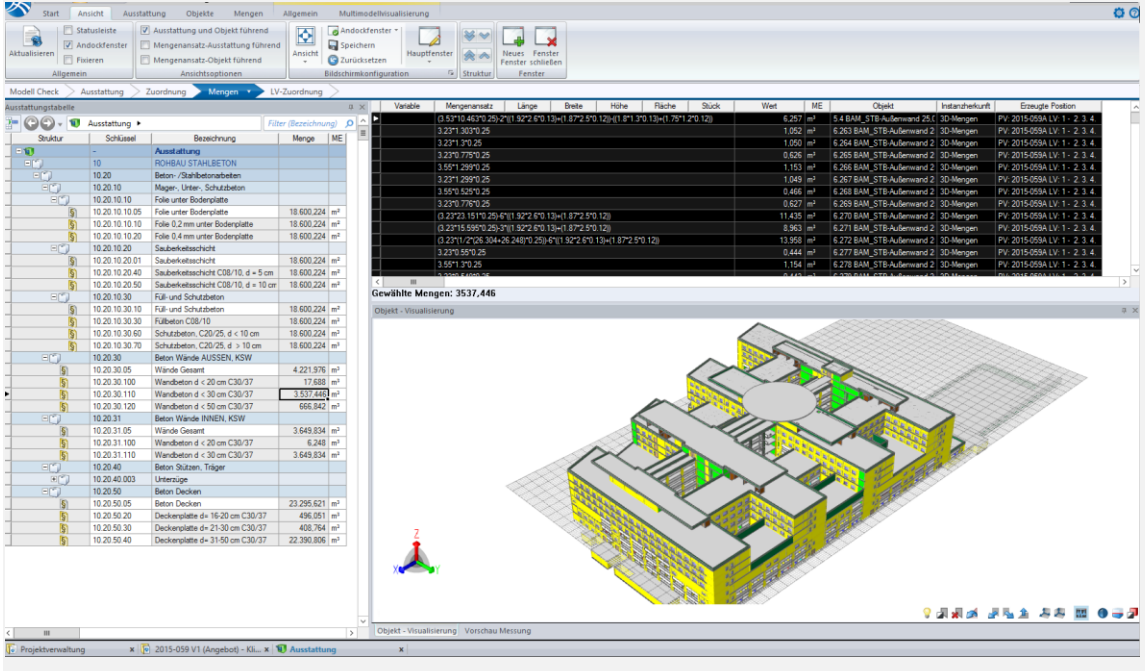
iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

Quantity take off & Bill of quantity in iTWO
Quantities



iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

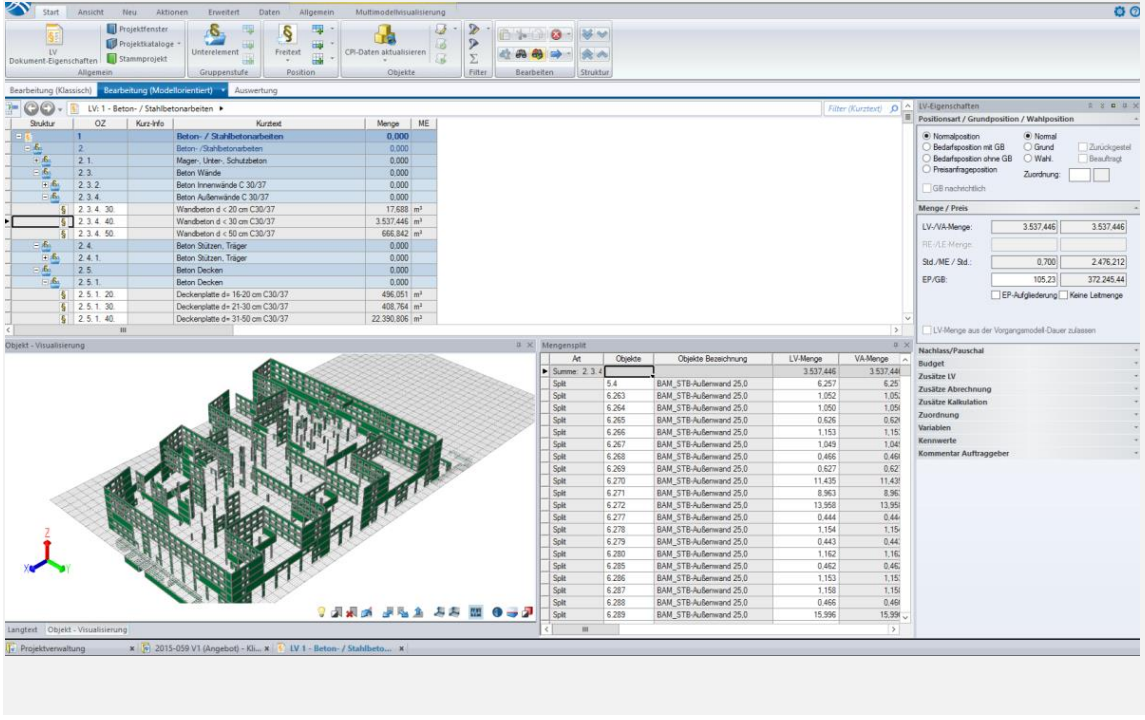
Quantity take off & Bill of quantity in iTWO
Quantities



iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

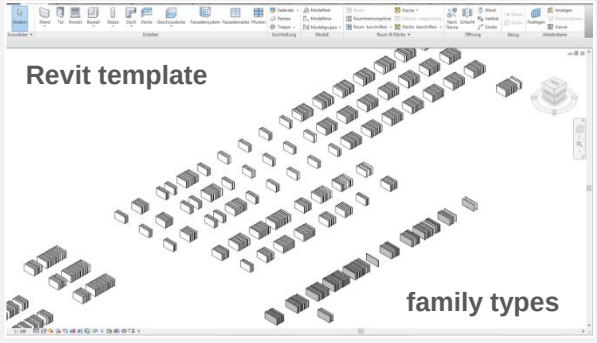
Quantity take off & Bill of quantity in iTWO

Bill of quantities

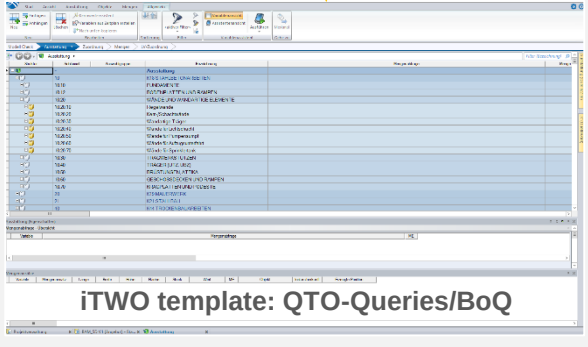


iTWO workflow	
Step 01	BIM Qualifier
Step 02	Model check
Step 03	Quantity Queries
Step 04	Quantity take off
Step 05	Bill of quantity

Standard libraries & Guidelines
BAM standards



BAM attributes



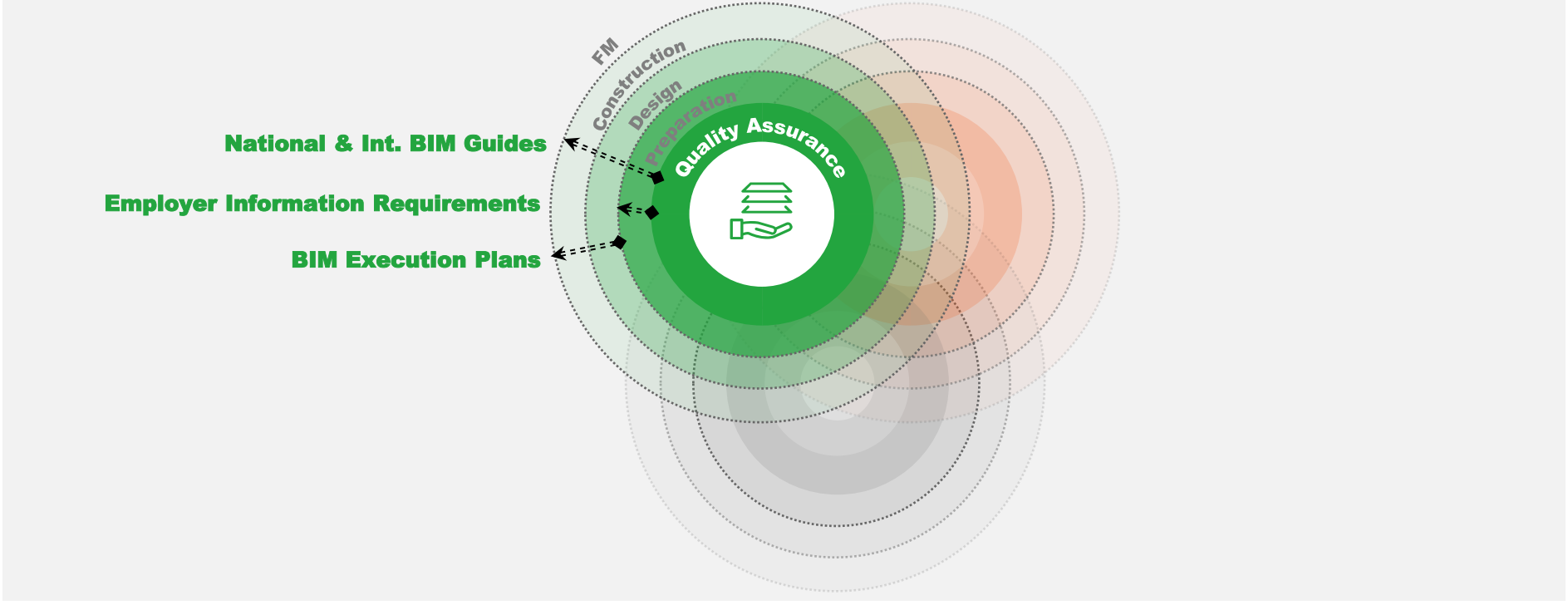
Guidelines

BIM Management & Coordination

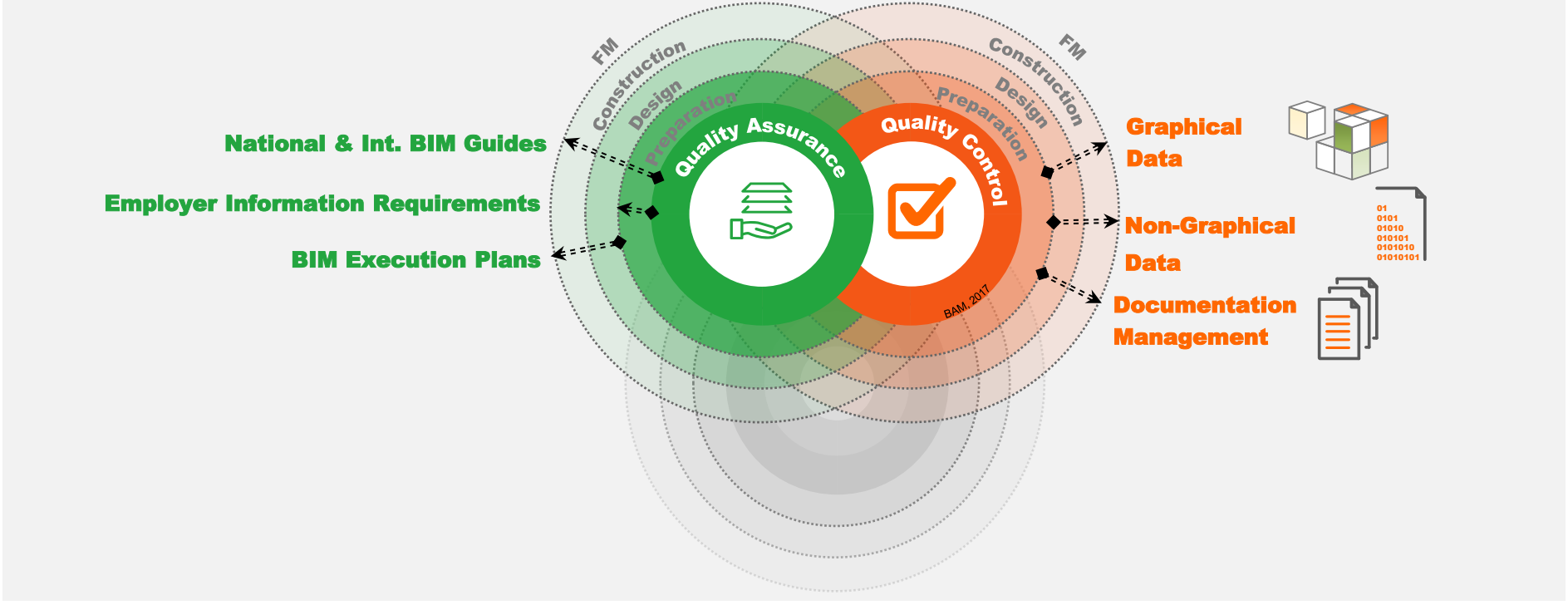
Samir Alzeer
Information Manager – BAM Deutschland AG

Naveed Zargar
BIM Coordinator – BAM Deutschland AG

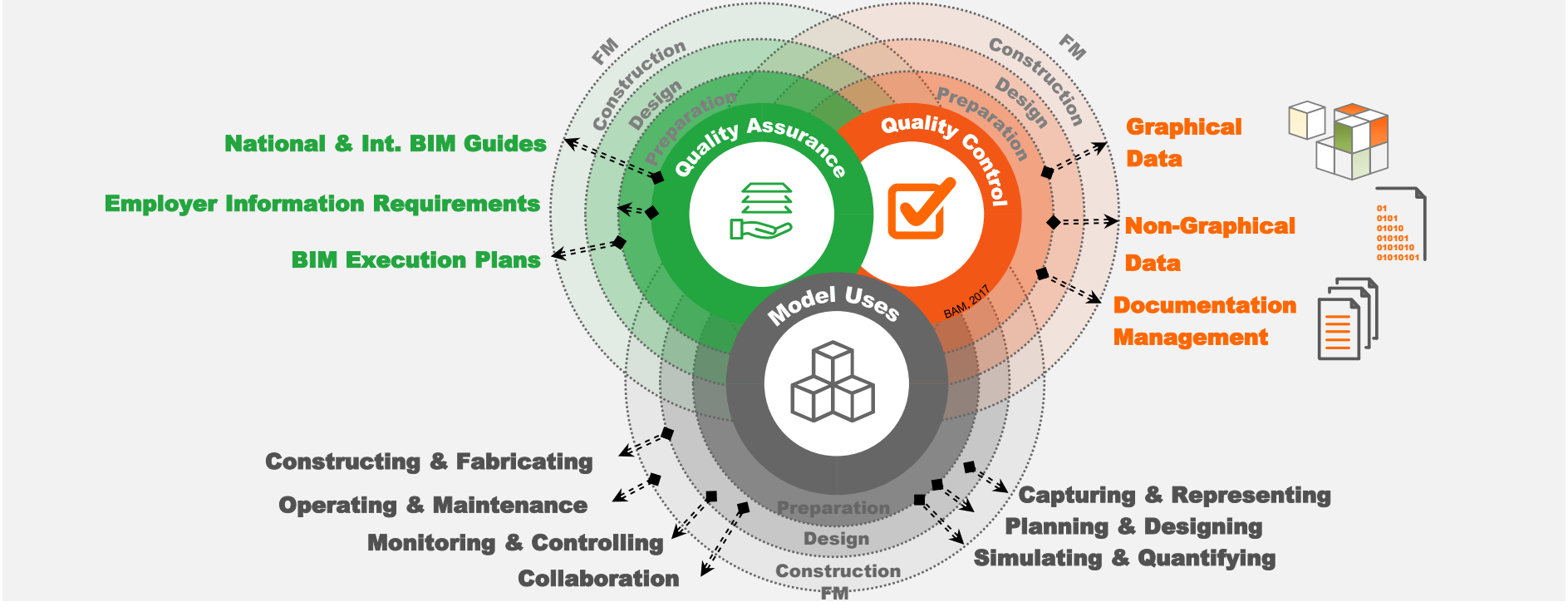
BIM Management & Coordination



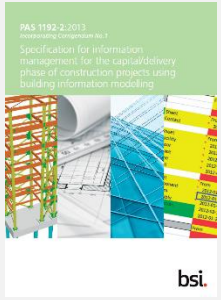
BIM Management & Coordination



BIM Management & Coordination



Quality Assurance
BIM Policy



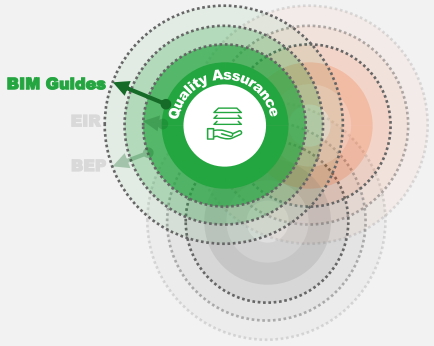
PAS1192-2:2013

ISO/DIS 19650

DIN EN ISO 19650

RICHTLINIE VDI 2552 "BUILDING INFORMATION MODELING (BIM)

BUILDINGSMART INTERNATIONAL

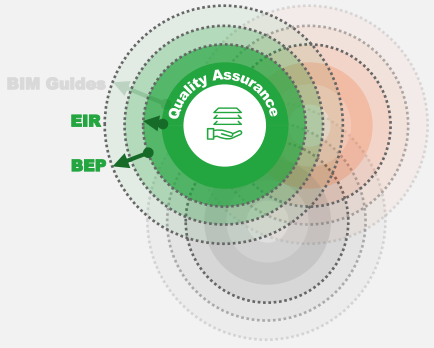


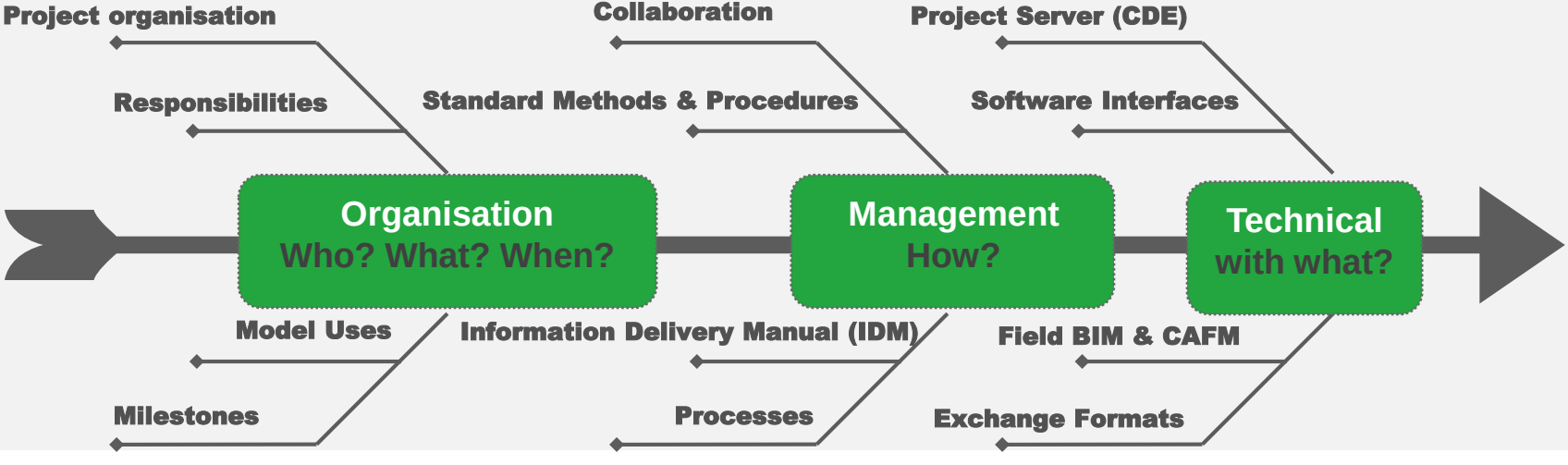
Standards

Boost

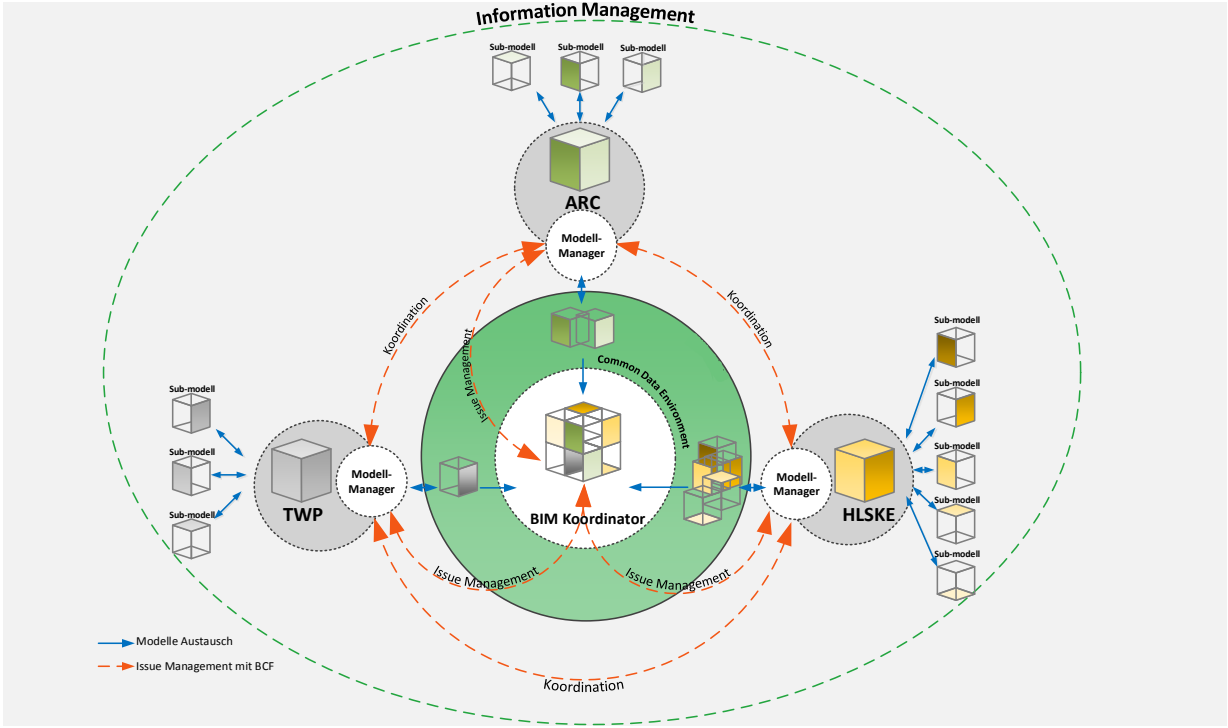
BIM

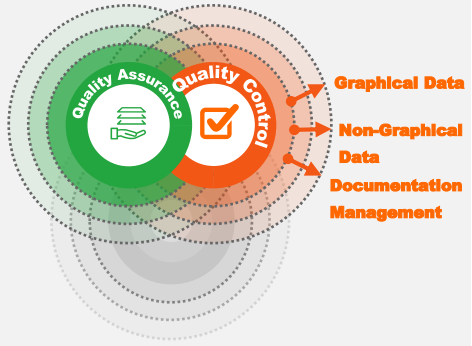
Quality Assurance
BIM Execution Plan



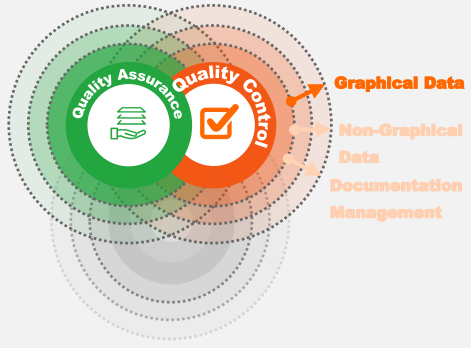


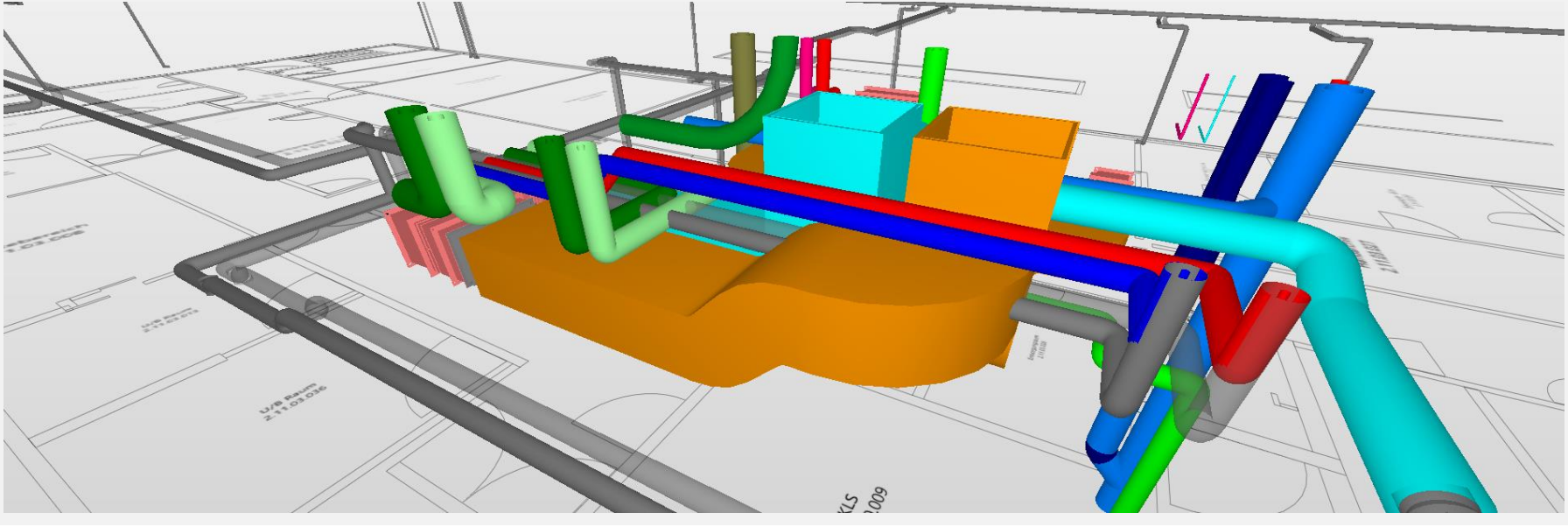
Model based Coordination





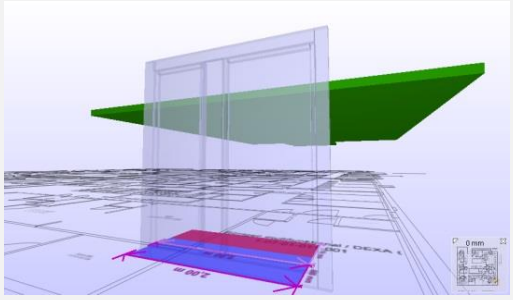
Graphical Data approval
Physical clashes (Hard Clashes)



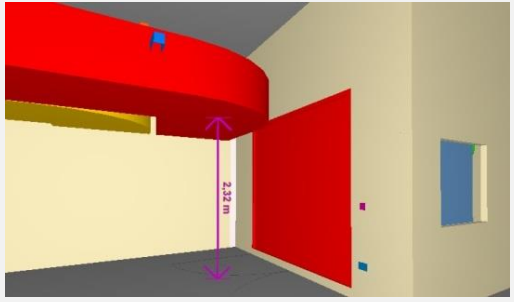


Graphical Data approval

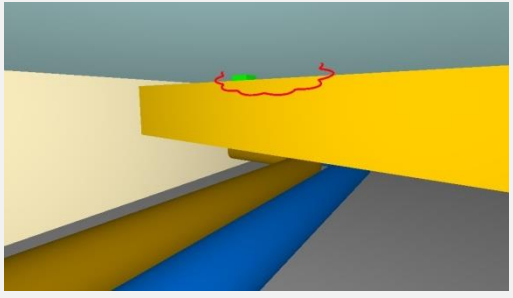
Non-Physical clashes (Functional clashes)



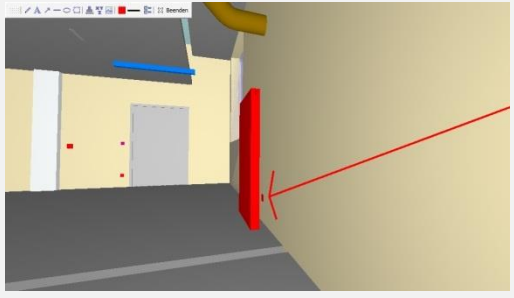
- Clear space in front of windows



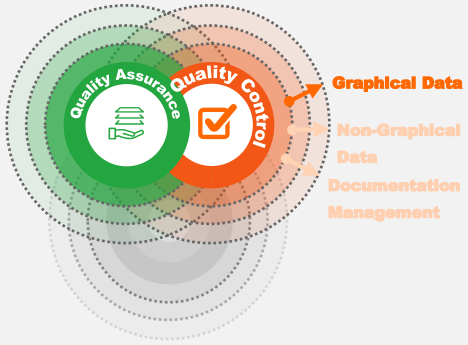
- Clear Space in front of doors

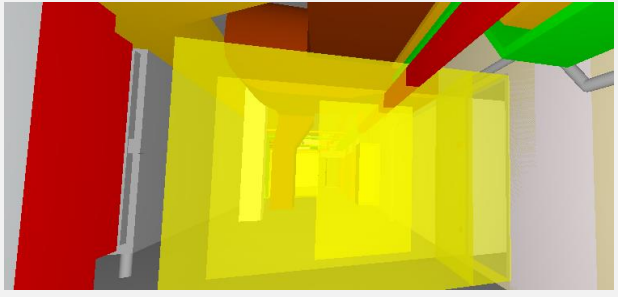


- Accessibility to fire alarms



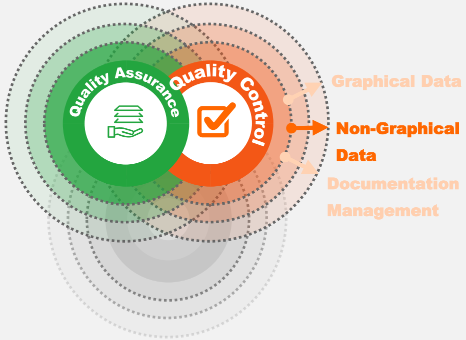
- Clear space in front of sockets

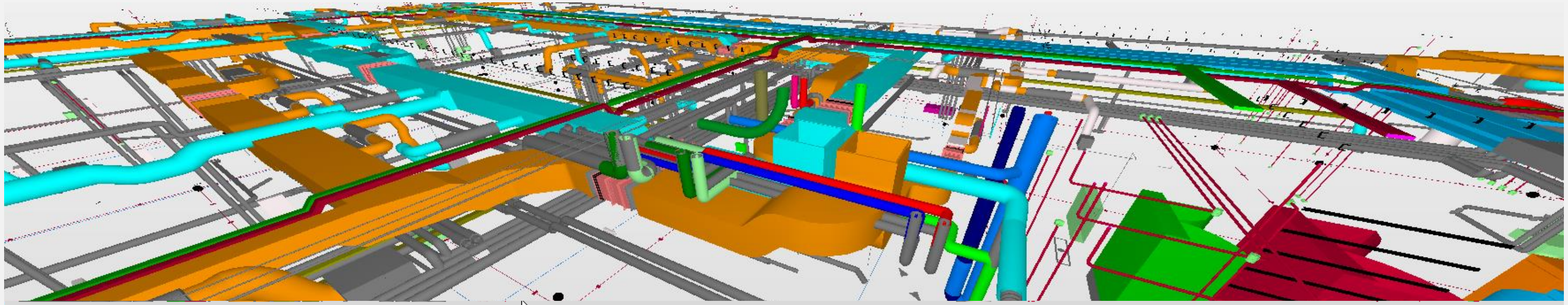




- Exit routes vs. MEP

Non-Graphical Data
Information approval

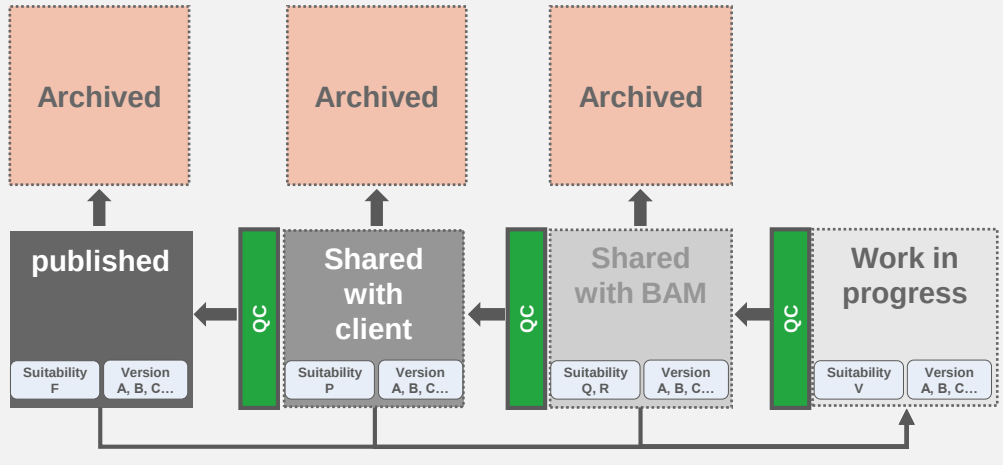


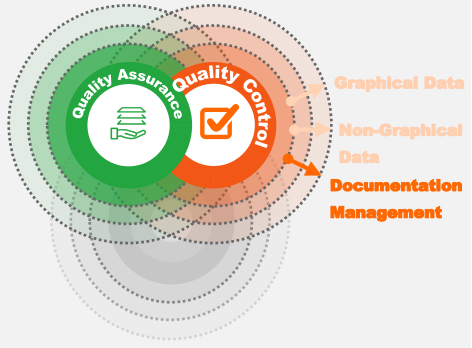


AUSWERTUNG — Alle auswerten — KFH_Durchflussanschlue... — Bericht

Disziplin	System	Komponente Typ	Typ	Volumen	Fläche	Breite Begrenzungsrahmen	Höhe Begrenzungsrahmen	Länge Begrenzungsrahmen	Pset Plancal nova - MEP.Tech-Insulation surface (m2)	Zahl
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	30 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	40 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	40 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	45 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	50 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	50 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	50 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	50 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	50 mm	159 mm		1
Lüftung	(EG08) System.b....	Durchflusselement		1 l		159 mm	50 mm	159 mm		1

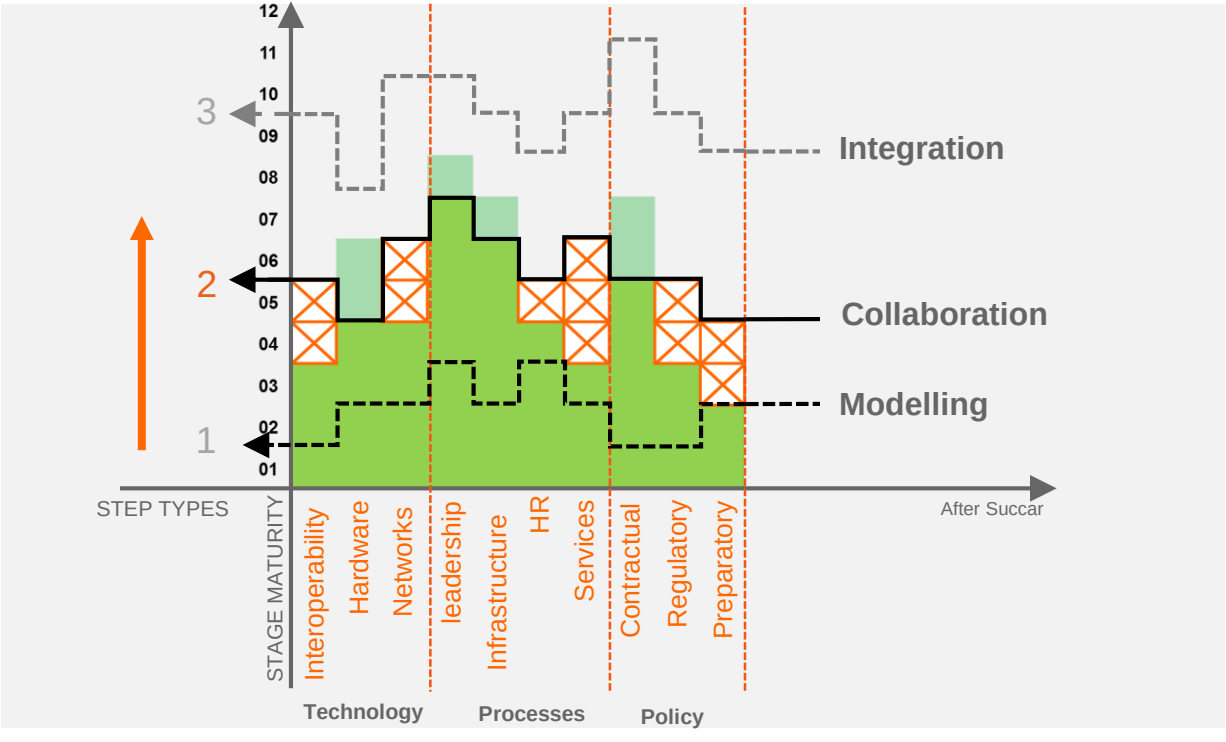
Documentation Management
Common Data Environment

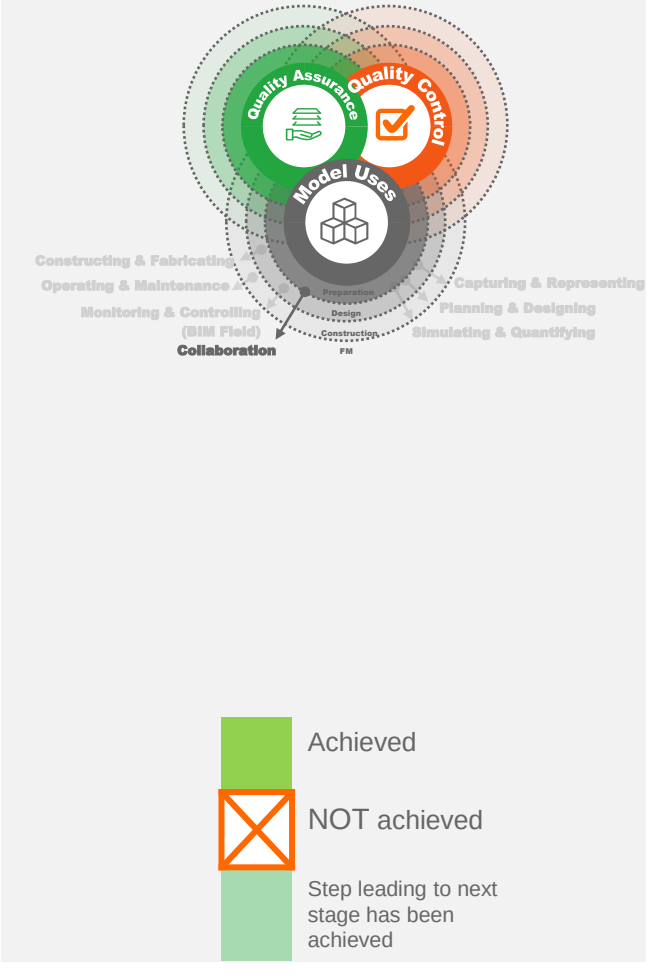




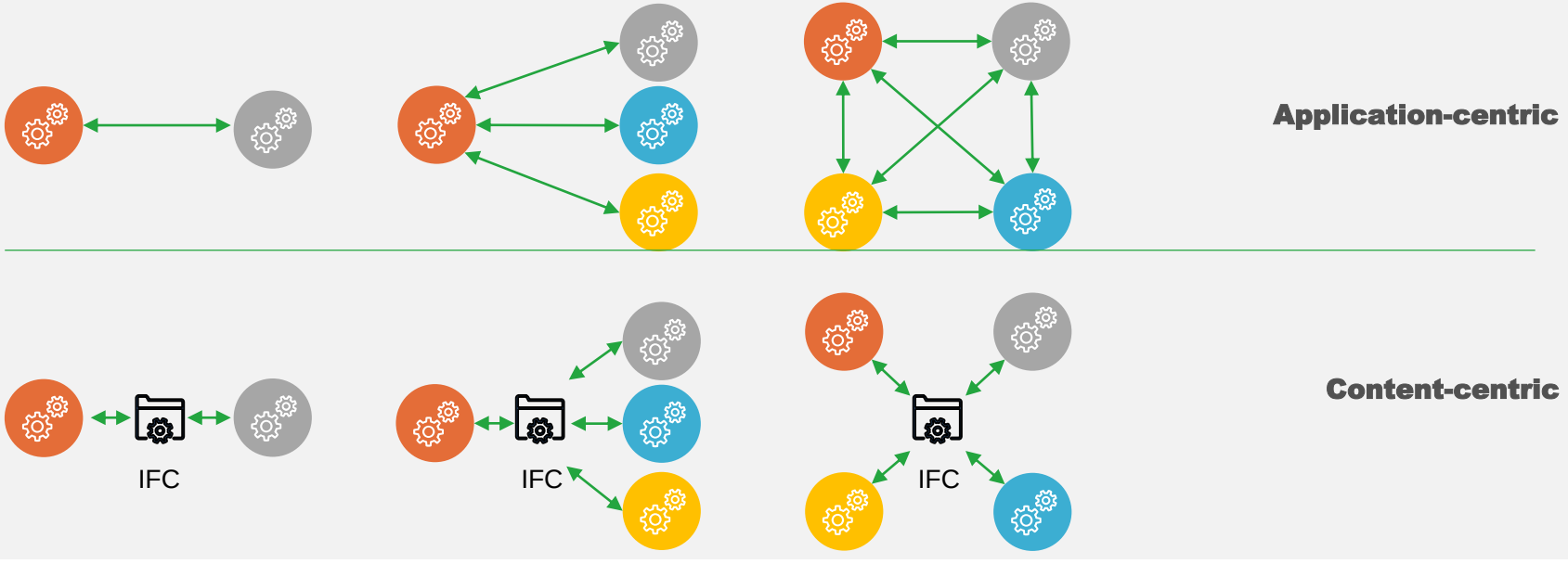
Suitability codes	Description
V	Work in progress
Q	Suitable for internal review and comment
R	Approved by BAM
P	Suitable for approval by client
F	Approved by client

Challenges

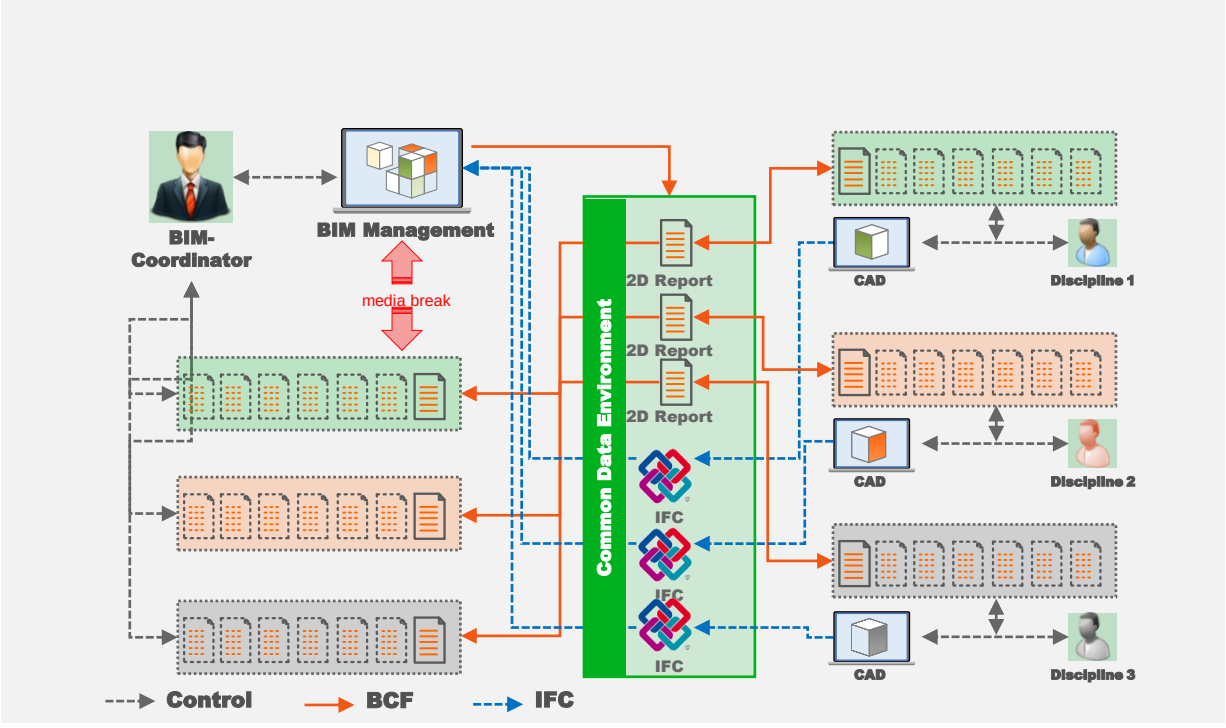

12
11
10
09
08
07
06
05
04
03
02
01
3
2
1
Integration
Collaboration
Modelling
STEP TYPES
STAGE MATURITY
Interoperability
Hardware
Networks
leadership
Infrastructure
HR
Services
Contractual
Regulatory
Preparatory
After Succar
Technology
Processes
Policy

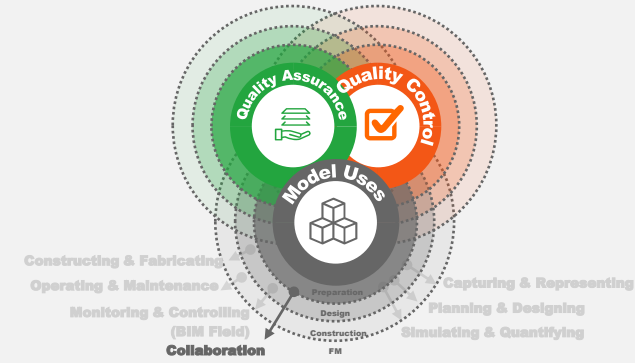

Quality Assurance
Quality Control
Model Uses
Constructing & Fabricating
Operating & Maintenance
Monitoring & Controlling
(BIM Field)
Collaboration
Preparation
Design
Construction
FM
Capturing & Representing
Planning & Designing
Simulating & Quantifying
Achieved
NOT achieved
Step leading to next stage has been achieved

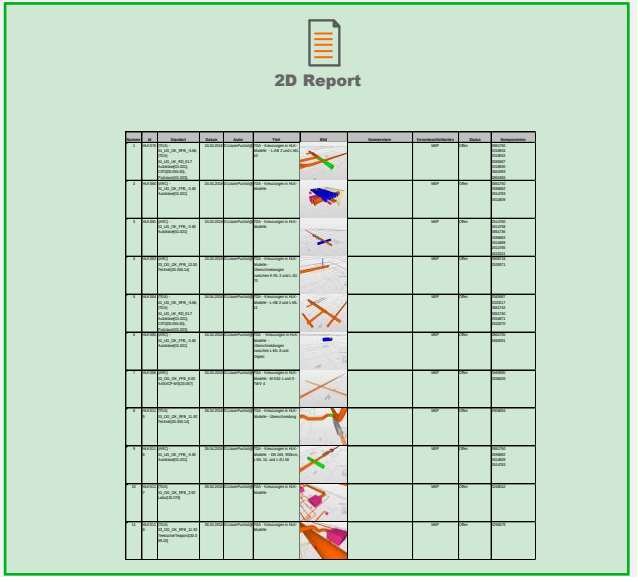
Collaboration



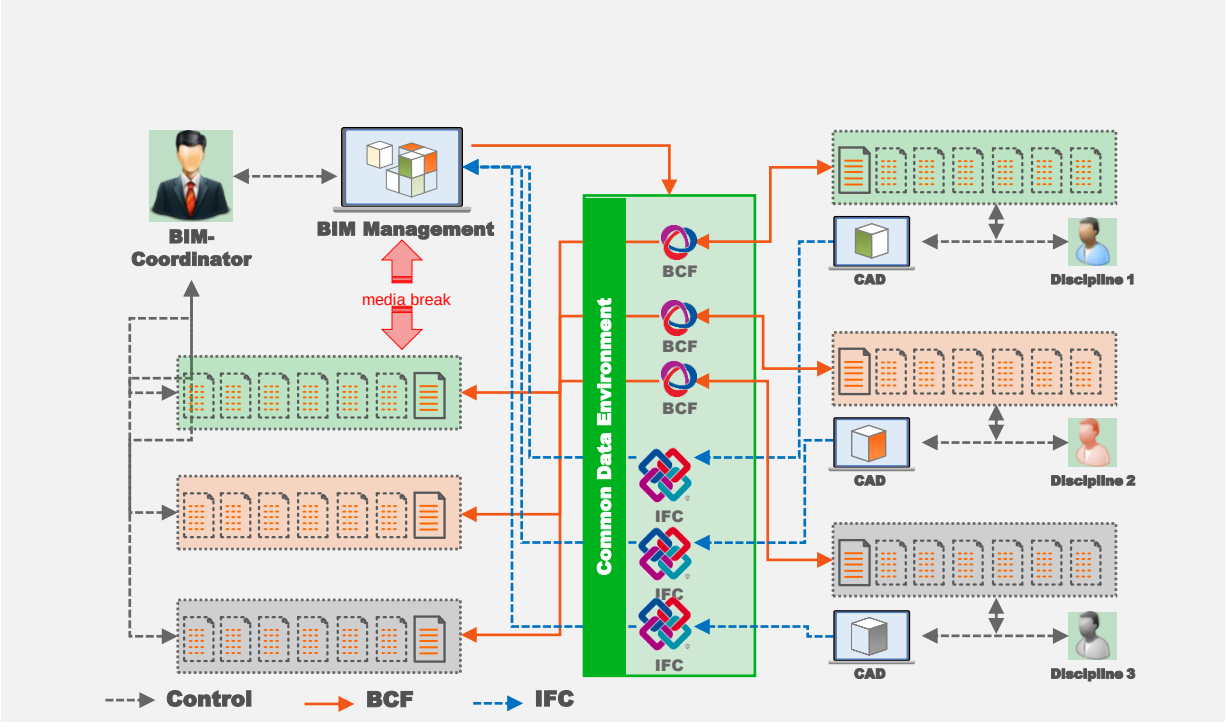
Issue Management with 2D reports

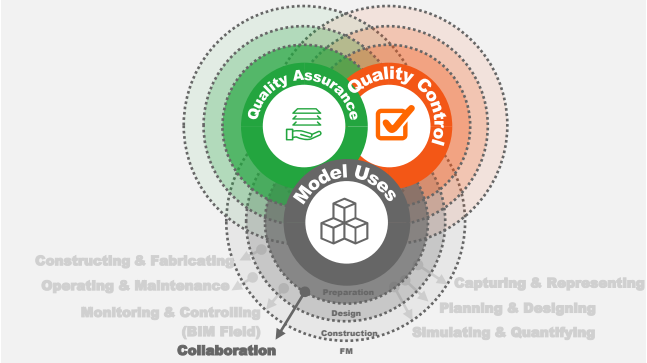


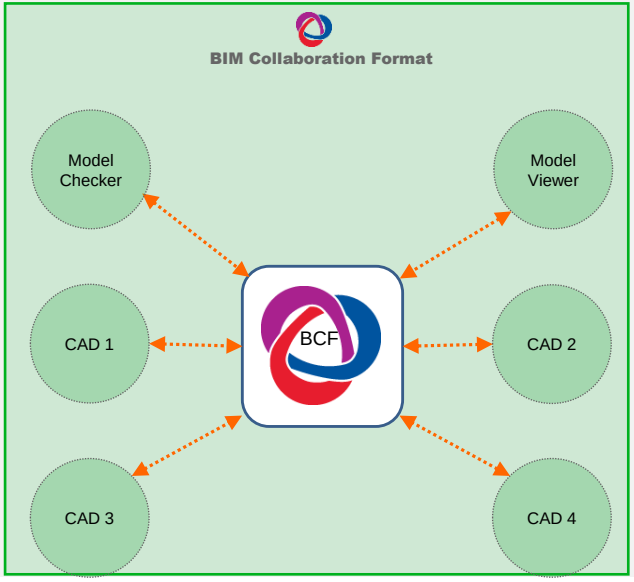




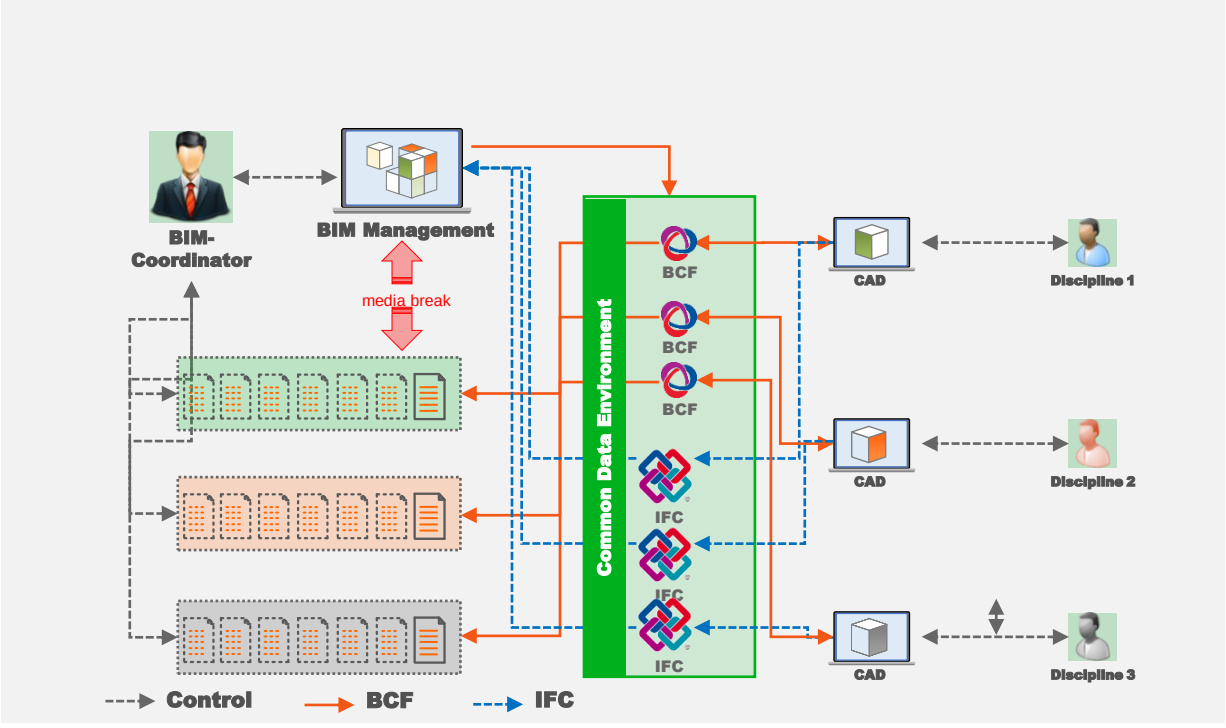
Issue Management with BCF

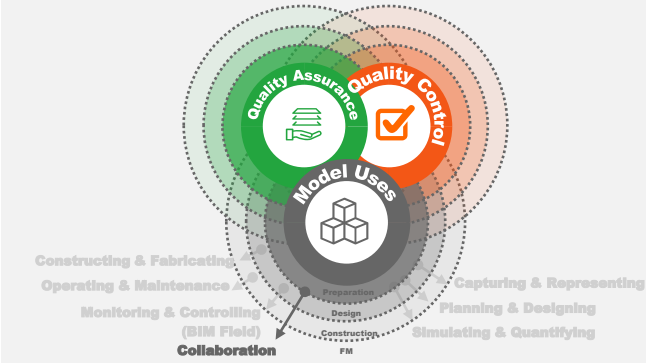


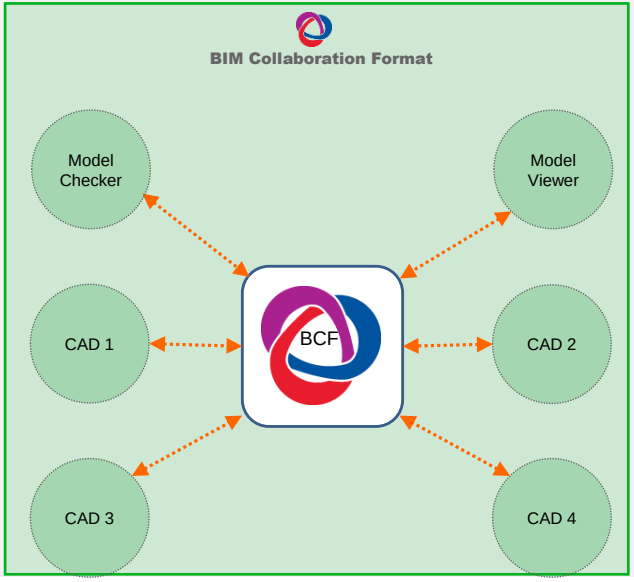




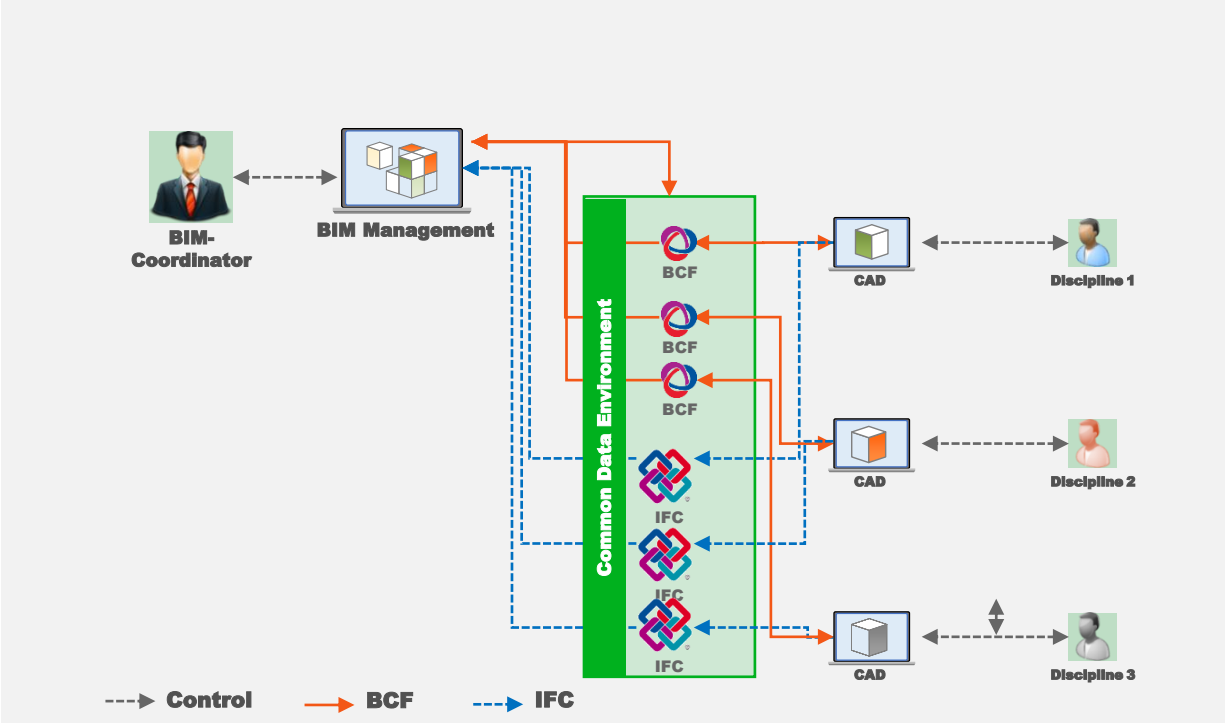
Issue Management with BCF

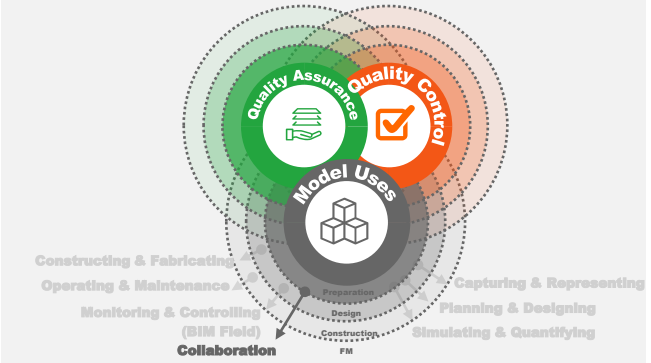


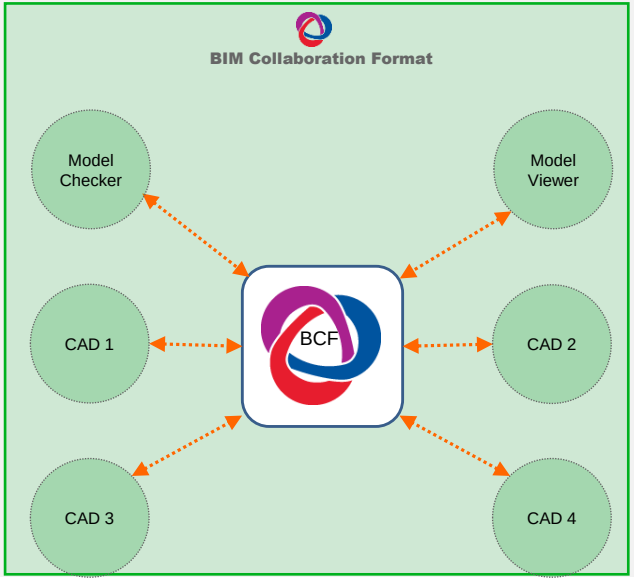




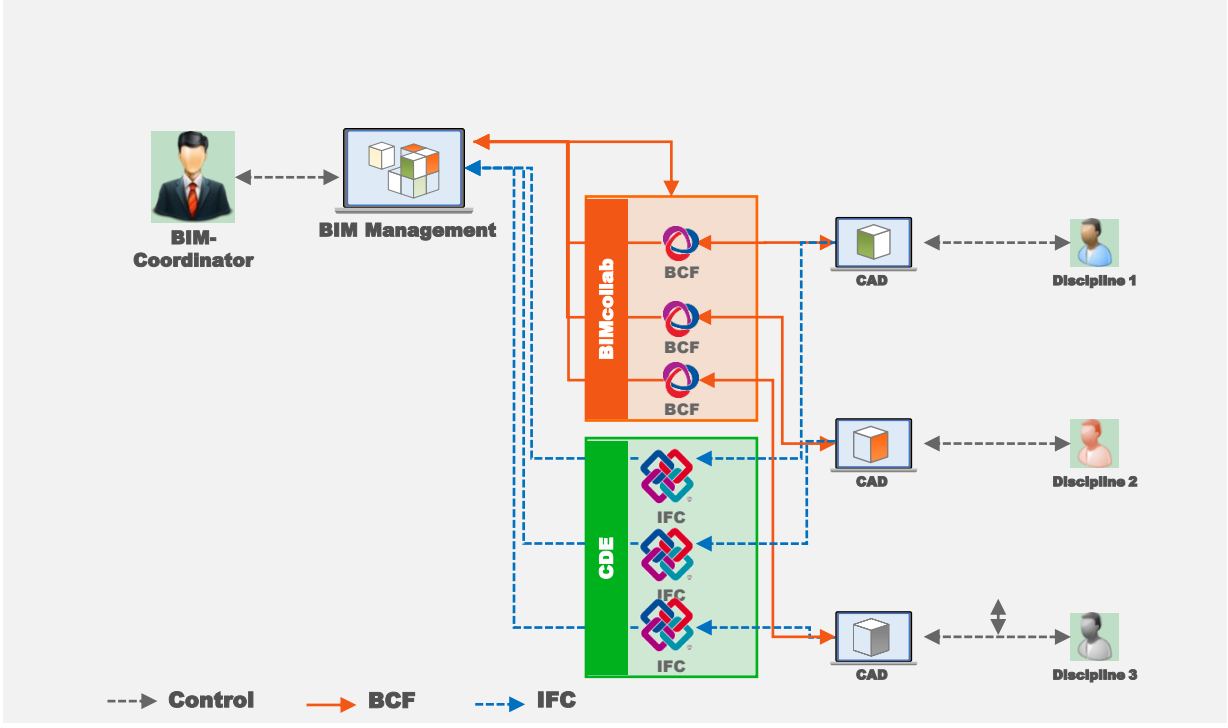
Issue Management with BCF

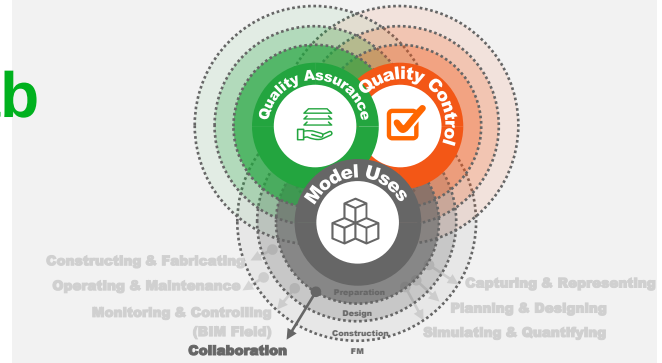


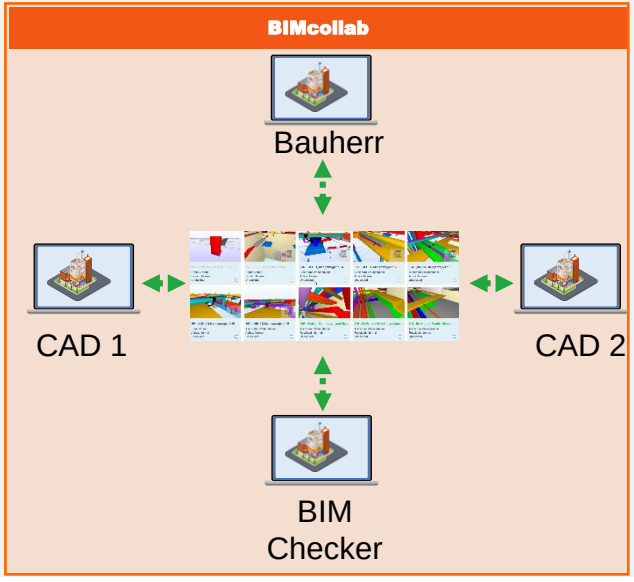




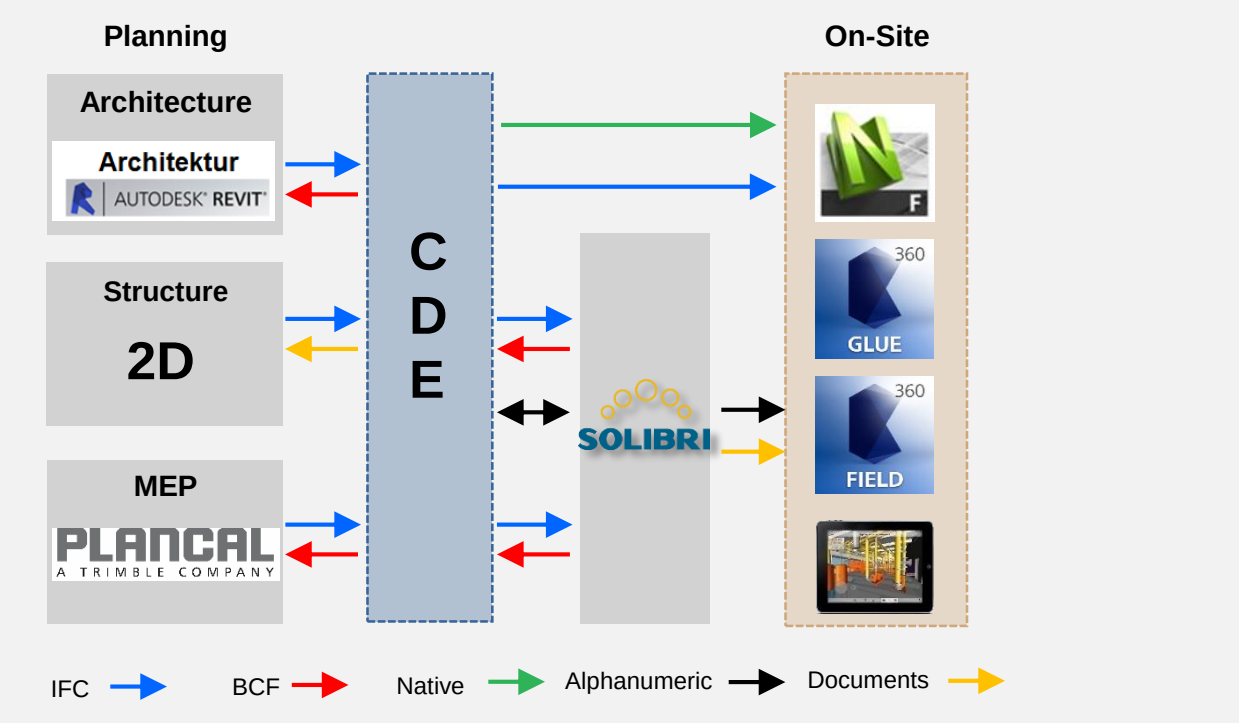
Issue Management with BCF & BIMCollab





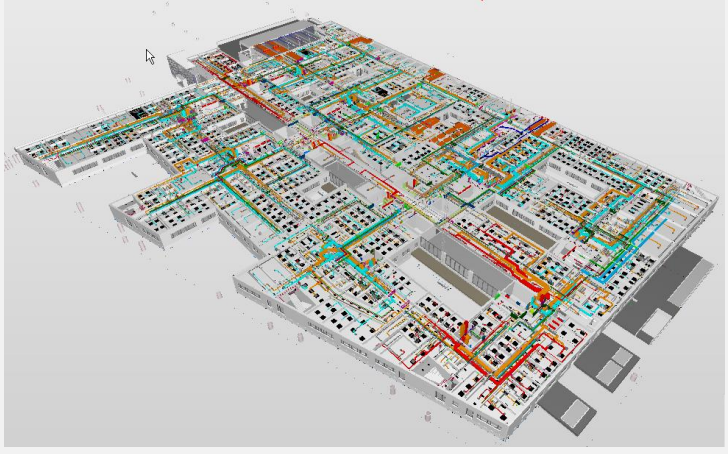


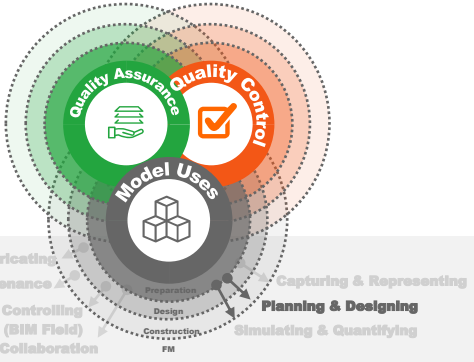
Information Exchange Workflow



- Poolarserver used as project common data environment (CDE)

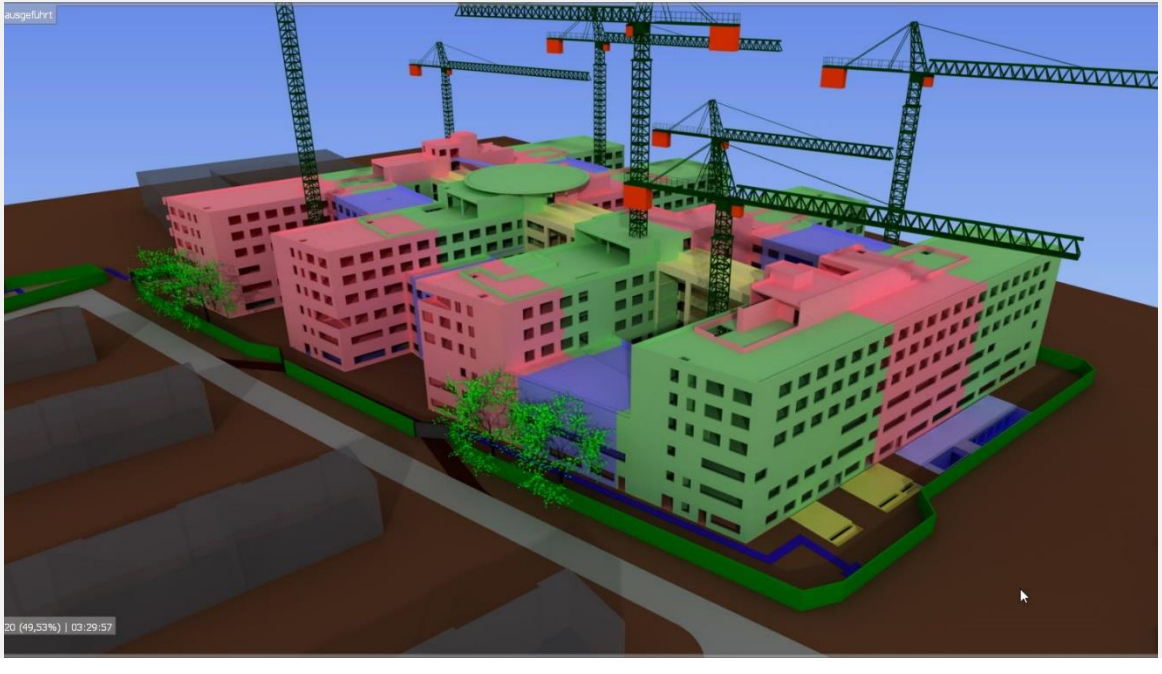
Volume Allocation Strategy

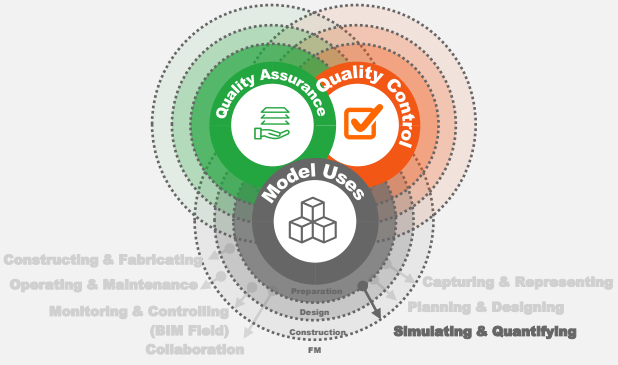




- Each floor as **single coordinated model**

Simulating & Quantifying





- 3D colour-coded visualisation of construction phasing

- Enabling the use of 3D models for planners and site-managers

Execution Drawings LP05

Volker Biermann
Member of the Management Board, HPP Stuttgart

Johannes Meiners
Head of BIM, HPP Düsseldorf

HPP

Architekten

HPP Architects

HPP Partnership

HPP Architekten

HPP is one of Germany's most successful architectural partnerships. The practice is currently led by the 4th generation of architects more than 80 years after it was founded by Helmut Hentrich.

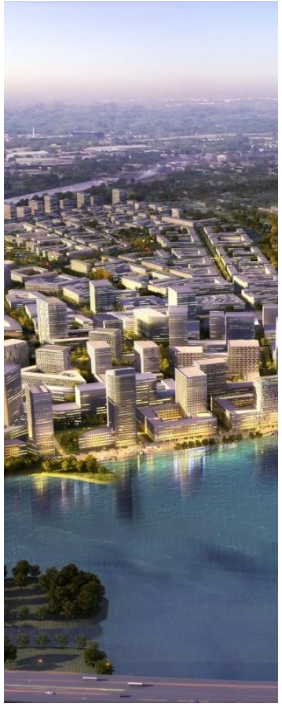
HPP Offices


PEKING
SHANGHAI
ISTANBUL
DÜSSELDORF
BERLIN
FRANKFURT
HAMBURG
KÖLN
LEIPZIG
STUTTGART
MÜNCHEN

Portfolio

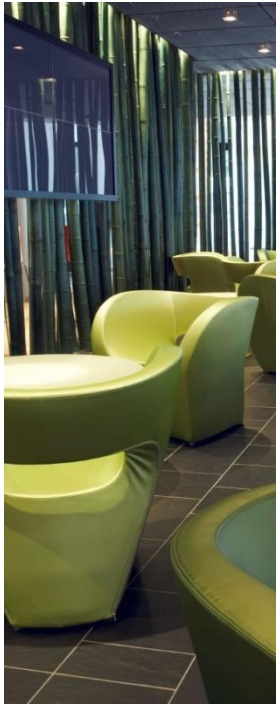
HPP
Architekten

Architecture,
Refurbishment,
Modernisation,
Preservation

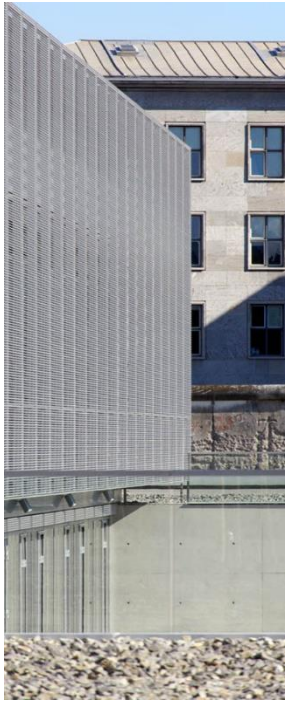


Masterplanning

Conversion



Interior Design



Construction and
Project
Management

Lead Consulting

HPP

Architekten

BIM projects at HPP

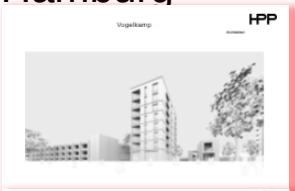
Düsseldorf

Köln

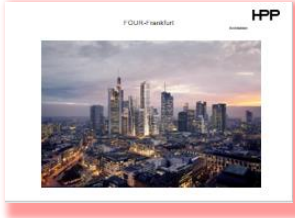
Stuttgart

München

Hamburg

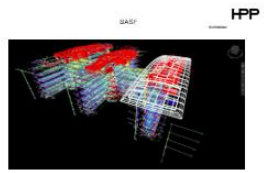


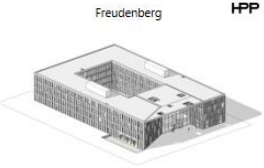
Frankfurt



Leipzig

Architekten





HPP

Architekten

HPP Architects

BIM-Practice

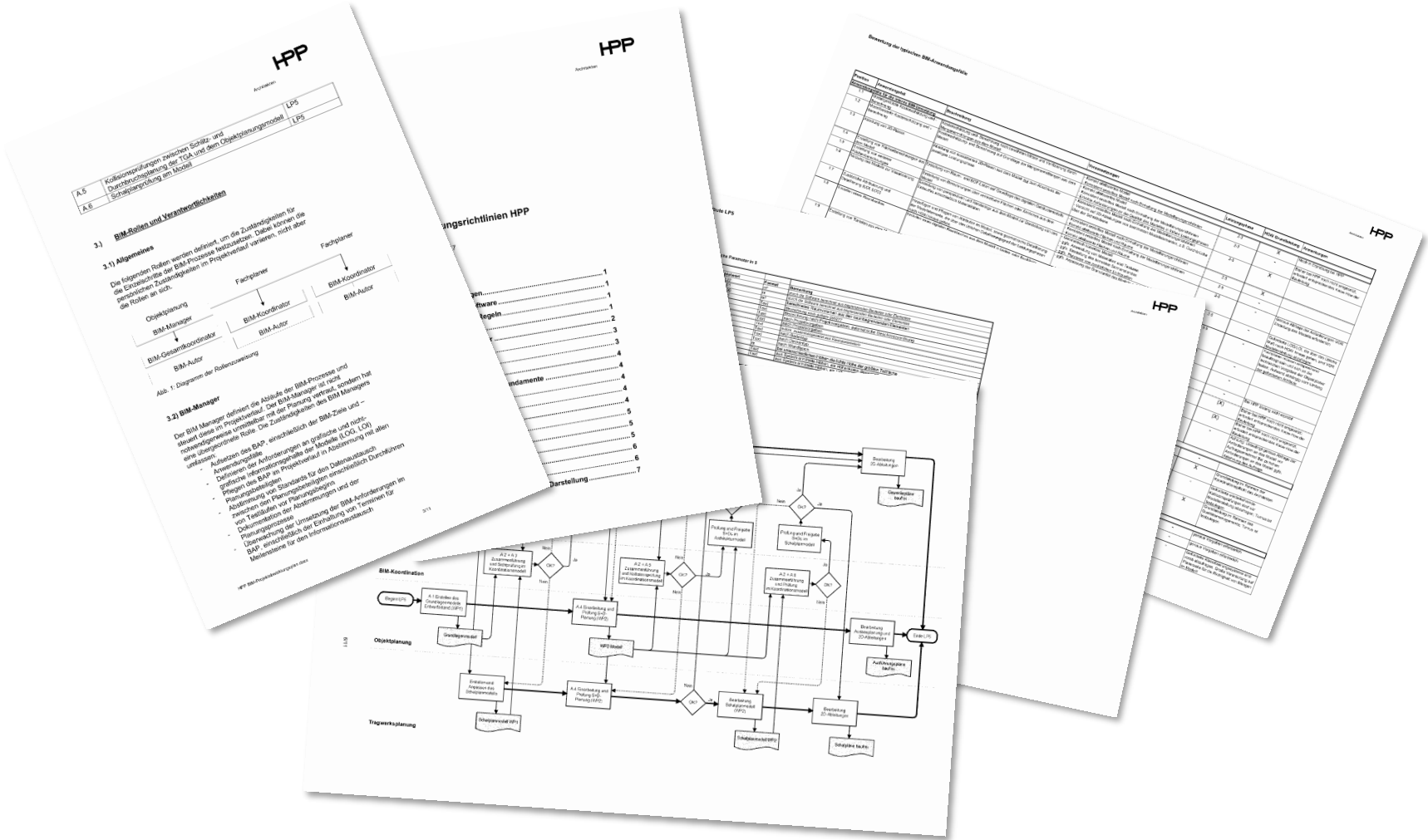
HPP BIM Management

HPP
Architekten

- Central BIM/CAD team 4 members
- Central modeling guidelines
- Central BIM objects
- Standard templates
- Internal social network
- Central training and qualification

BIM standards

HPP
Architekten



Klinikum Frankfurt Höchst

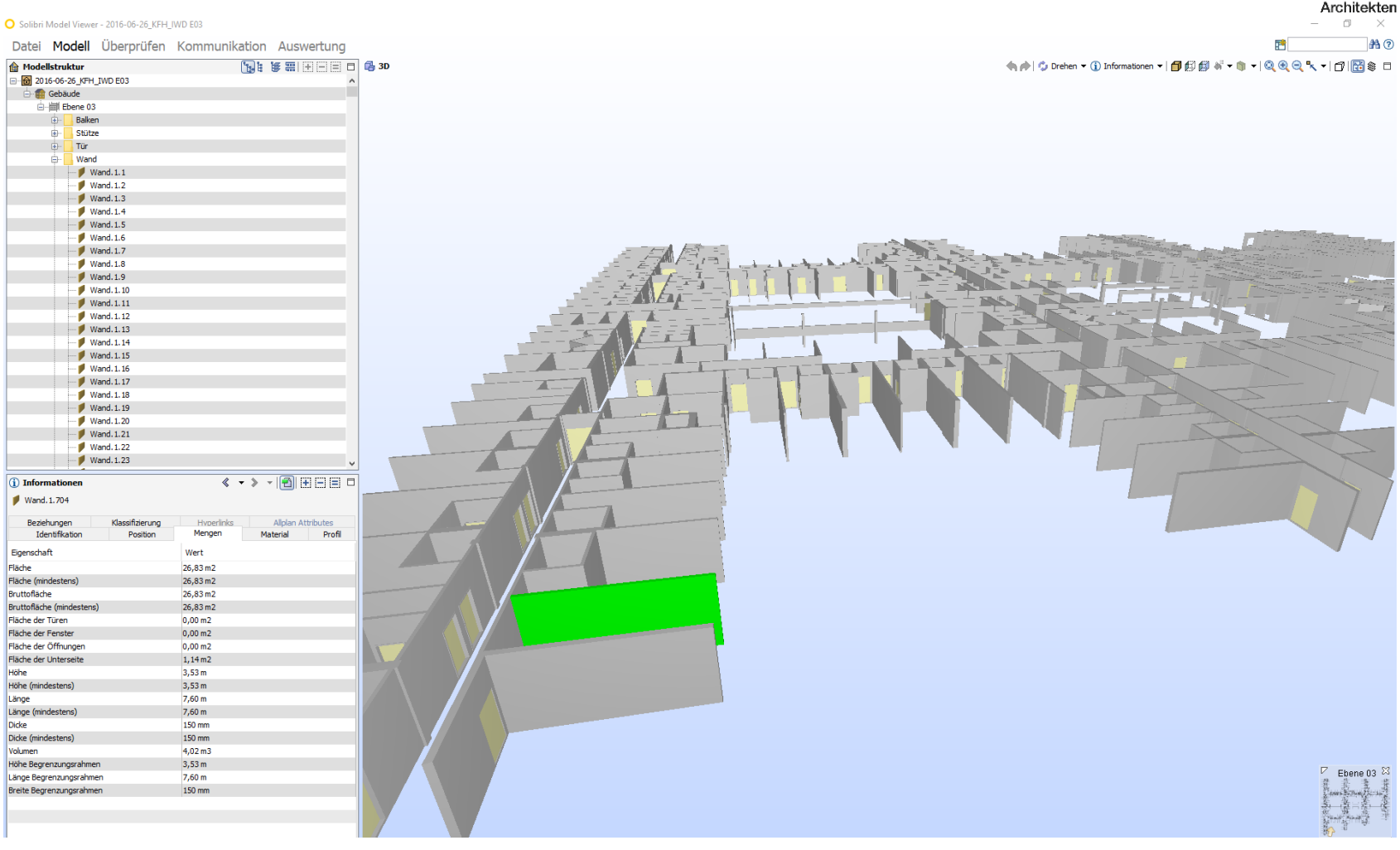
HPP Architekten

HPP
Architekten

- Transfer data LP3-LP5 geometry and information
- Transfer room information
- Visualization of information: doors
- Openings: from IFC volumes to openings

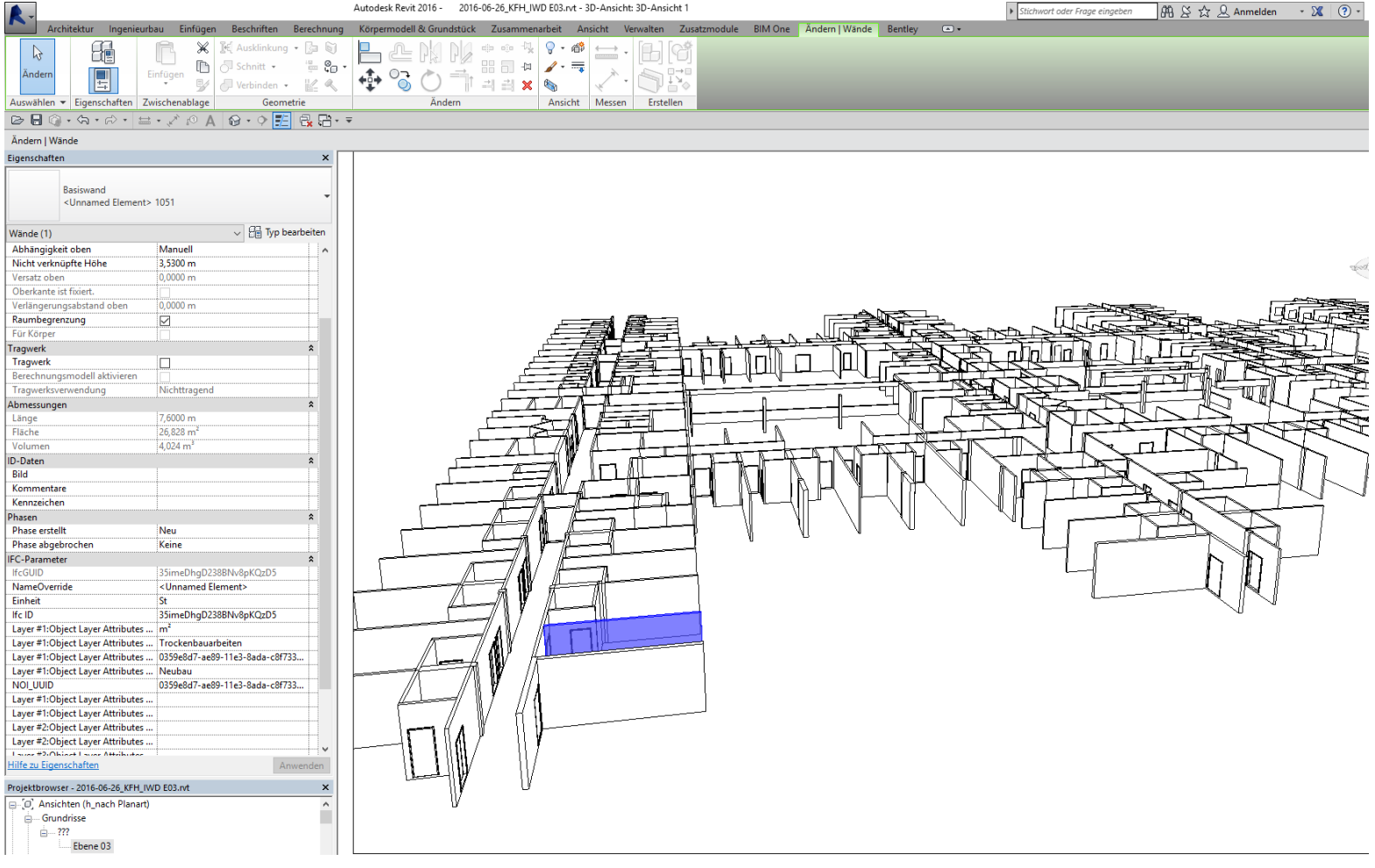
- Transfer data LP3-LP5 geometry and information

Walls in IFC Model



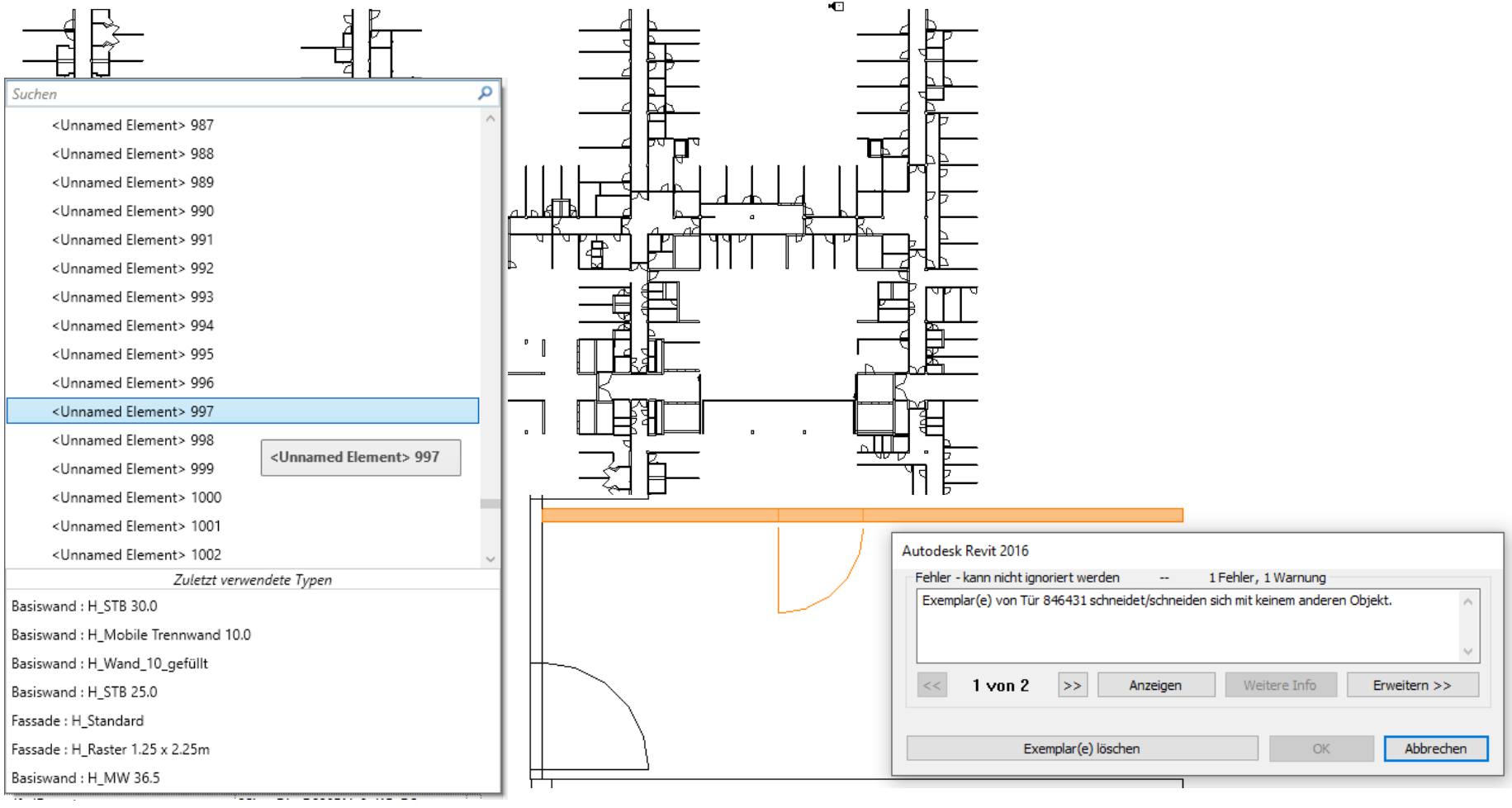
Imported Walls from IFC in Revit

HPP Architekten



Imported Walls from IFC in Revit

HPP
Architekten



HPP

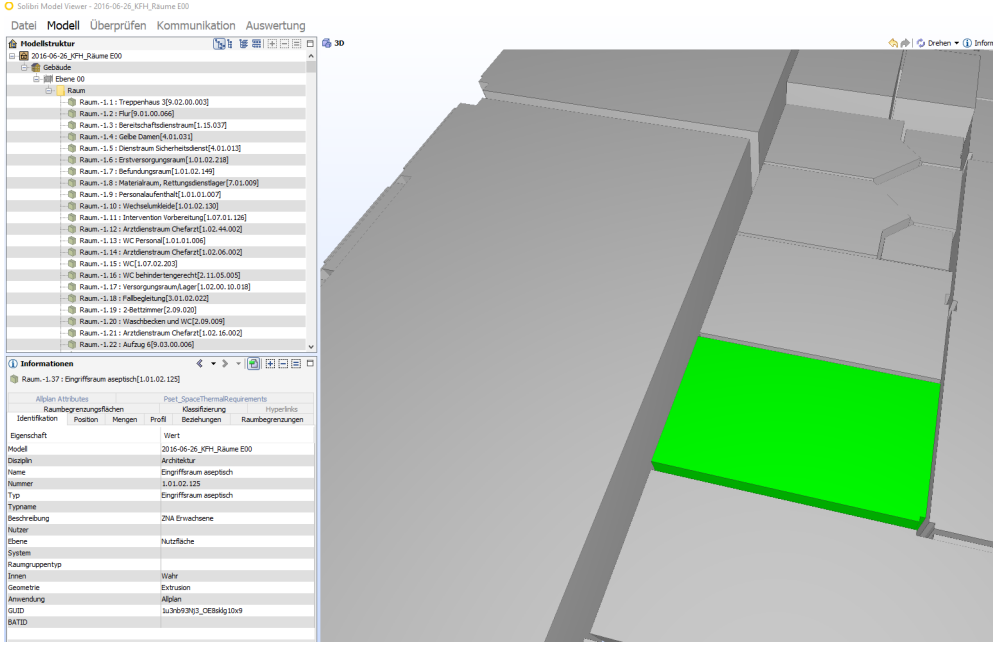
Architekten

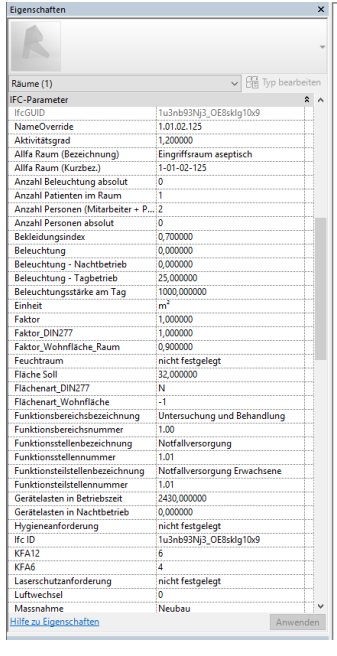
- IFC models work for data exchange and not for modifying the objects

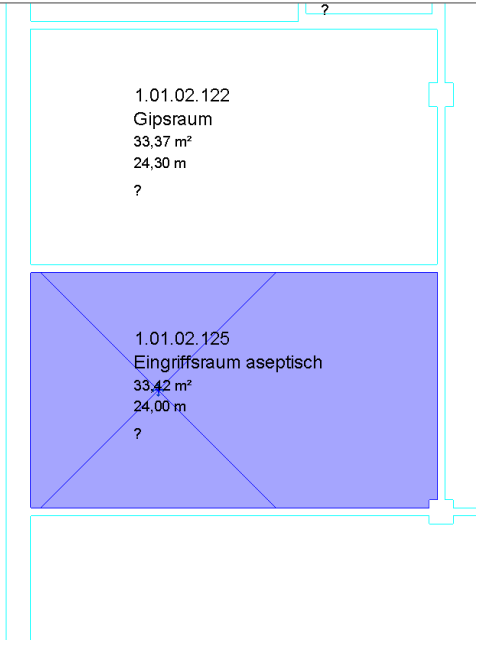
- Walls are imported as In-Place Family

- Converting and manipulating to Revit Wall family is not possible

- Transfer room information
  - Room information from IFC to Revit model

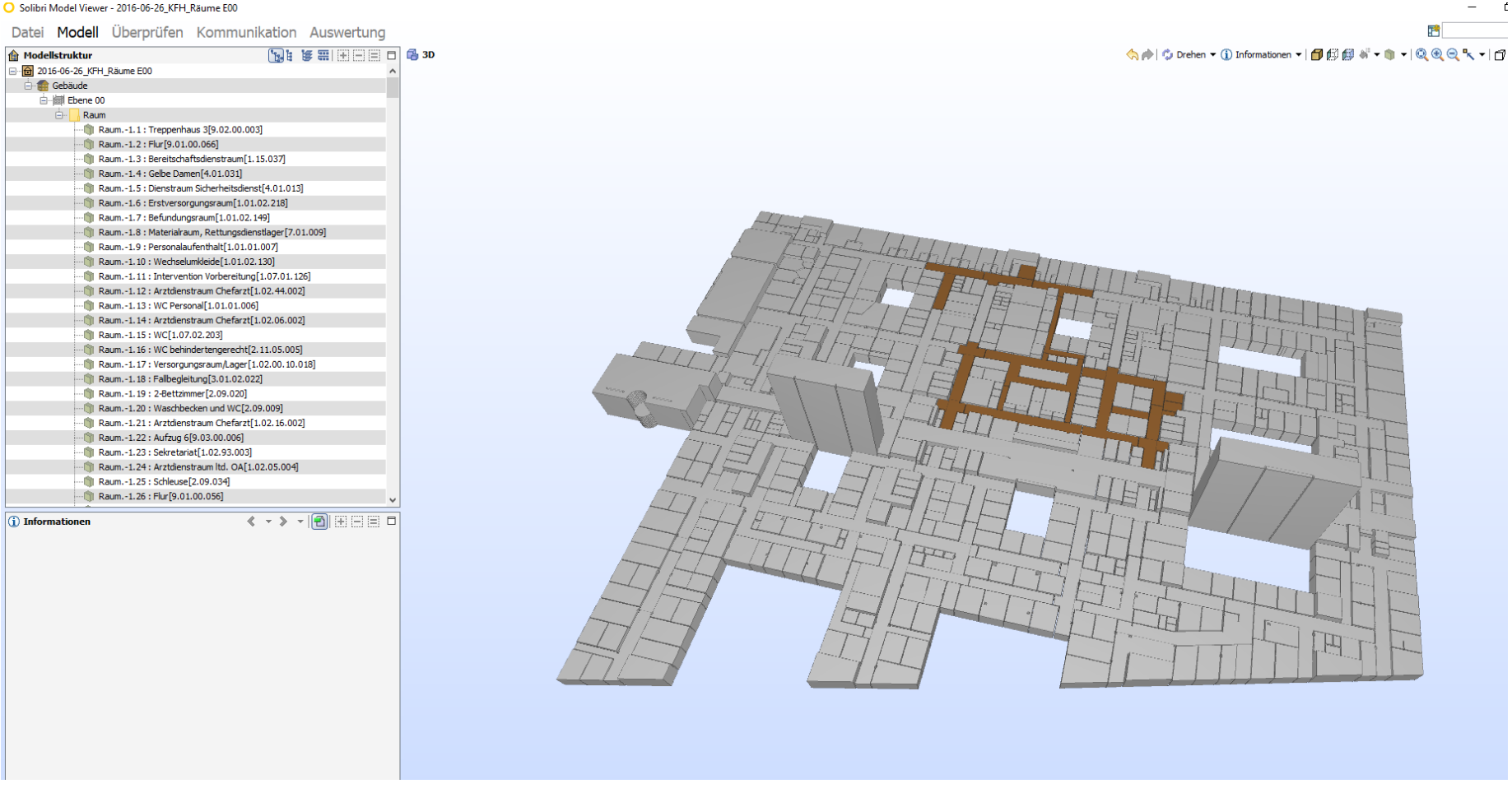






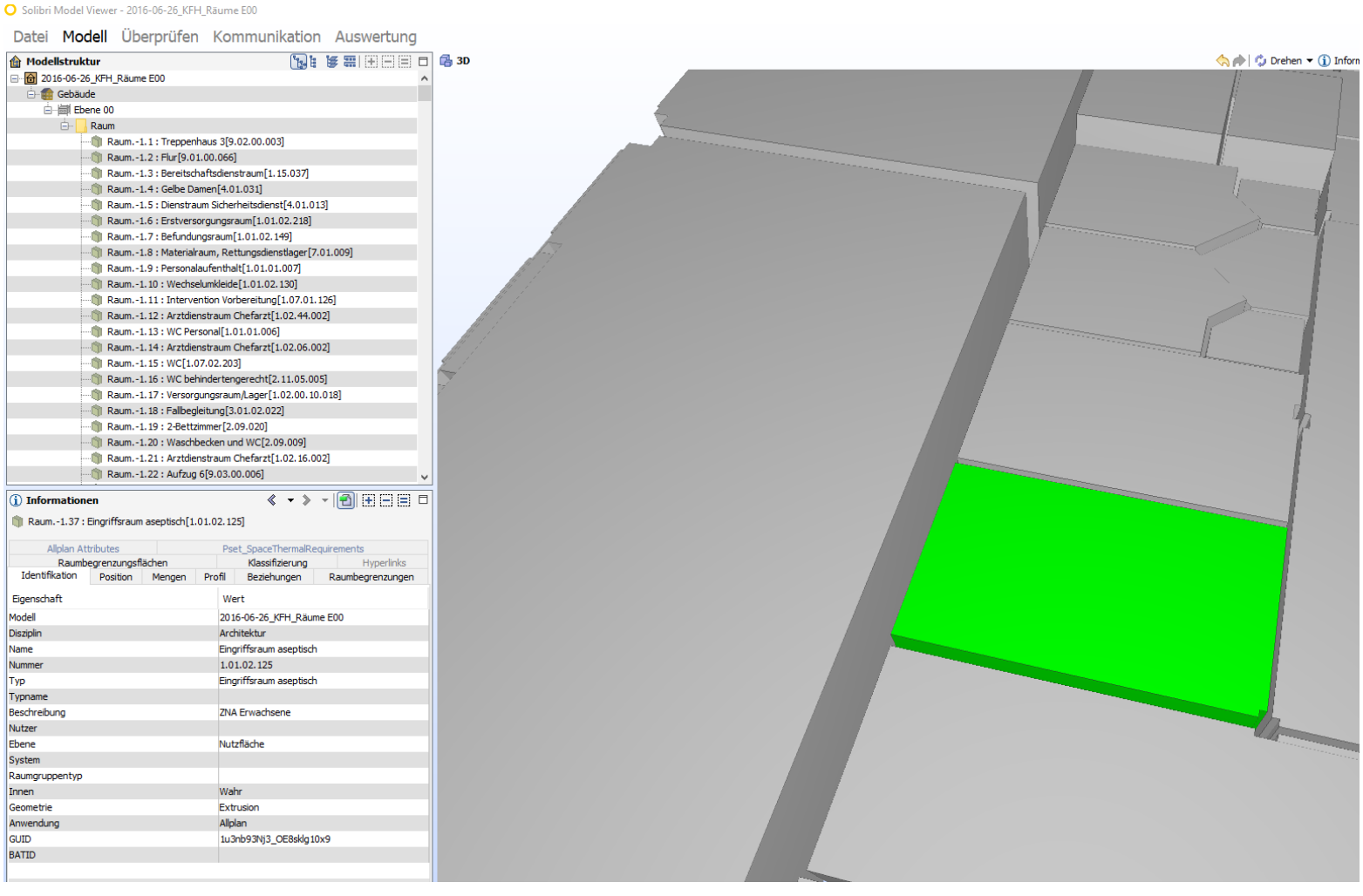
Rooms in IFC model

Architekten



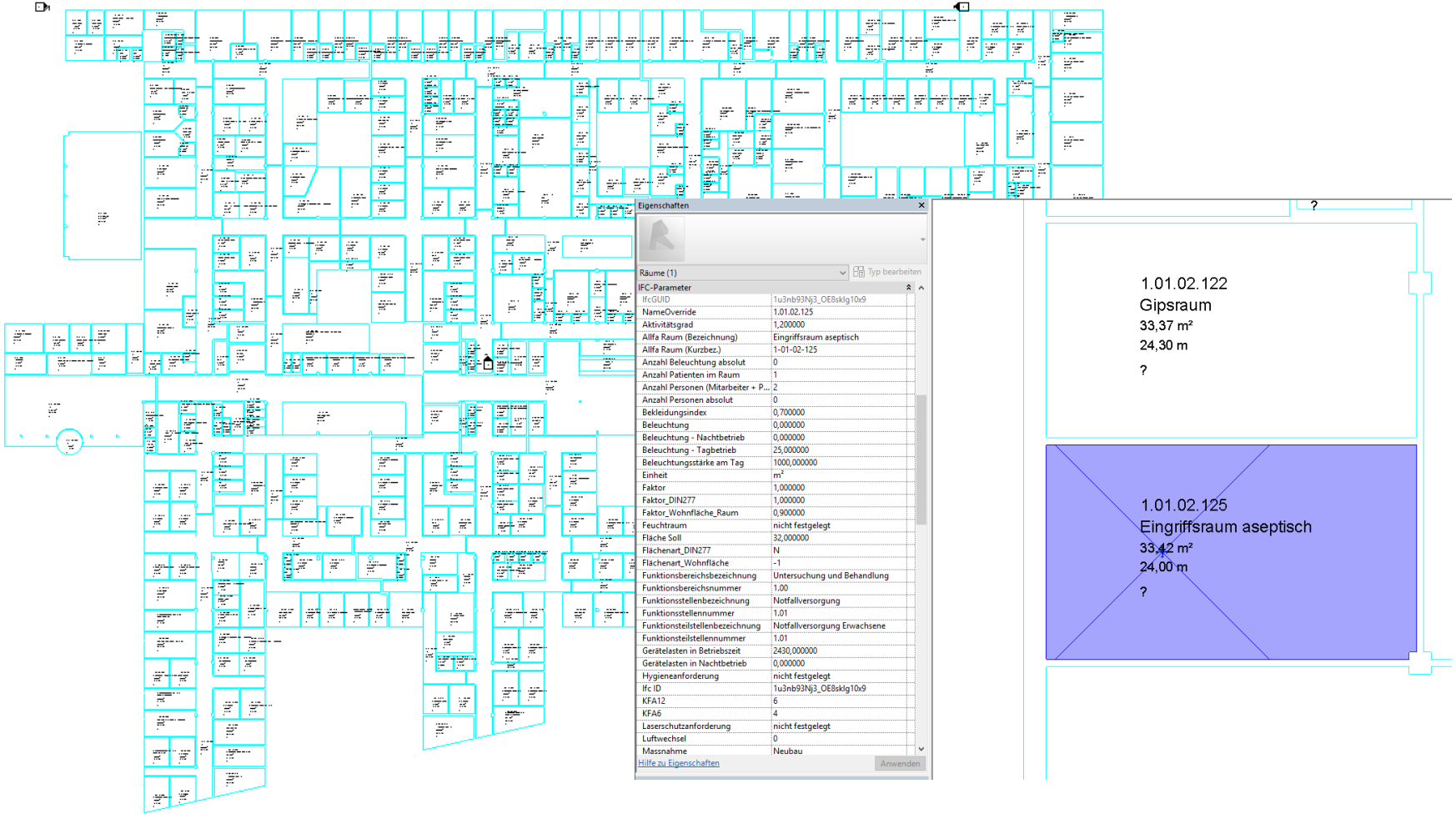
Rooms in IFC model

HPP Architekten



Imported rooms in IFC model

HPP Architekten

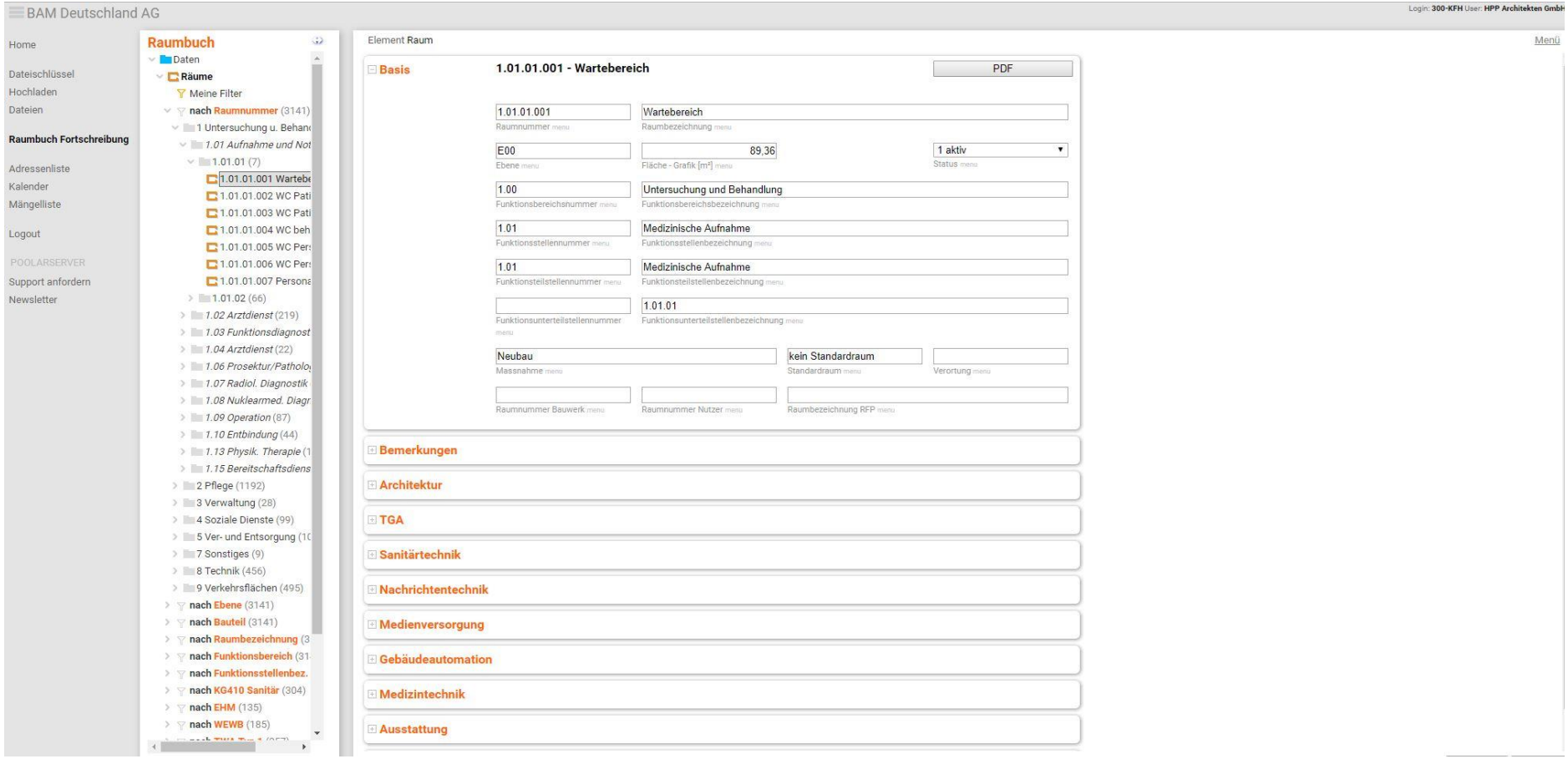


- Room information is correctly imported

- Approximately 60 room parameters per room were added to the new geometry

Transfer and update to online room information

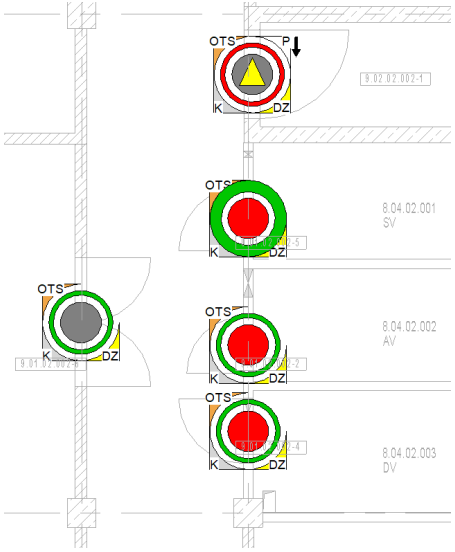
HPP Architekten



Visualization of information: Doors

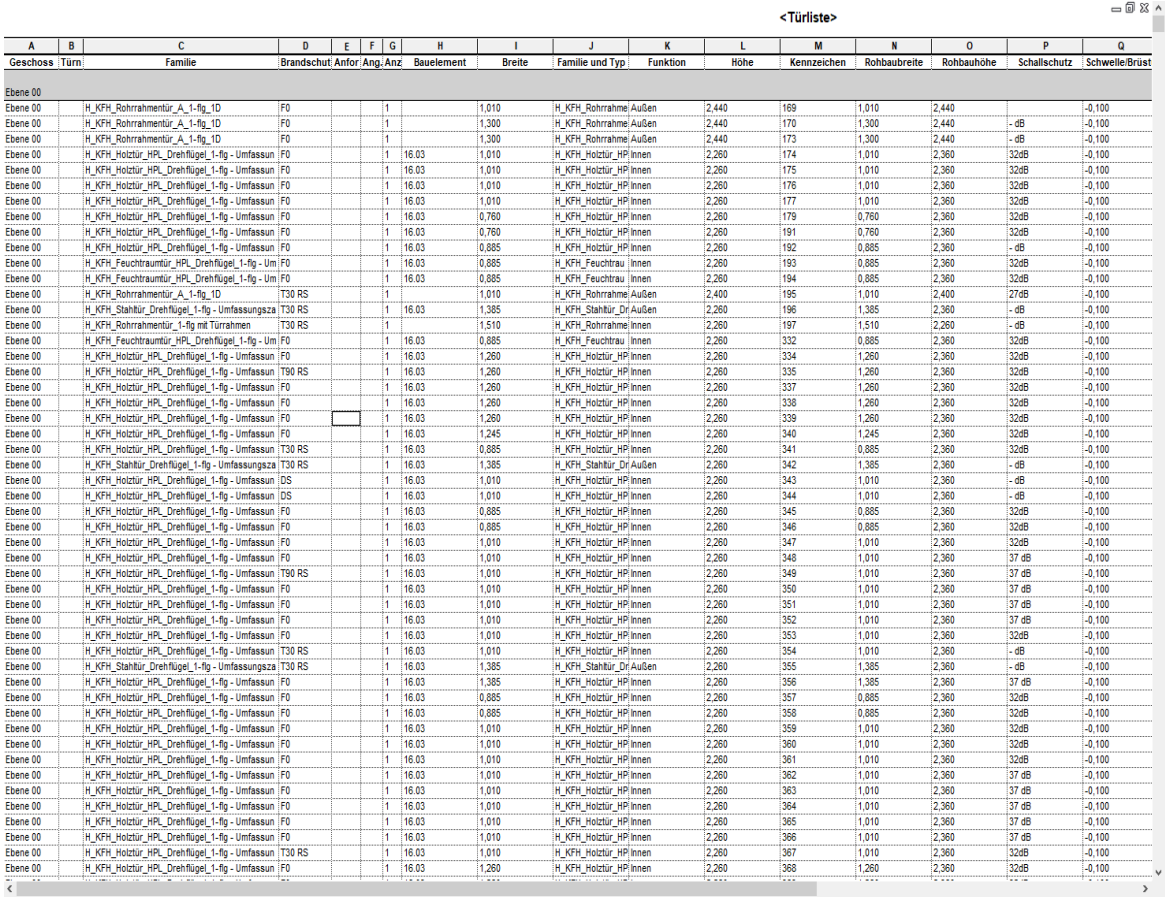
<Türliste>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Geschoss	Türn	Familie	Brandschut	Anfor	Ang.	Anz	Bauelement	Breite	Familie und Typ	Funktion	Höhe	Kennzeichen	Rohbaubreite	Rohbauhöhe	Schallschutz	Schwelle/Brüst
Ebene 00																
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	F0			1		1,010	H_KFH_Rohrrahme	Außen	2,440	169	1,010	2,440		-0,100
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	F0			1		1,300	H_KFH_Rohrrahme	Außen	2,440	170	1,300	2,440	- dB	-0,100
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	F0			1		1,300	H_KFH_Rohrrahme	Außen	2,440	173	1,300	2,440	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	174	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	175	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	176	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	177	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,760	H_KFH_Holztür_HP	Innen	2,260	179	0,760	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,760	H_KFH_Holztür_HP	Innen	2,260	191	0,760	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	192	0,885	2,360	- dB	-0,100
Ebene 00		H_KFH_Feuchtraumtür_HPL_Drehflügel_1-flg - Um	F0			1	16.03	0,885	H_KFH_Feuchtrau	Innen	2,260	193	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Feuchtraumtür_HPL_Drehflügel_1-flg - Um	F0			1	16.03	0,885	H_KFH_Feuchtrau	Innen	2,260	194	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	T30 RS			1		1,010	H_KFH_Rohrrahme	Außen	2,400	195	1,010	2,400	27dB	-0,100
Ebene 00		H_KFH_Stahltür_Drehflügel_1-flg - Umfassungsza	T30 RS			1	16.03	1,385	H_KFH_Stahltür_DI	Außen	2,260	196	1,385	2,360	- dB	-0,100
Ebene 00		H_KFH_Rohrrahmentür_1-flg mit Türrahmen	T30 RS			1		1,510	H_KFH_Rohrrahme	Innen	2,260	197	1,510	2,260	- dB	-0,100
Ebene 00		H_KFH_Feuchtraumtür_HPL_Drehflügel_1-flg - Um	F0			1	16.03	0,885	H_KFH_Feuchtrau	Innen	2,260	332	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	334	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T90 RS			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	335	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	337	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	338	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	339	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,245	H_KFH_Holztür_HP	Innen	2,260	340	1,245	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T30 RS			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	341	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Stahltür_Drehflügel_1-flg - Umfassungsza	T30 RS			1	16.03	1,385	H_KFH_Stahltür_DI	Außen	2,260	342	1,385	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	DS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	343	1,010	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	DS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	344	1,010	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	345	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	346	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	347	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	348	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T90 RS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	349	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	350	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	351	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	352	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	353	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T30 RS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	354	1,010	2,360	- dB	-0,100
Ebene 00		H_KFH_Stahltür_Drehflügel_1-flg - Umfassungsza	T30 RS			1	16.03	1,385	H_KFH_Stahltür_DI	Außen	2,260	355	1,385	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,385	H_KFH_Holztür_HP	Innen	2,260	356	1,385	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	357	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	358	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	359	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	360	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	361	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	362	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	363	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	364	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	365	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	366	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T30 RS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	367	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	368	1,260	2,360	32dB	-0,100



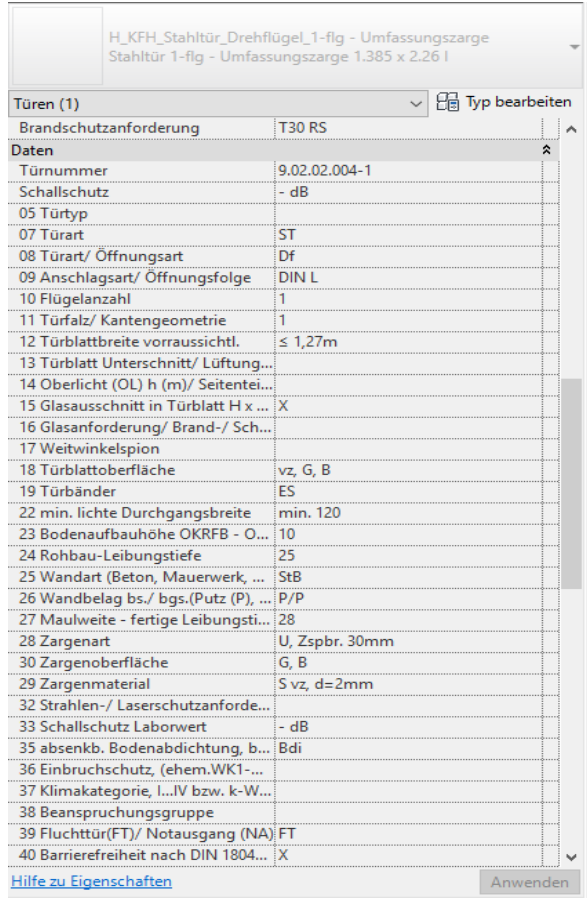
Door schedule and parameters

HPP Architekten



<Türliste>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Geschoss	Türn	Familie	Brandschut	Anfor	Ang.	Anz	Bauelement	Breite	Familie und Typ	Funktion	Höhe	Kennzeichen	Rohbaubreite	Rohbauhöhe	Schallschutz	Schwelle/Brüst
Ebene 00																
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	F0			1		1,010	H_KFH_Rohrrahme	Außen	2,440	169	1,010	2,440		-0,100
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	F0			1		1,300	H_KFH_Rohrrahme	Außen	2,440	170	1,300	2,440	- dB	-0,100
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	F0			1		1,300	H_KFH_Rohrrahme	Außen	2,440	173	1,300	2,440	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	174	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	175	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	176	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	177	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,760	H_KFH_Holztür_HP	Innen	2,260	179	0,760	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,760	H_KFH_Holztür_HP	Innen	2,260	191	0,760	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	192	0,885	2,360	- dB	-0,100
Ebene 00		H_KFH_Feuchtraumtür_HPL_Drehflügel_1-flg - Um	F0			1	16.03	0,885	H_KFH_Feuchtrau	Innen	2,260	193	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Feuchtraumtür_HPL_Drehflügel_1-flg - Um	F0			1	16.03	0,885	H_KFH_Feuchtrau	Innen	2,260	194	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Rohrrahmentür_A_1-flg_1D	T30 RS			1		1,010	H_KFH_Rohrrahme	Außen	2,400	195	1,010	2,400	27dB	-0,100
Ebene 00		H_KFH_Stahltür_Drehflügel_1-flg - Umfassungsza	T30 RS			1	16.03	1,385	H_KFH_Stahltür_Dr	Außen	2,260	196	1,385	2,360	- dB	-0,100
Ebene 00		H_KFH_Rohrrahmentür_1-flg mit Türrahmen	T30 RS			1		1,510	H_KFH_Rohrrahme	Innen	2,260	197	1,510	2,260	- dB	-0,100
Ebene 00		H_KFH_Feuchtraumtür_HPL_Drehflügel_1-flg - Um	F0			1	16.03	0,885	H_KFH_Feuchtrau	Innen	2,260	332	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	334	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T90 RS			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	335	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	337	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	338	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	339	1,260	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,245	H_KFH_Holztür_HP	Innen	2,260	340	1,245	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T30 RS			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	341	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Stahltür_Drehflügel_1-flg - Umfassungsza	T30 RS			1	16.03	1,385	H_KFH_Stahltür_Dr	Außen	2,260	342	1,385	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	DS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	343	1,010	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	DS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	344	1,010	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	345	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	346	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	347	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	348	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T90 RS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	349	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	350	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	351	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	352	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	353	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T30 RS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	354	1,010	2,360	- dB	-0,100
Ebene 00		H_KFH_Stahltür_Drehflügel_1-flg - Umfassungsza	T30 RS			1	16.03	1,385	H_KFH_Stahltür_Dr	Außen	2,260	355	1,385	2,360	- dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,385	H_KFH_Holztür_HP	Innen	2,260	356	1,385	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	357	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	0,885	H_KFH_Holztür_HP	Innen	2,260	358	0,885	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	359	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	360	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	361	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	362	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	363	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	364	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	365	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	366	1,010	2,360	37 dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	T30 RS			1	16.03	1,010	H_KFH_Holztür_HP	Innen	2,260	367	1,010	2,360	32dB	-0,100
Ebene 00		H_KFH_Holztür_HPL_Drehflügel_1-flg - Umfassun	F0			1	16.03	1,260	H_KFH_Holztür_HP	Innen	2,260	368	1,260	2,360	32dB	-0,100



H_KFH_Stahltür_Drehflügel_1-flg - Umfassungszarge
Stahltür 1-flg - Umfassungszarge 1.385 x 2.26 I

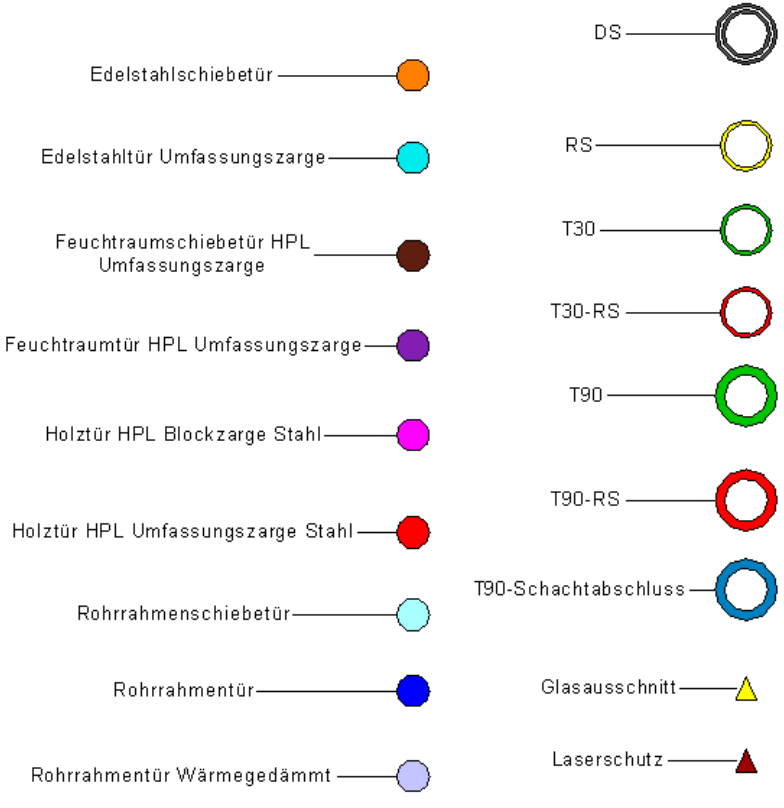
Türen (1) — Typ bearbeiten

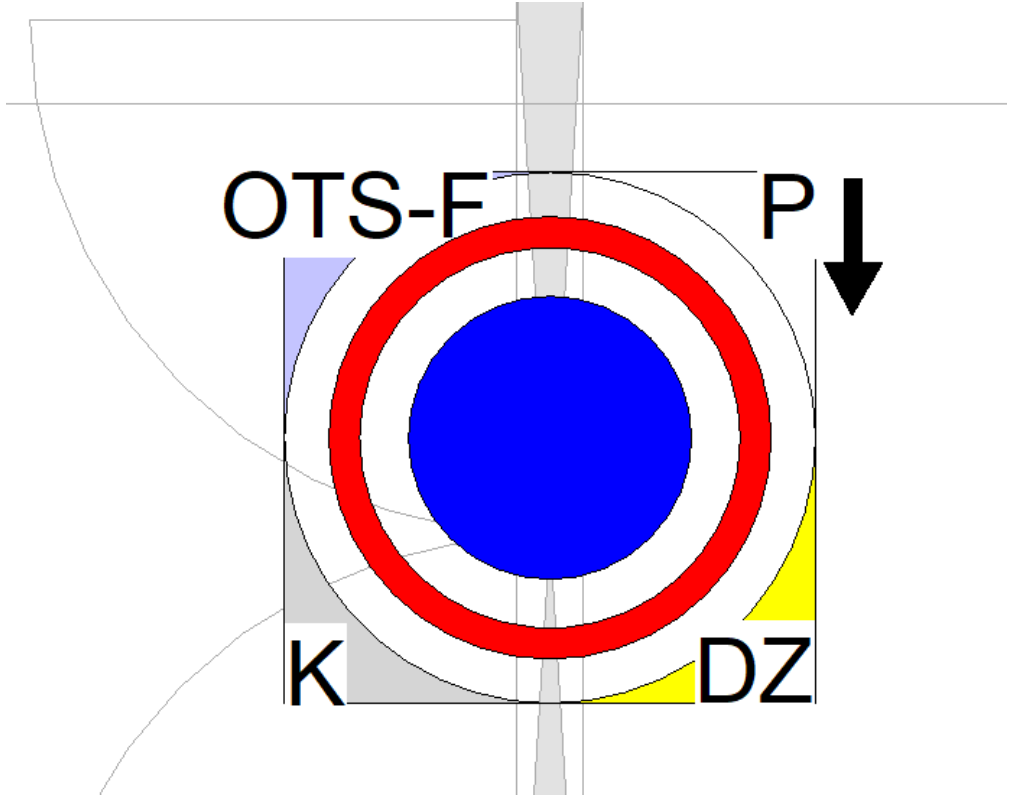
Brandschutzanforderung	T30 RS
Daten	
Türnummer	9.02.02.004-1
Schallschutz	- dB
05 Türtyp	
07 Türart	ST
08 Türart/ Öffnungsart	Df
09 Anschlagsart/ Öffnungsfolge	DIN L
10 Flügelanzahl	1
11 Türfalz/ Kantengeometrie	1
12 Türblattbreite vorraussichtl.	≤ 1,27m
13 Türblatt Unterschnitt/ Lüftung...	
14 Oberlicht (OL) h (m)/ Seitentei...	
15 Glasausschnitt in Türblatt H x ...	X
16 Glasanforderung/ Brand-/ Sch...	
17 Weitwinkelspion	
18 Türblattoberfläche	vz, G, B
19 Türbänder	ES
22 min. lichte Durchgangsbreite	min. 120
23 Bodenaufbauhöhe OKRFB - O...	10
24 Rohbau-Leibungstiefe	25
25 Wandart (Beton, Mauerwerk, ...	StB
26 Wandbelag bs./ bgs.(Putz (P), ...	P/P
27 Maulweite - fertige Leibungsti...	28
28 Zargenart	U, Zspbr. 30mm
30 Zargenoberfläche	G, B
29 Zargenmaterial	S vz, d=2mm
32 Strahlen-/ Laserschutzanforde...	
33 Schallschutz Laborwert	- dB
35 absenkb. Bodenabdichtung, b...	Bdi
36 Einbruchschutz, (ehem.WK1-...	
37 Klimakategorie, I...IV bzw. k-W...	
38 Beanspruchungsgruppe	
39 Fluchttür(FT)/ Notausgang (NA)	FT
40 Barrierefreiheit nach DIN 1804...	X

Hilfe zu Eigenschaften — Anwenden

Visualization of information

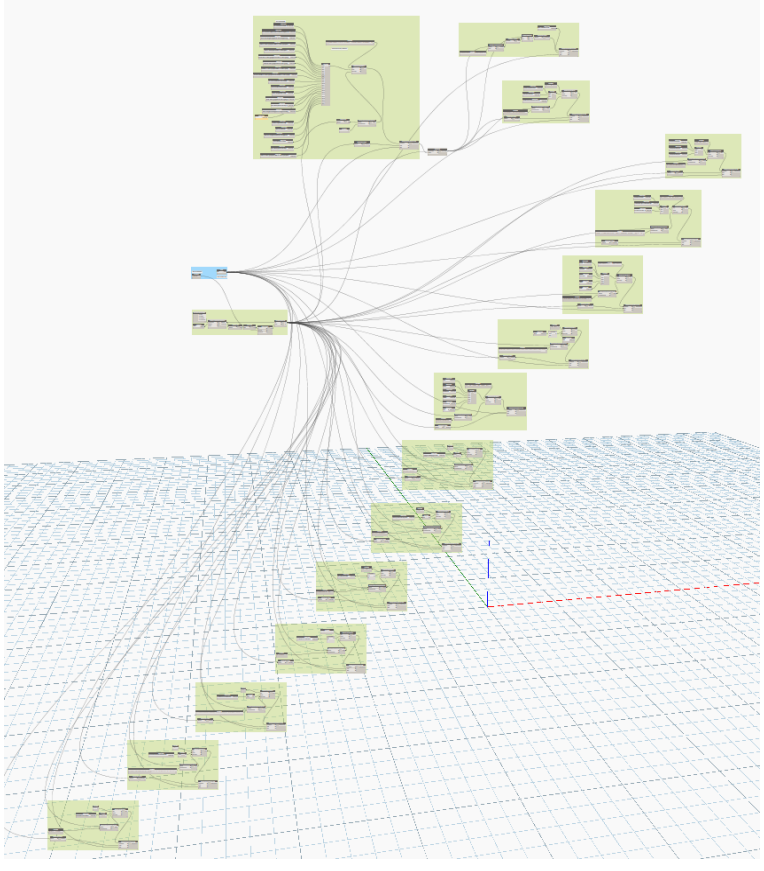
HPP Architekten

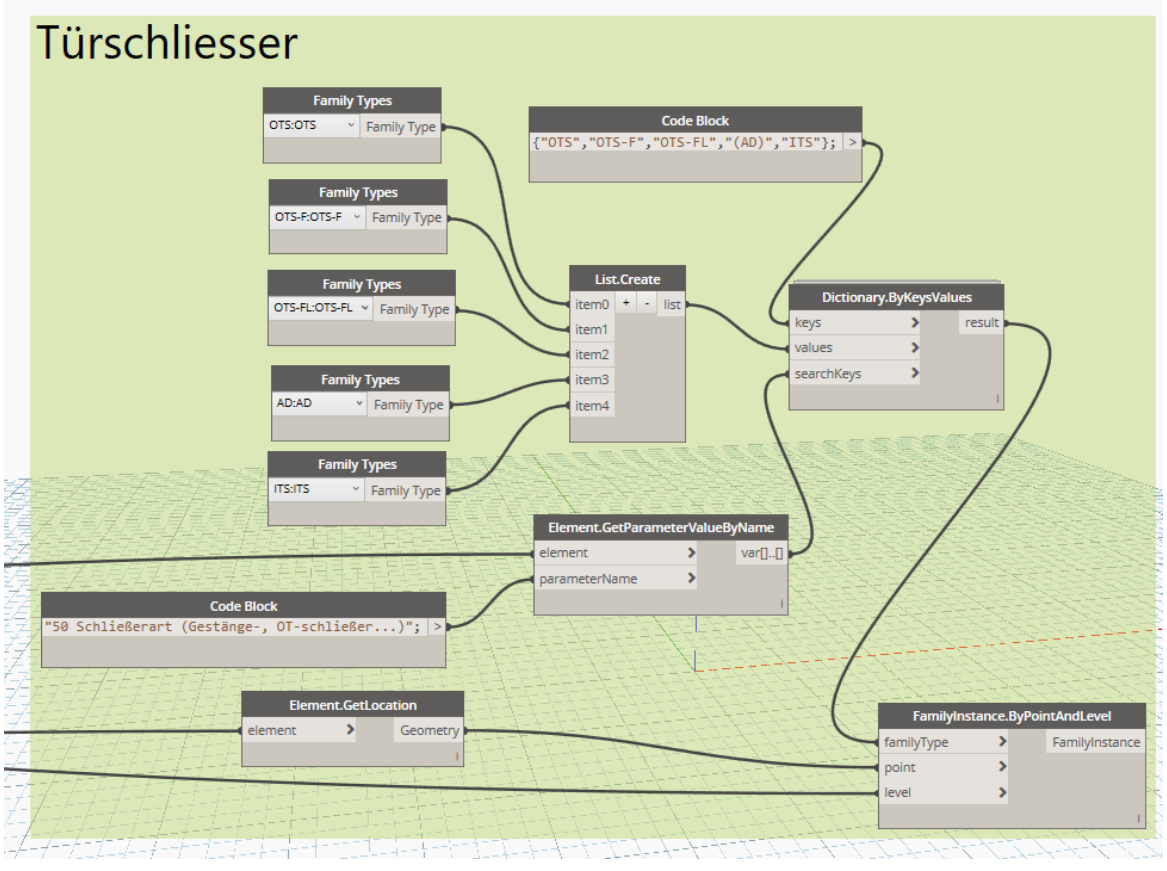




Creating graphics with dynamo scripts

HPP Architekten





From parameter value to graphical representation

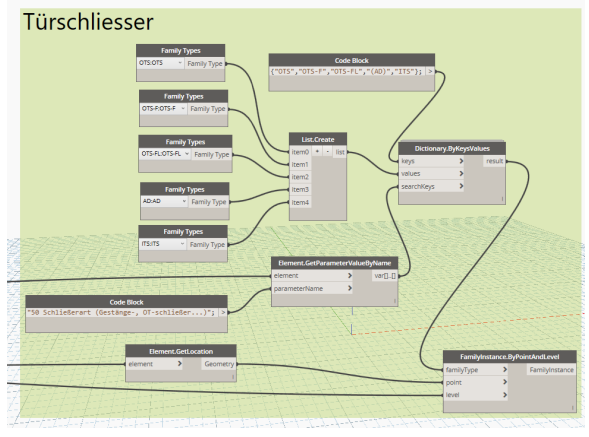
HPP Architekten

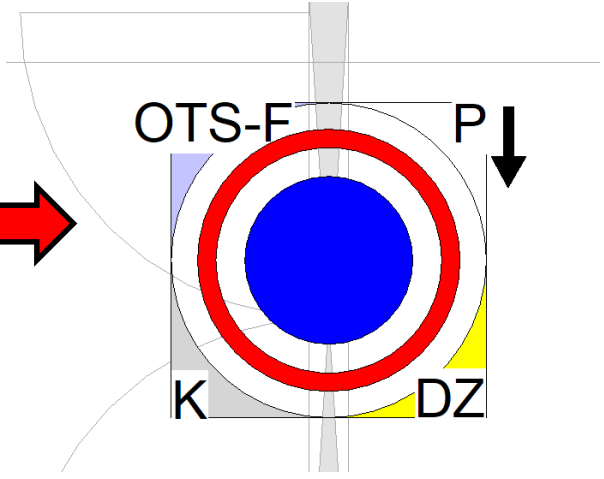
H_KFH_Stahltür_Drehflügel_1-flg - Umfassungszarge
Stahltür 1-flg - Umfassungszarge 1.385 x 2.26 l

Türen (1) | Typ bearbeiten

Brandschutzanforderung	T30 RS
Daten	
Türnummer	9.02.02.004-1
Schallschutz	- dB
05 Türtyp	
07 Türart	ST
08 Türart/ Öffnungsart	Df
09 Anschlagsart/ Öffnungsfolge	DIN L
10 Flügelanzahl	1
11 Türfalz/ Kantengeometrie	1
12 Türblattbreite vorraussichtl.	≤ 1,27m
13 Türblatt Unterschnitt/ Lüftung...	
14 Oberlicht (OL) h (m)/ Seitentei...	
15 Glasausschnitt in Türblatt H x ...	X
16 Glasanforderung/ Brand-/ Sch...	
17 Weitwinkelspion	
18 Türblattoberfläche	vz, G, B
19 Türbänder	ES
22 min. lichte Durchgangsbreite	min. 120
23 Bodenaufbauhöhe OKRFB - O...	10
24 Rohbau-Leibungstiefe	25
25 Wandart (Beton, Mauerwerk, ...	StB
26 Wandbelag bs./ bgs.(Putz (P), ...	P/P
27 Maulweite - fertige Leibungsti...	28
28 Zargenart	U, Zspbr. 30mm
30 Zargenoberfläche	G, B
29 Zargenmaterial	S vz, d=
32 Strahlen-/ Laserschutzanforde...	
33 Schallschutz Laborwert	- dB
35 absenkb. Bodenabdichtung, b...	Bdi
36 Einbruchschutz, (ehem.WK1-...	
37 Klimakategorie, I...IV bzw. k-W...	
38 Beanspruchungsgruppe	
39 Fluchttür(FT)/ Notausgang (NA)	FT
40 Barrierefreiheit nach DIN 1804...	X

Hilfe zu Eigenschaften | Anwenden

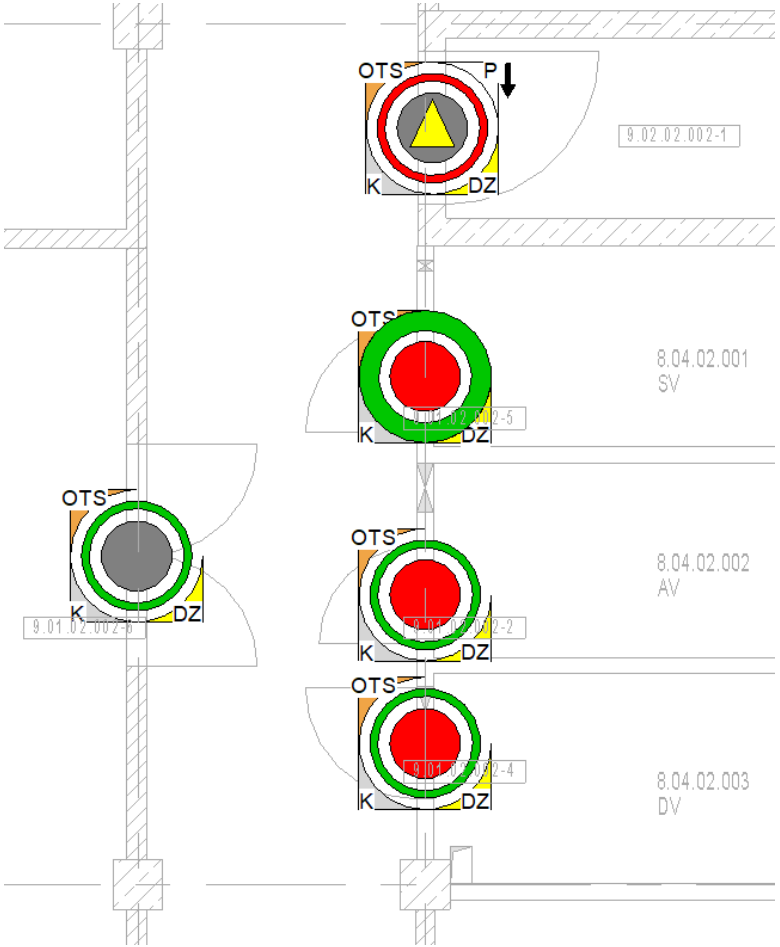




Schedules and visualization show identical information

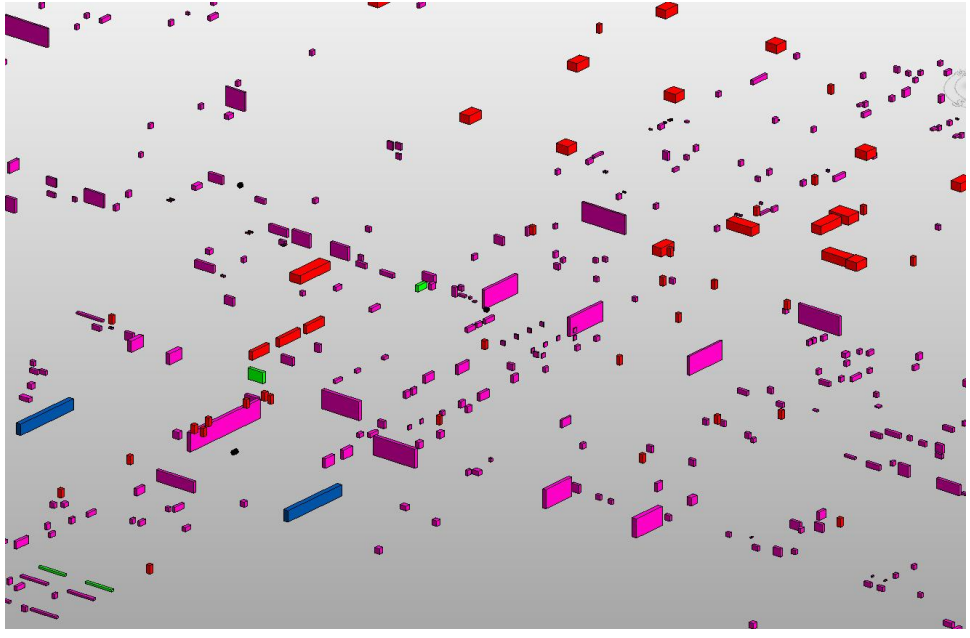
Updating information automatically by script

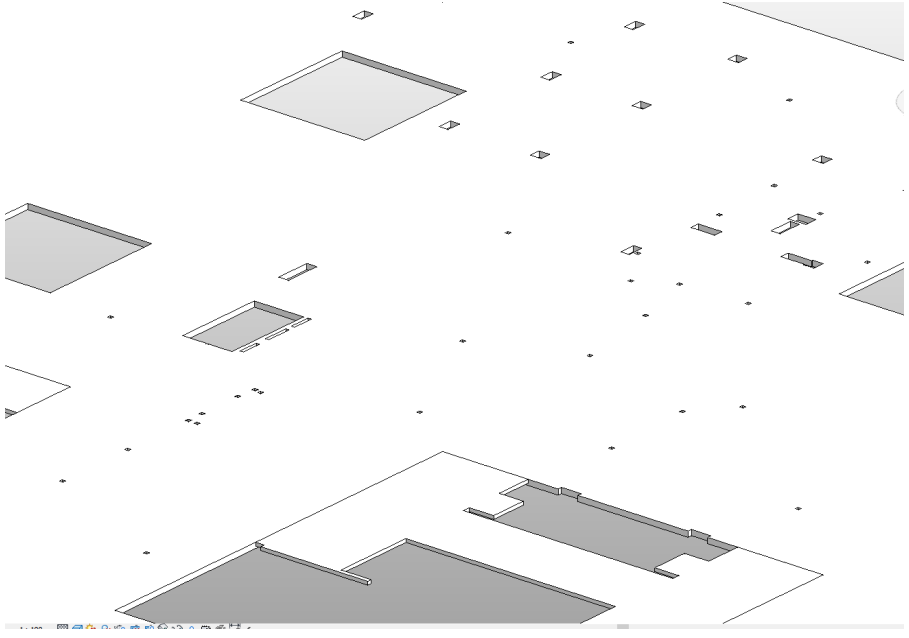
HPP Architekten



From IFC volumes to openings

HPP
Architekten





Import and proof-reading of openings

HPP Architekten

Building Services model

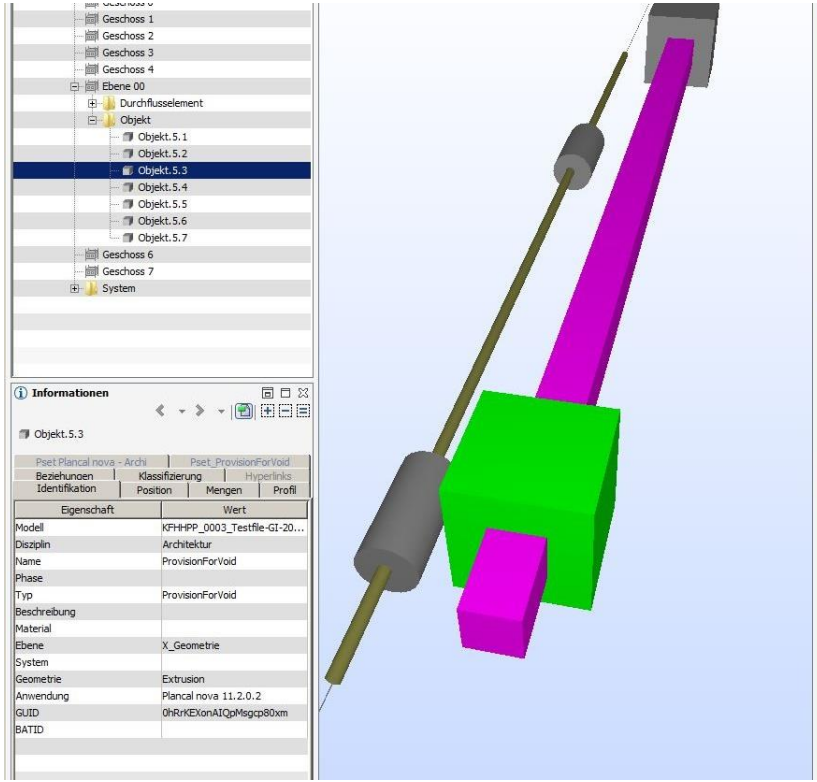
Dynamo

Import script

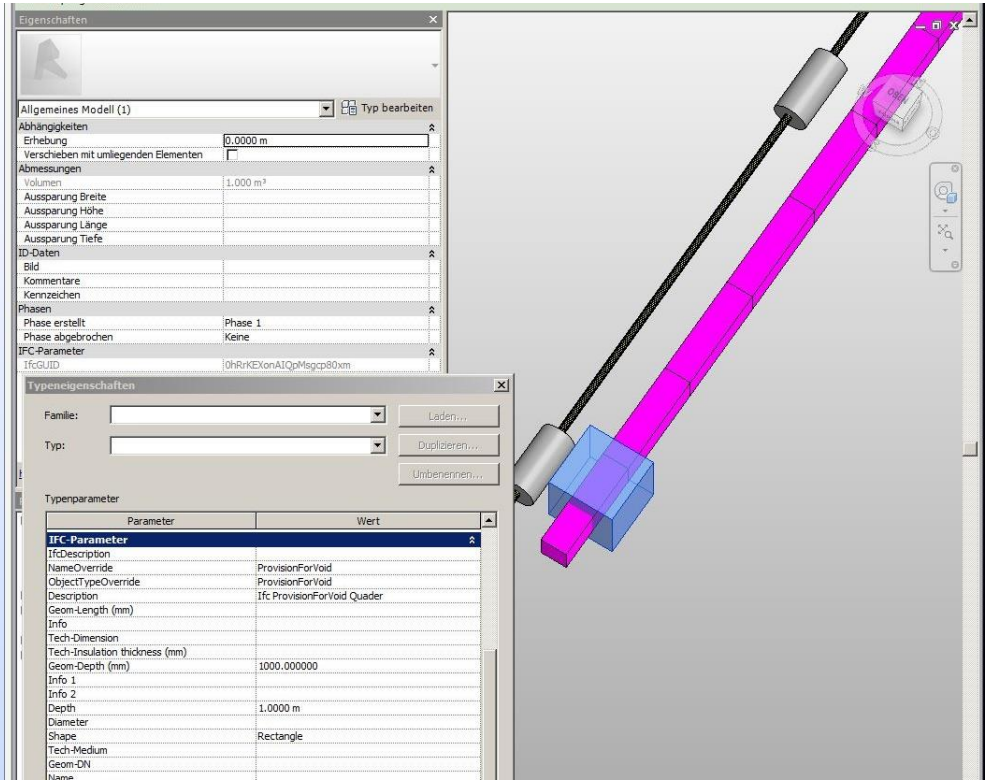
Architectural model

Clash model

Opening volumes in IFC

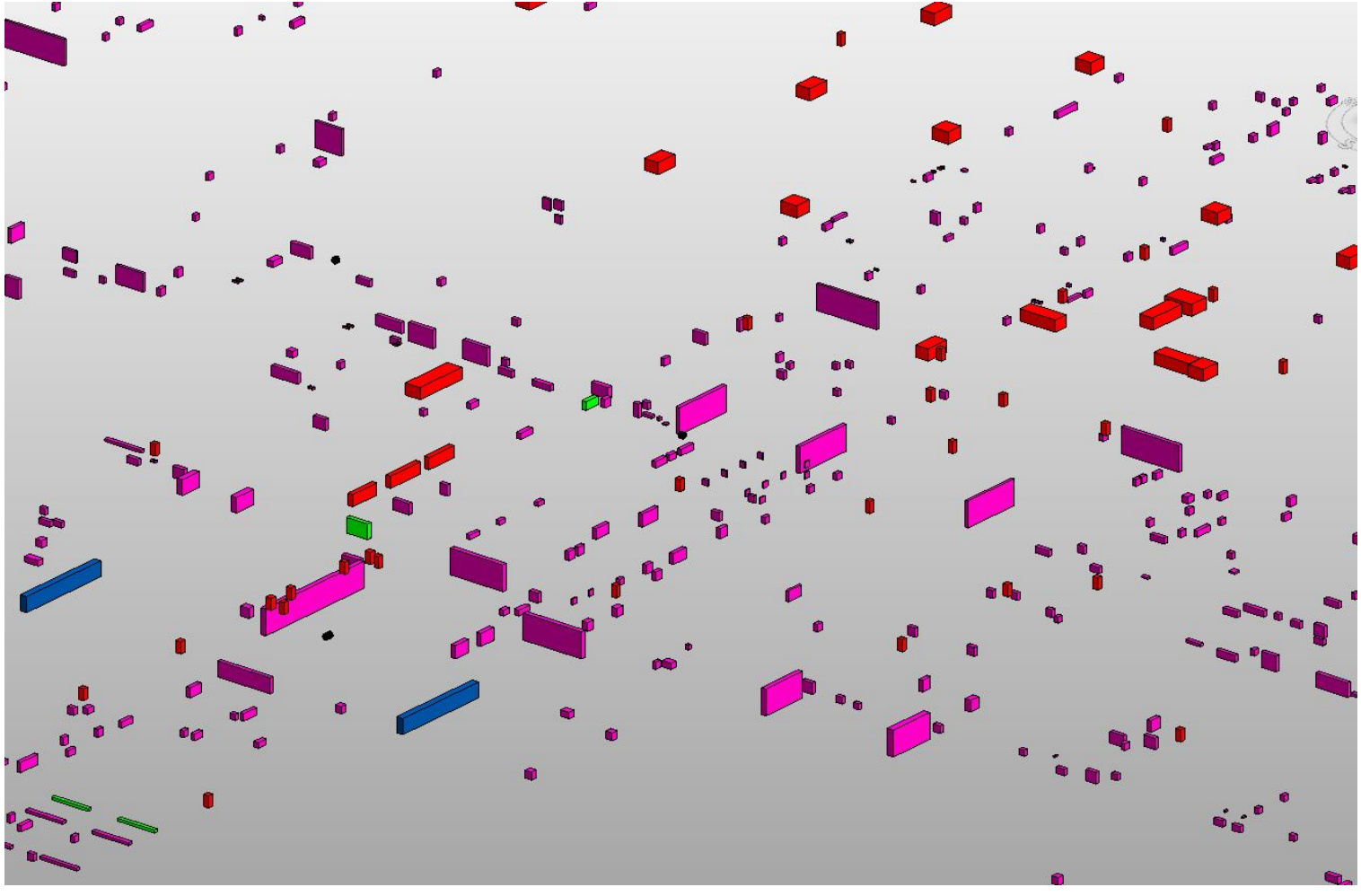


Opening volumes in Revit



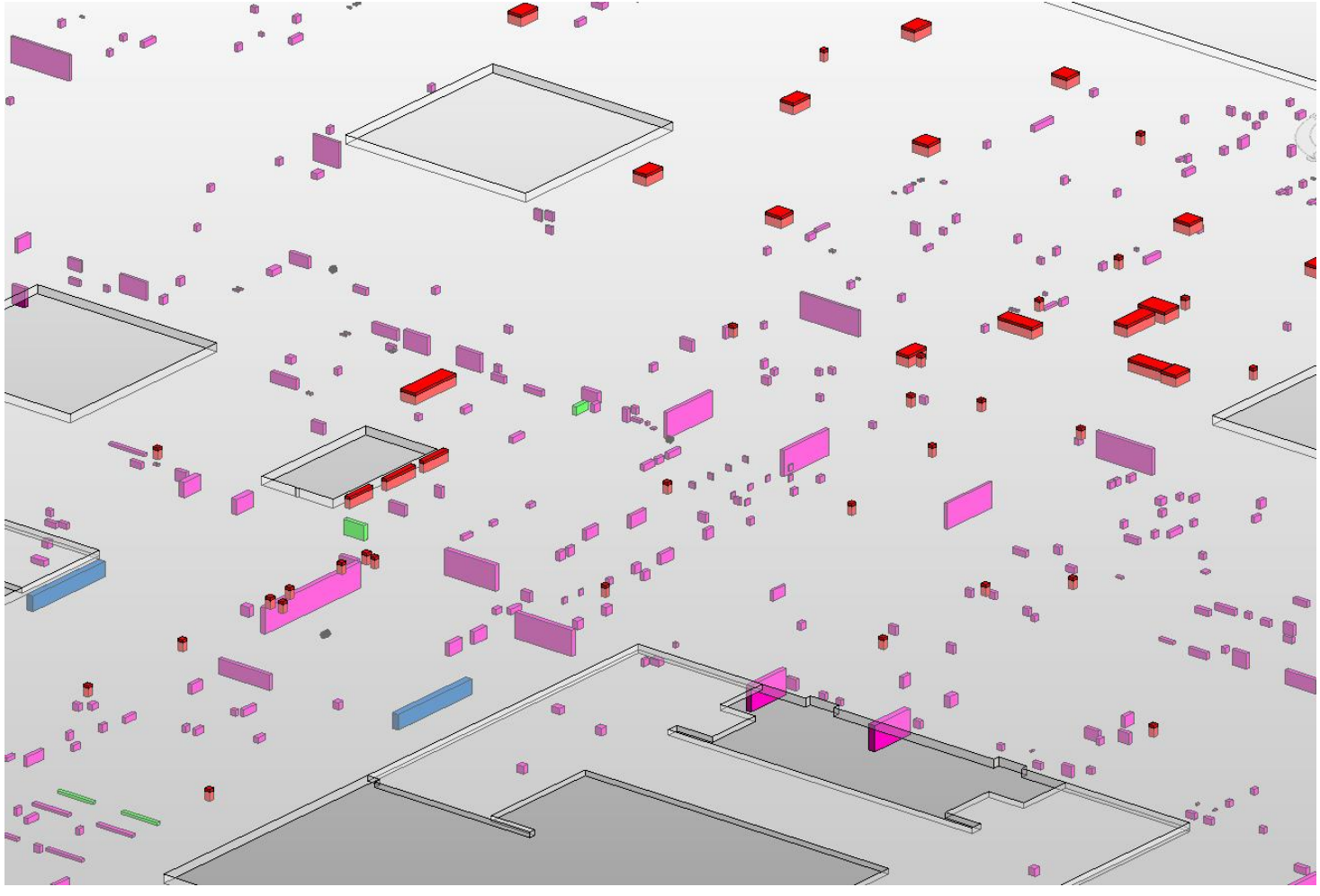
Volumes in Revit

HPP
Architekten



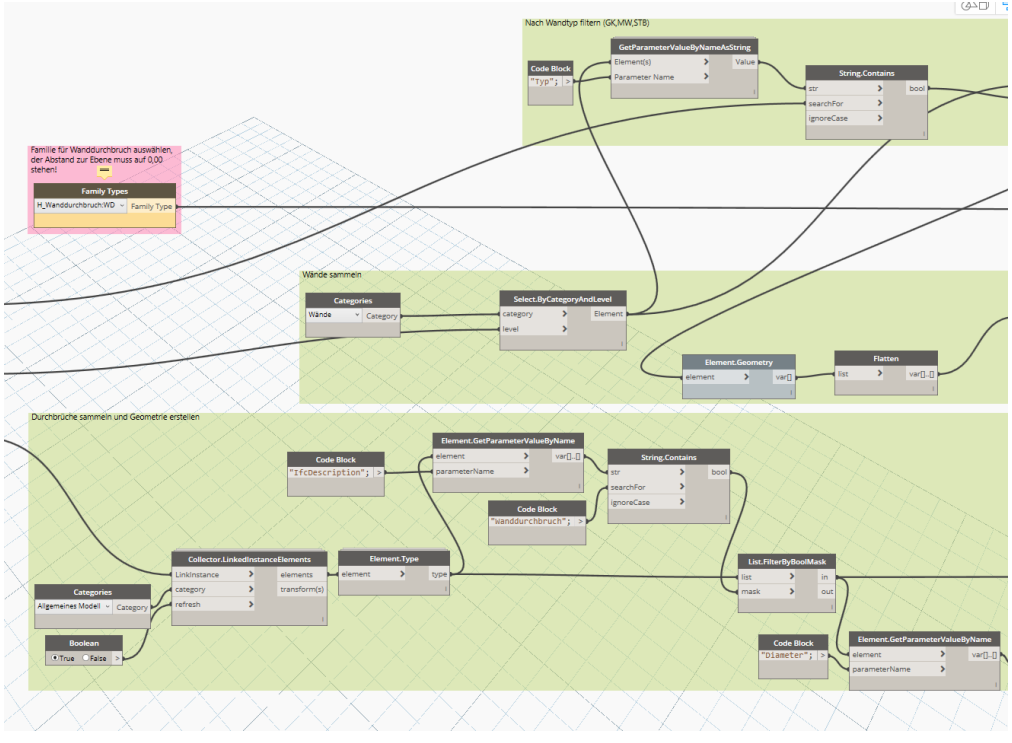
Overlay on architectural model

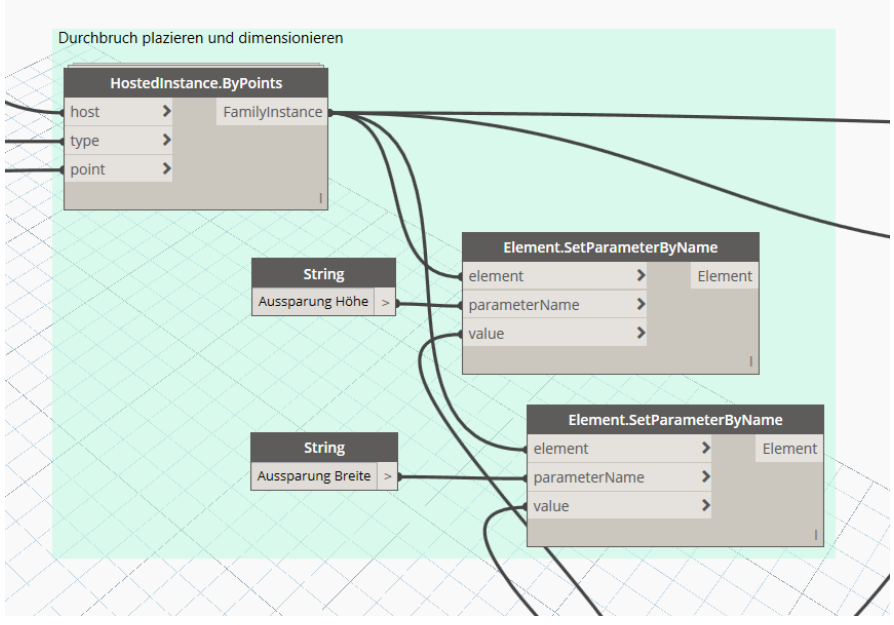
HPP
Architekten



Dynamo script, creating openings

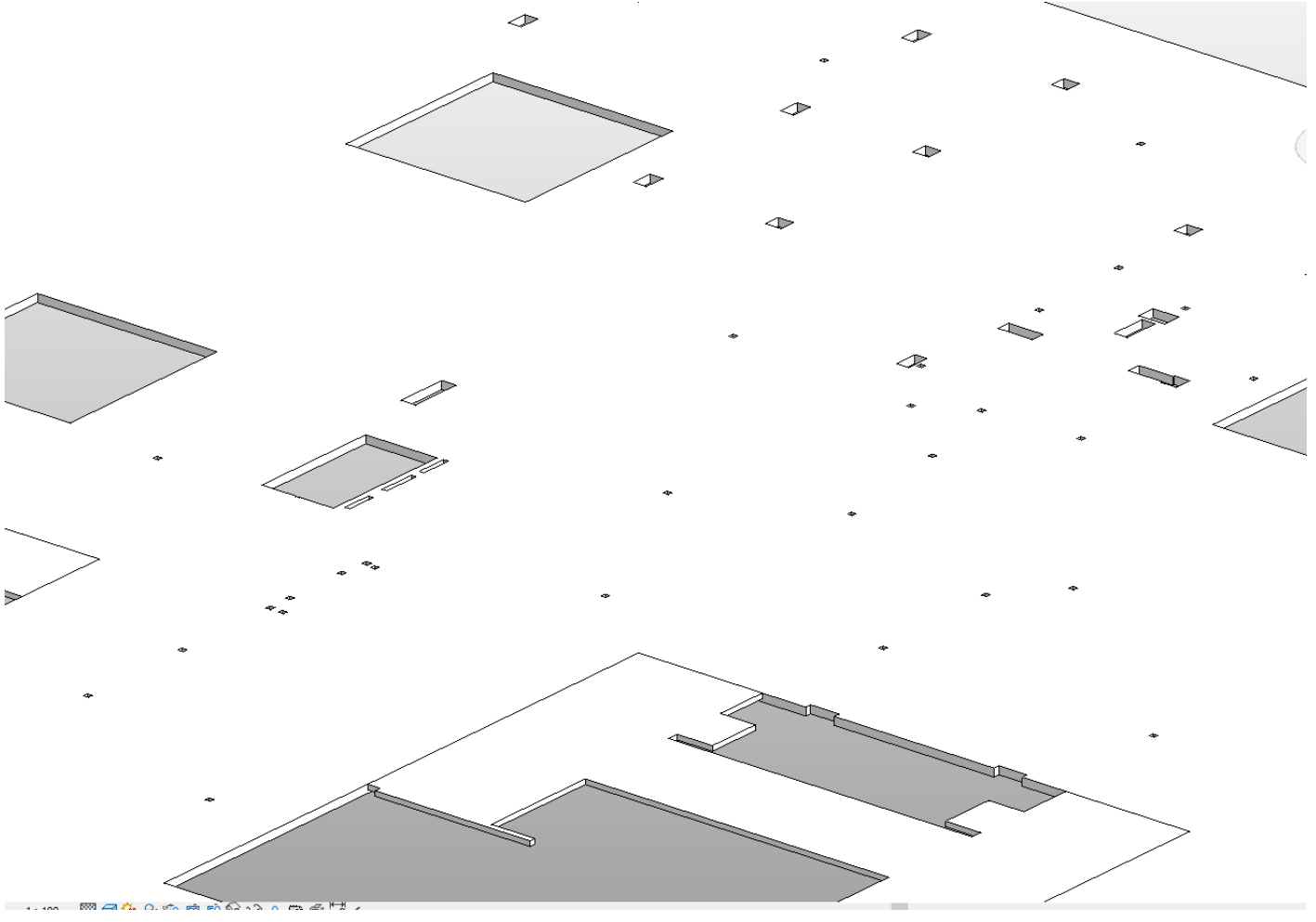
HPP Architekten



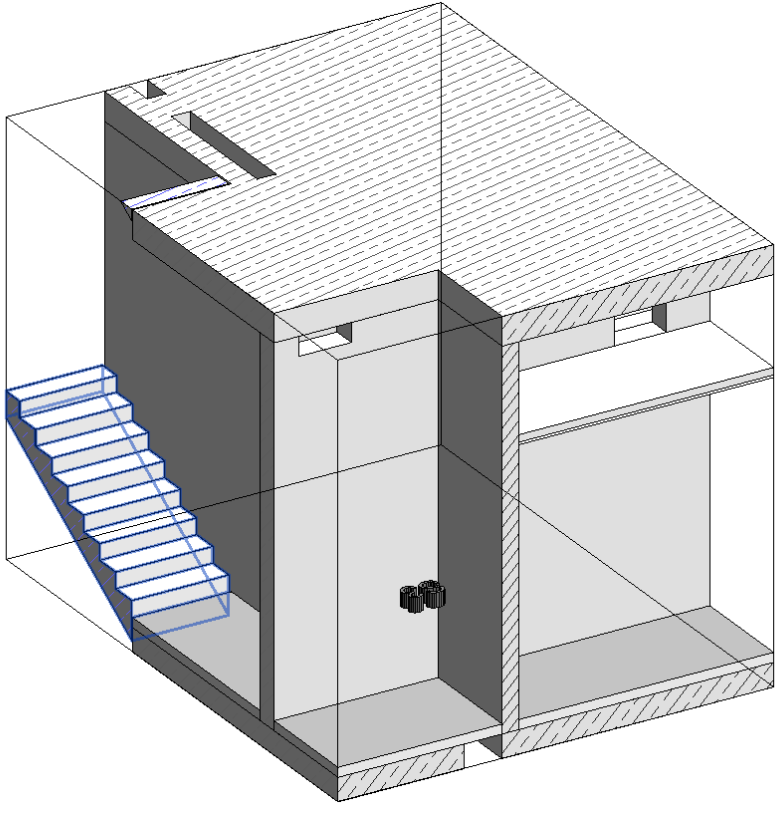


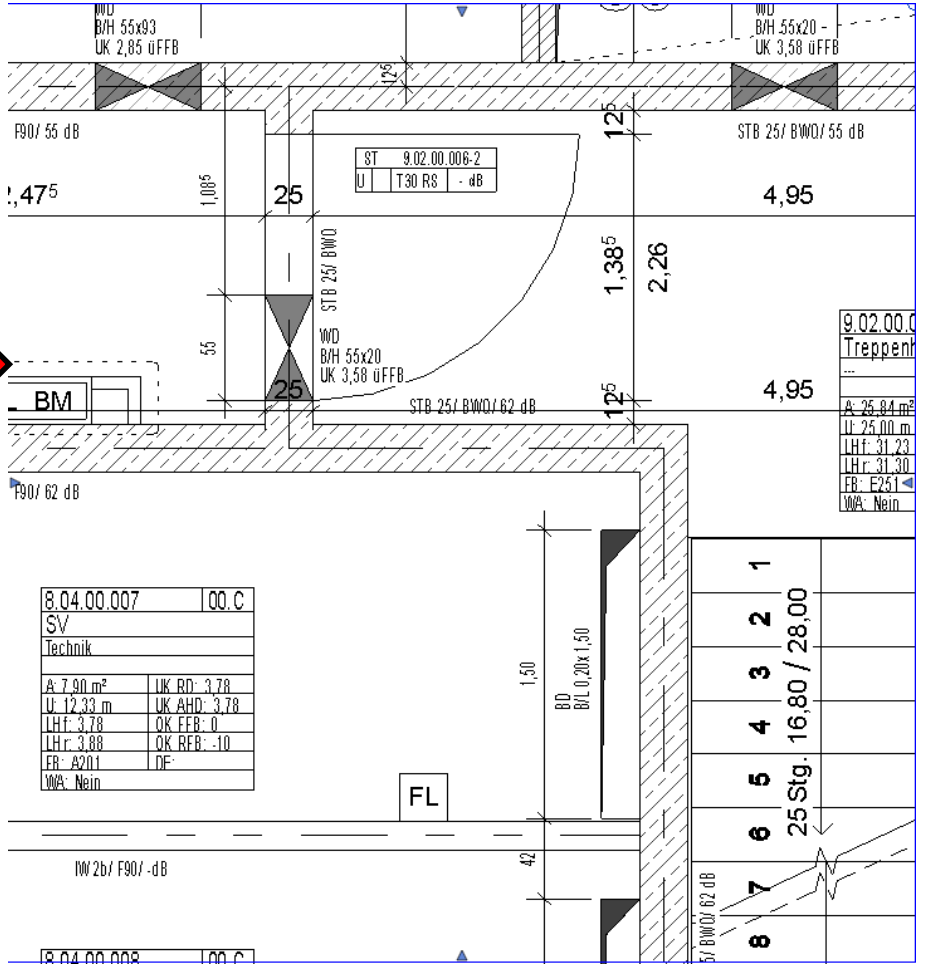
Openings in architectural model

HPP
Architekten

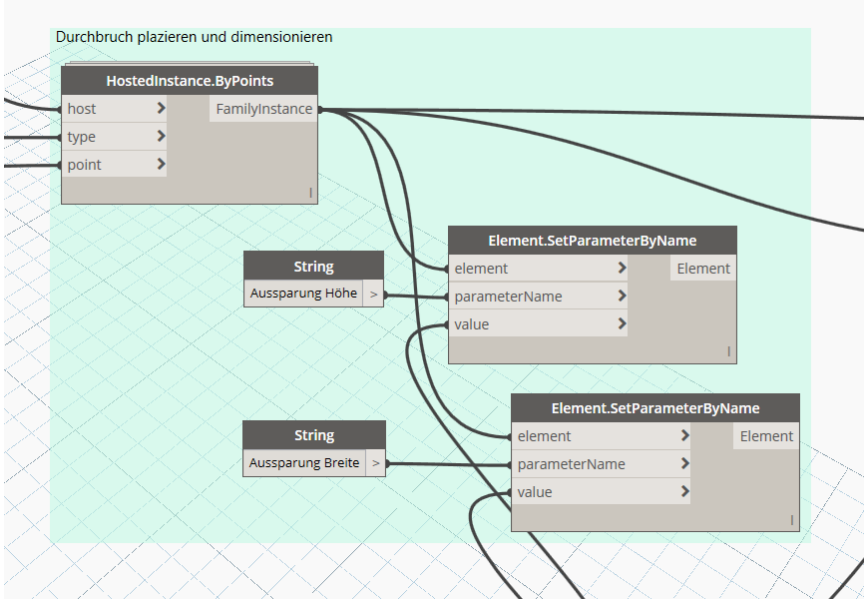


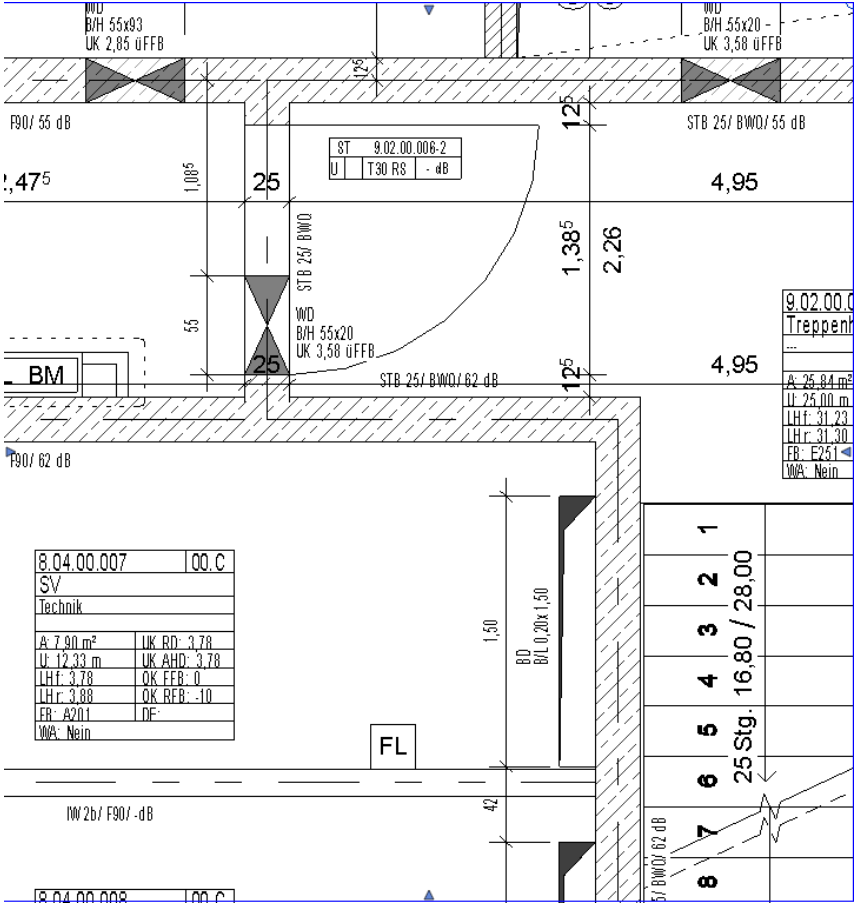
Generating 2D drawings from model

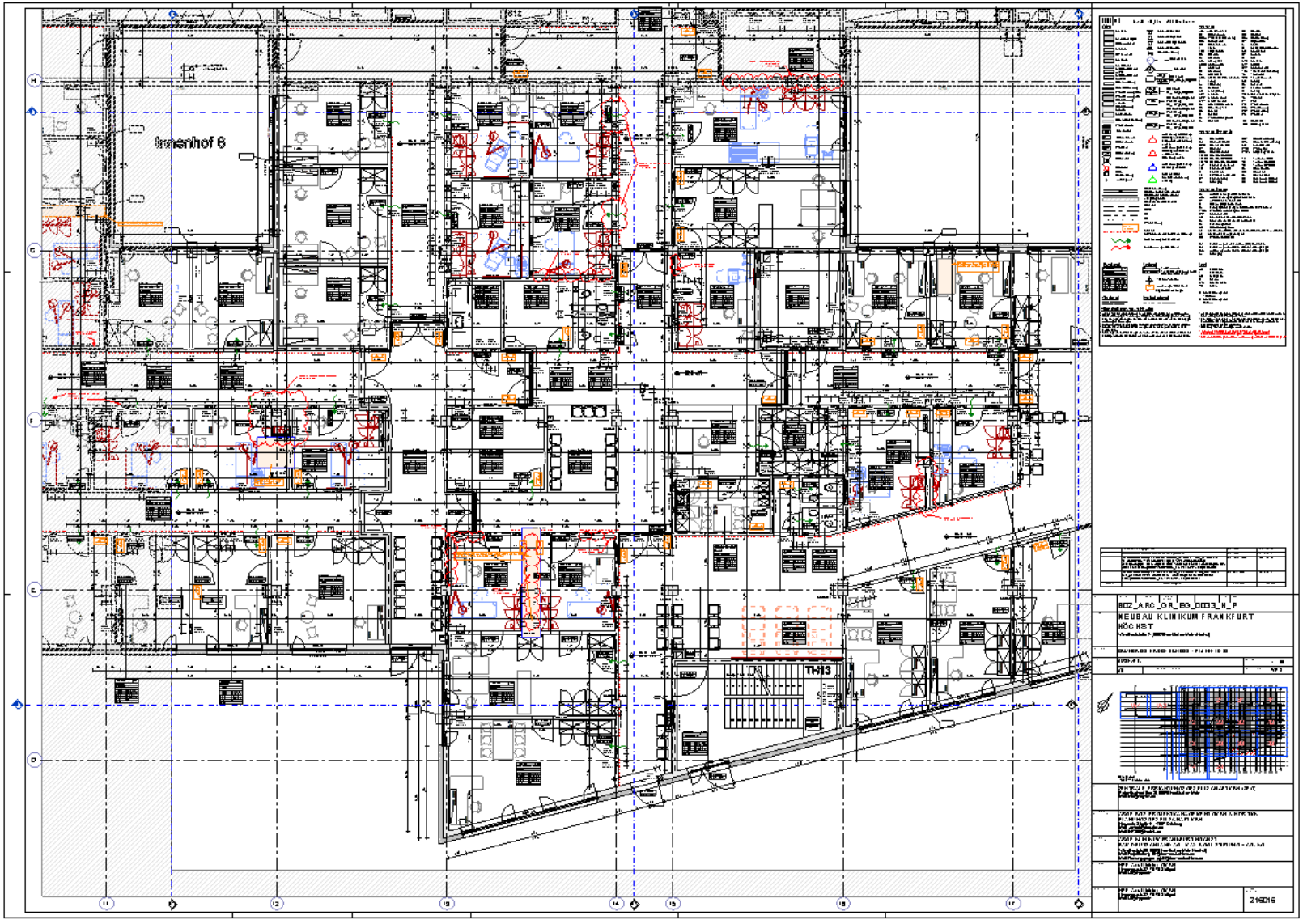




Updating by scripts





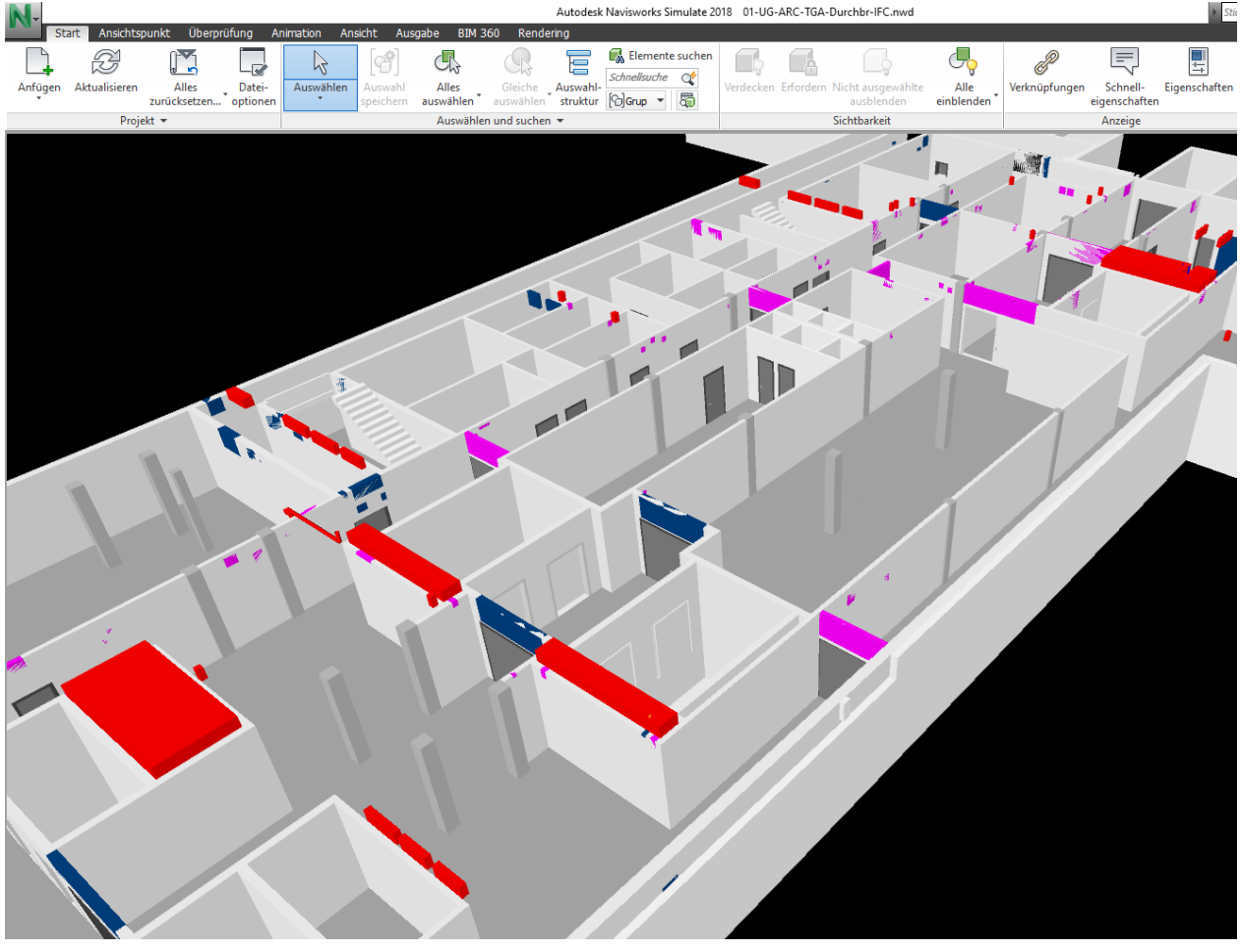


HPP

Architekten

Clash Detection: Openings vs Walls

HPP
Architekten

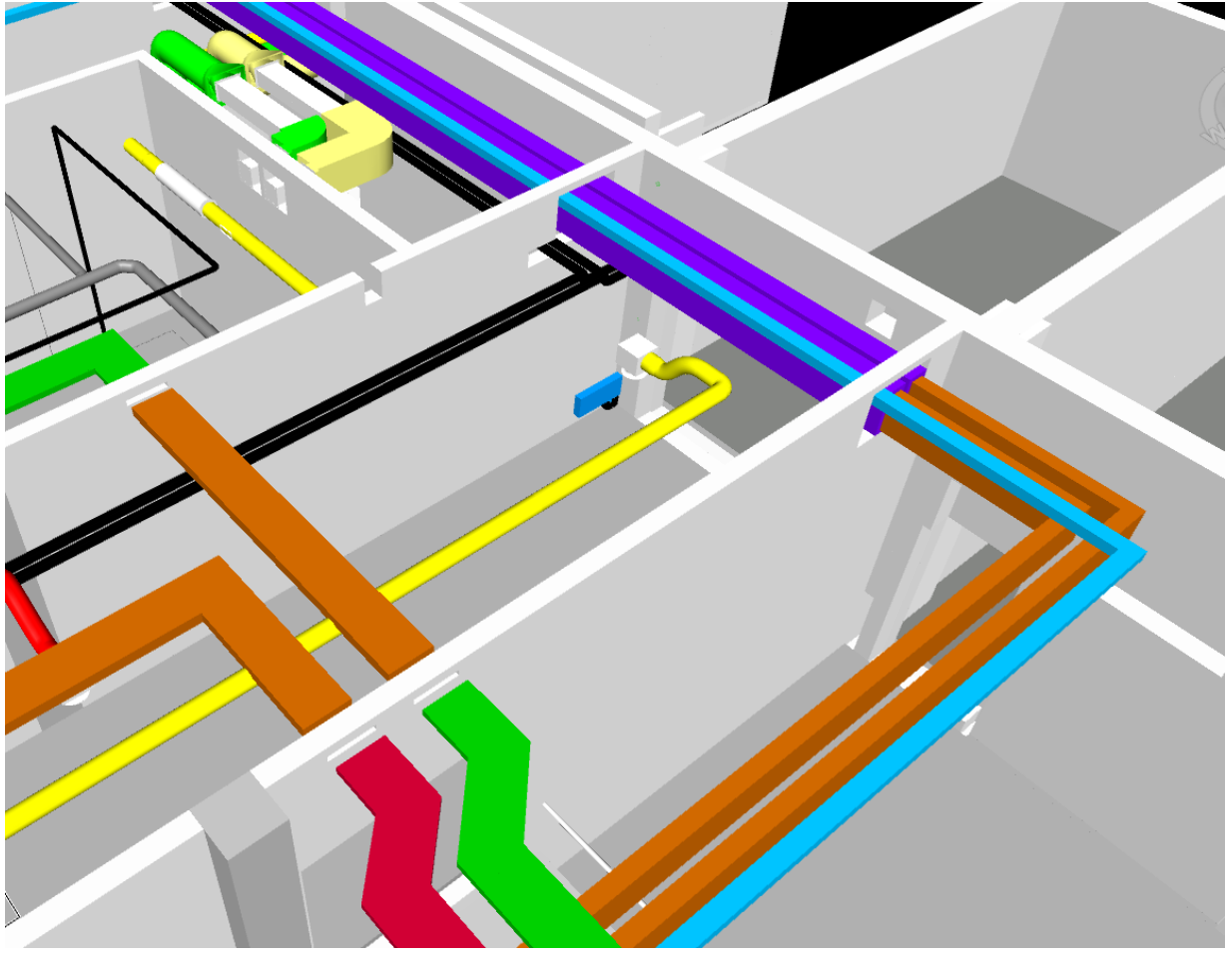


Openings: Visual check-up

HPP
Architekten

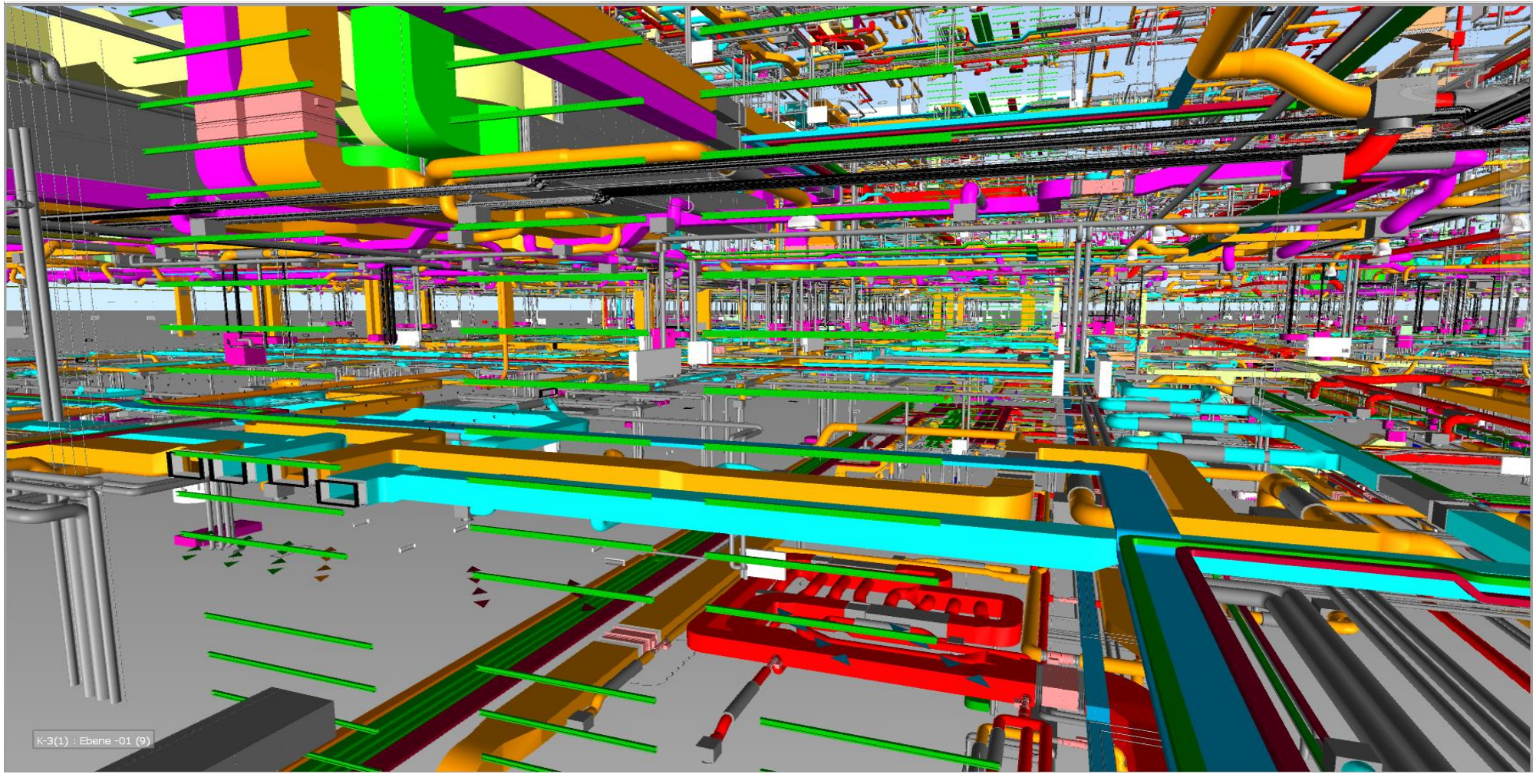
Openings: Visual check-up

HPP
Architekten



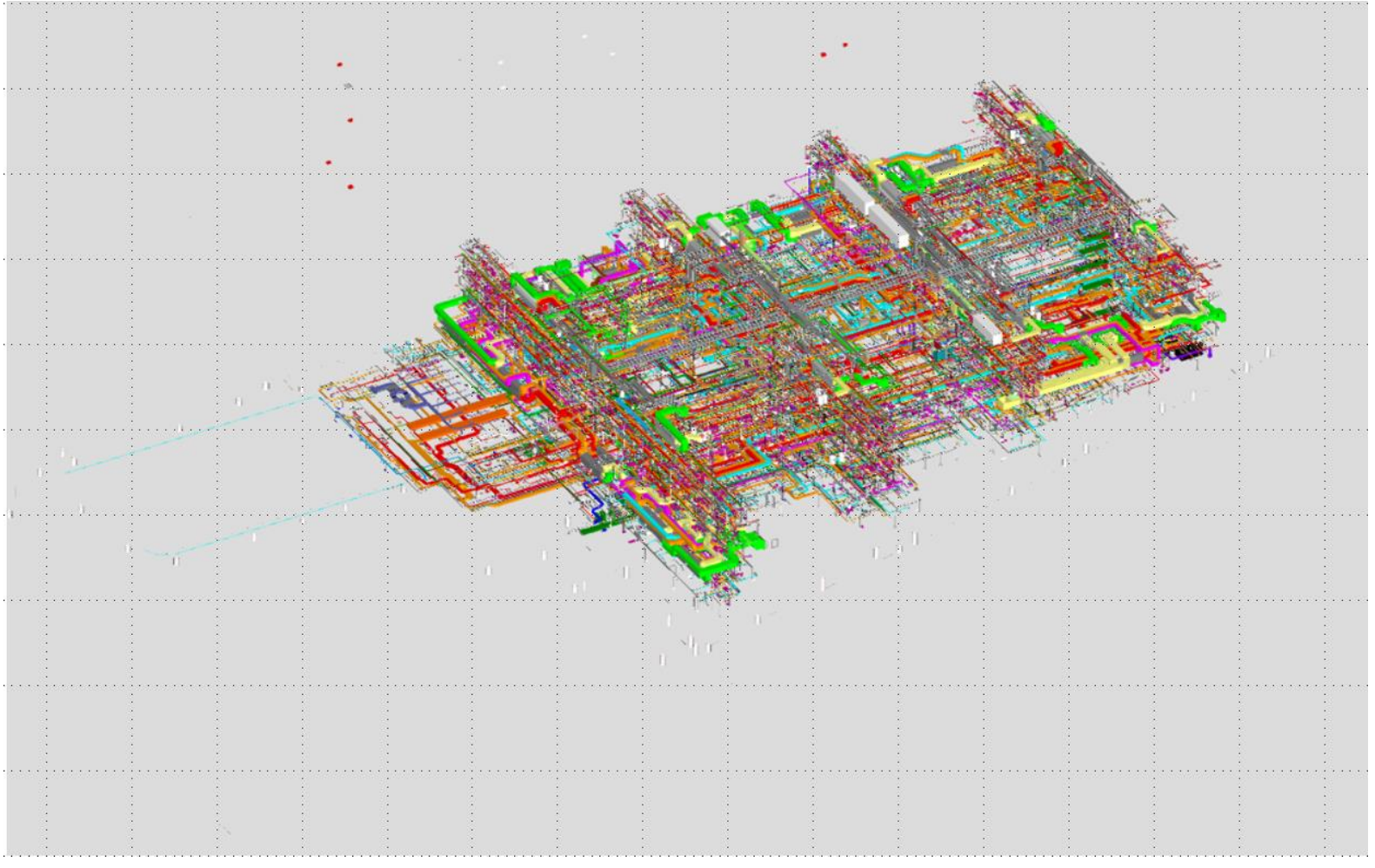
IFC model for coordination

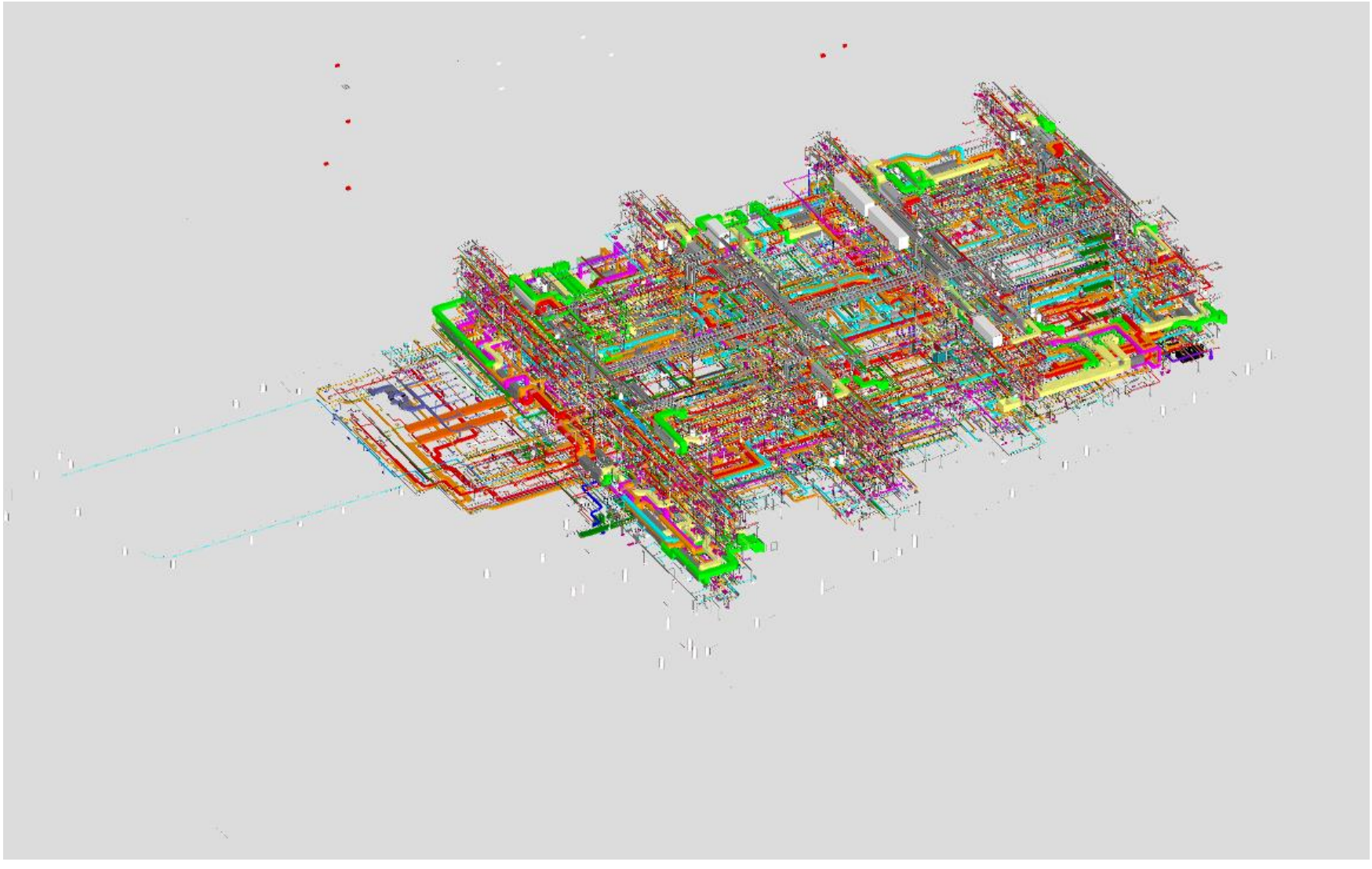
HPP Architekten



Coordination Architectural & MEP Models

HPP
Architekten



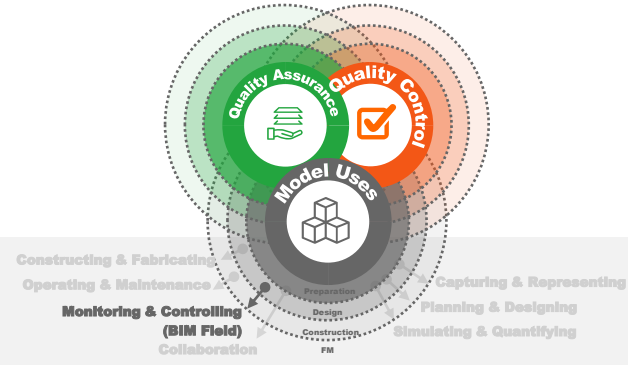


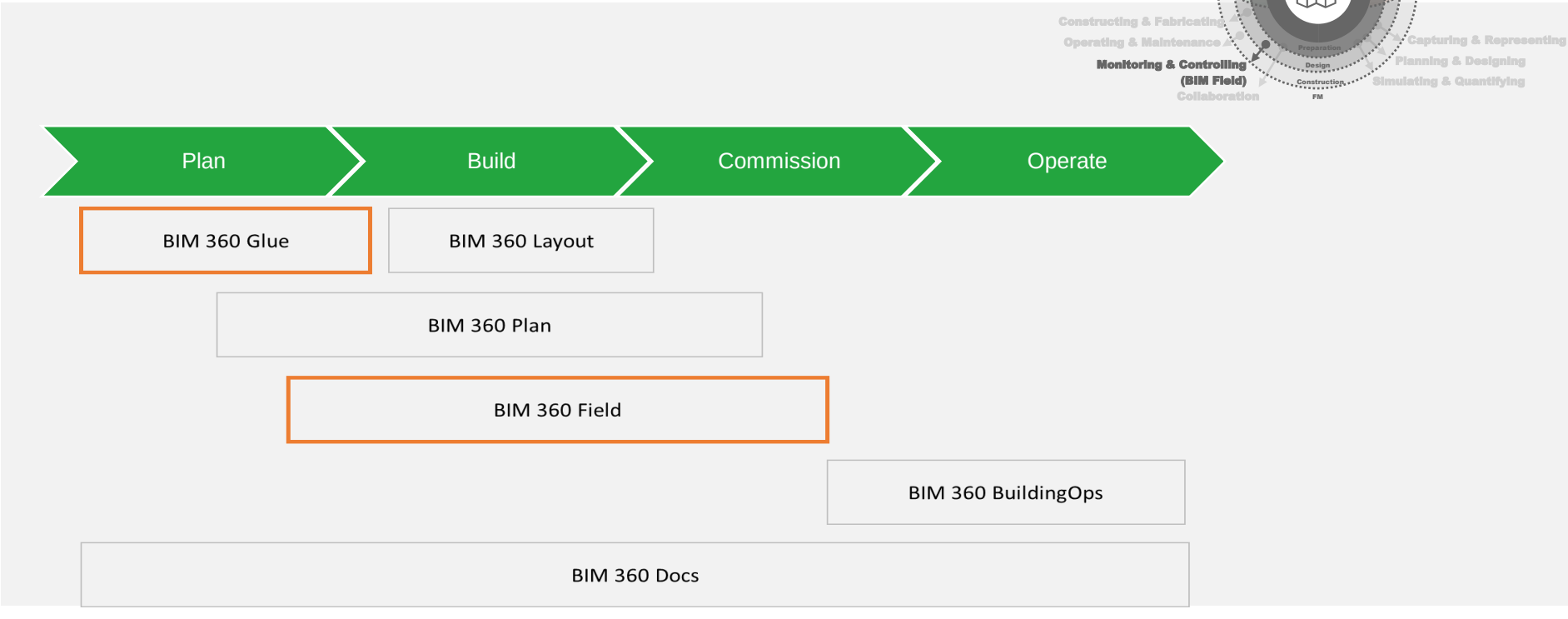
www.hpp.com

BIM on Site

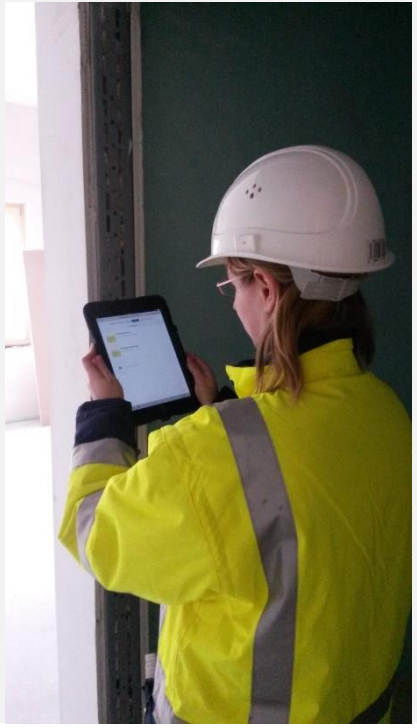
Timo Diebold
BIM-Coordinator on Site
BAM Deutschland AG

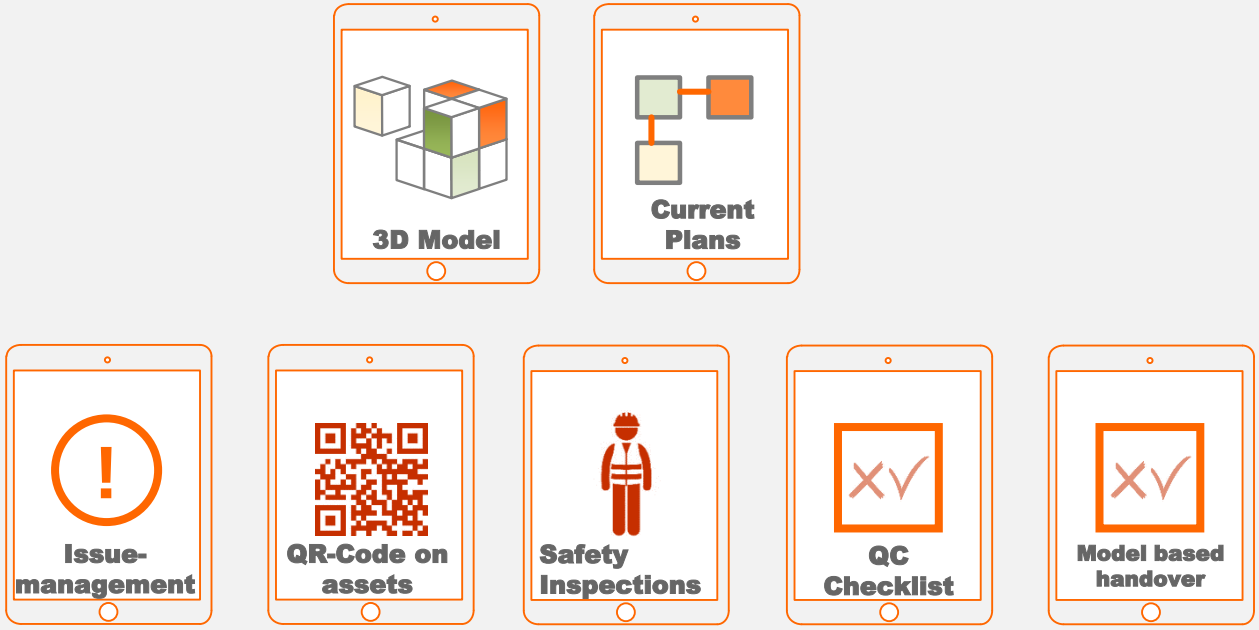
Monitoring and Controlling
Modell Based Construction Management





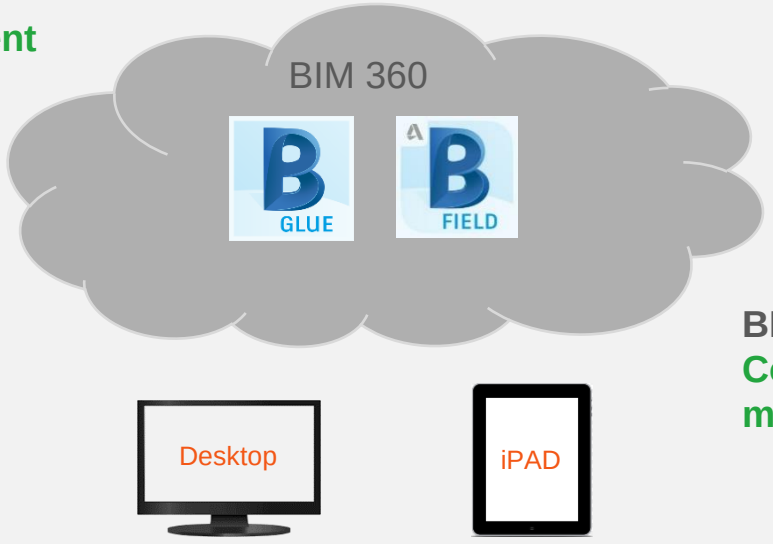
Monitoring and Controlling
Modell Based Construction Management





Monitoring and Controlling
Modell Based Construction Management

BIM 360 Glue
Model Management and Coordination



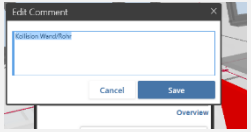
BIM 360 Field
Construction site management

BIM 360 Glue

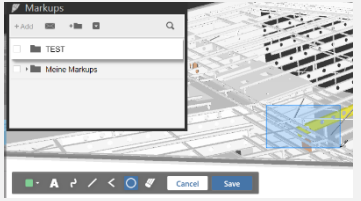
Desktop applications on PC

Views of preselected sections

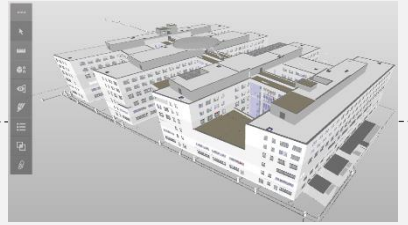
Communication



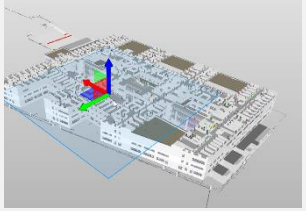
Communication - Markups



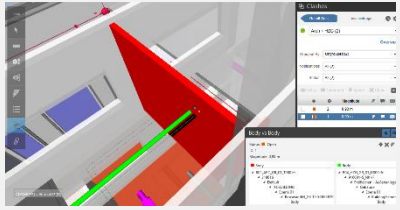
Access to the current model



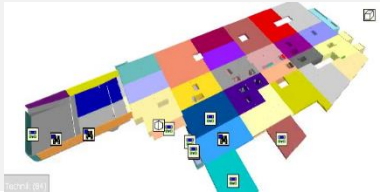
Section / Measure



Clash detection

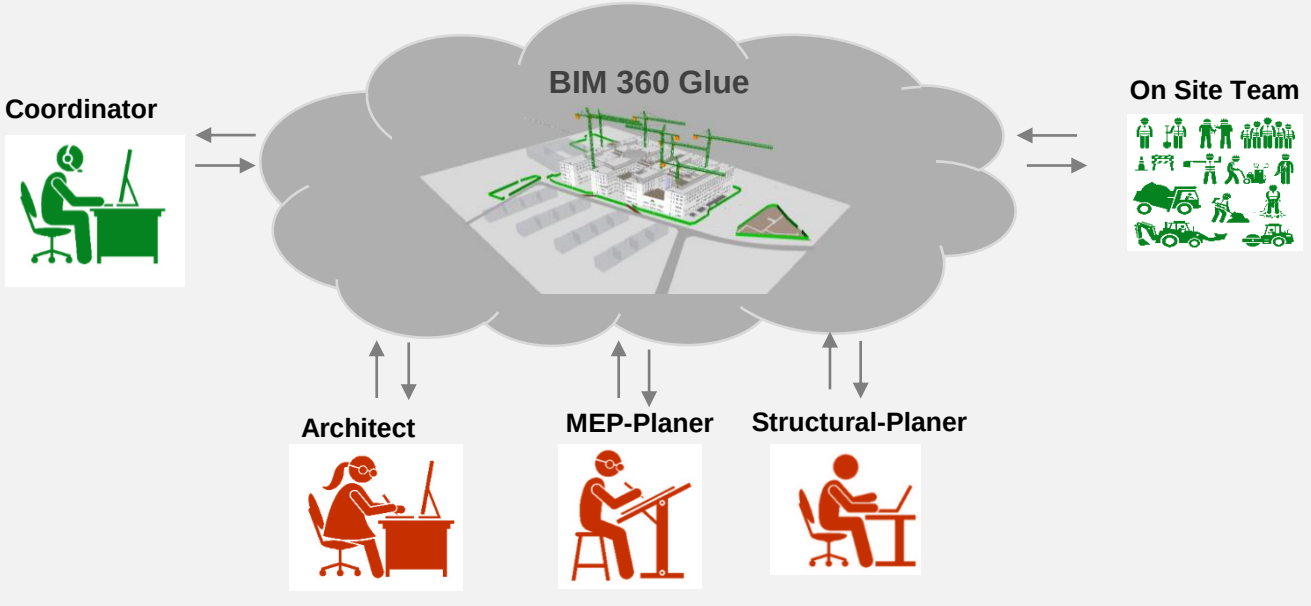


Search sets

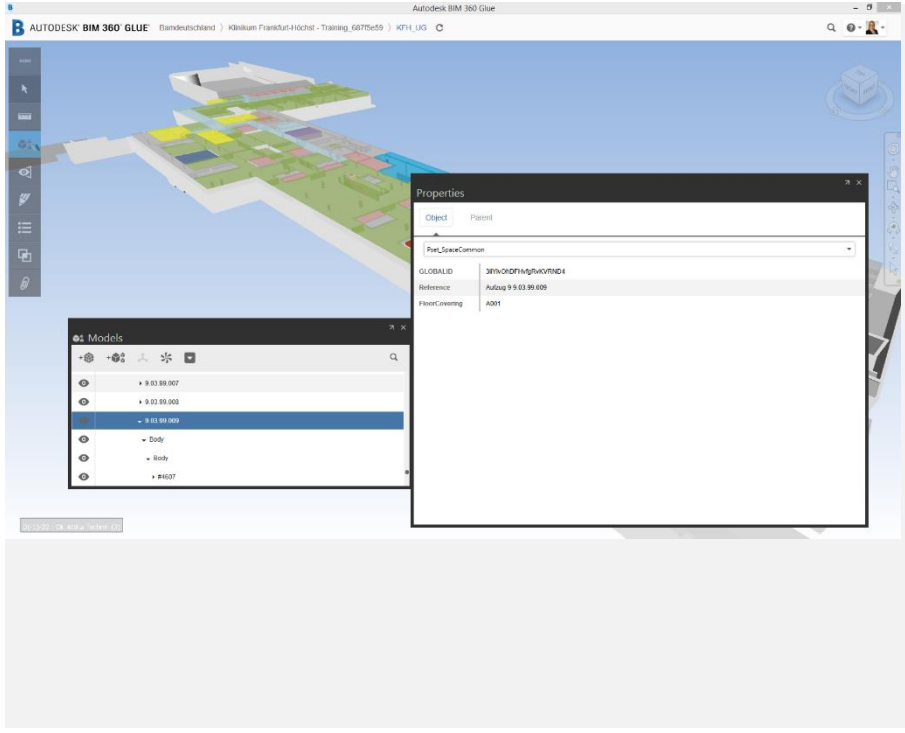


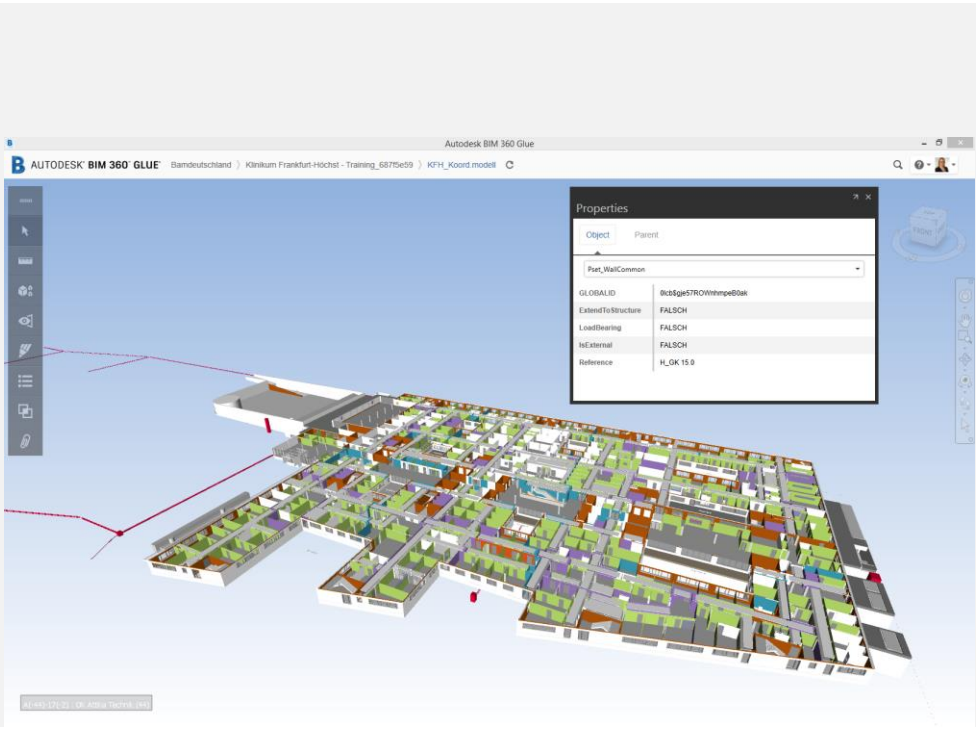
Model for the construction site

Participants On The Work Process



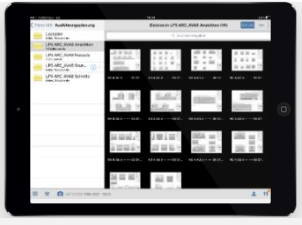
Generation of Element Sets via their Properties





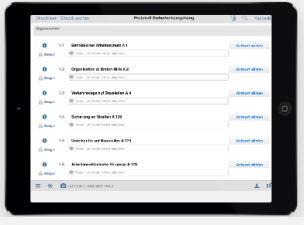
BIM 360 Field

Plan

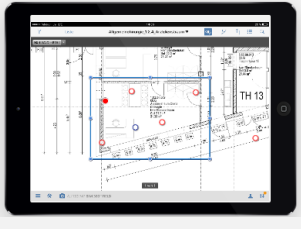


Model

Checklists



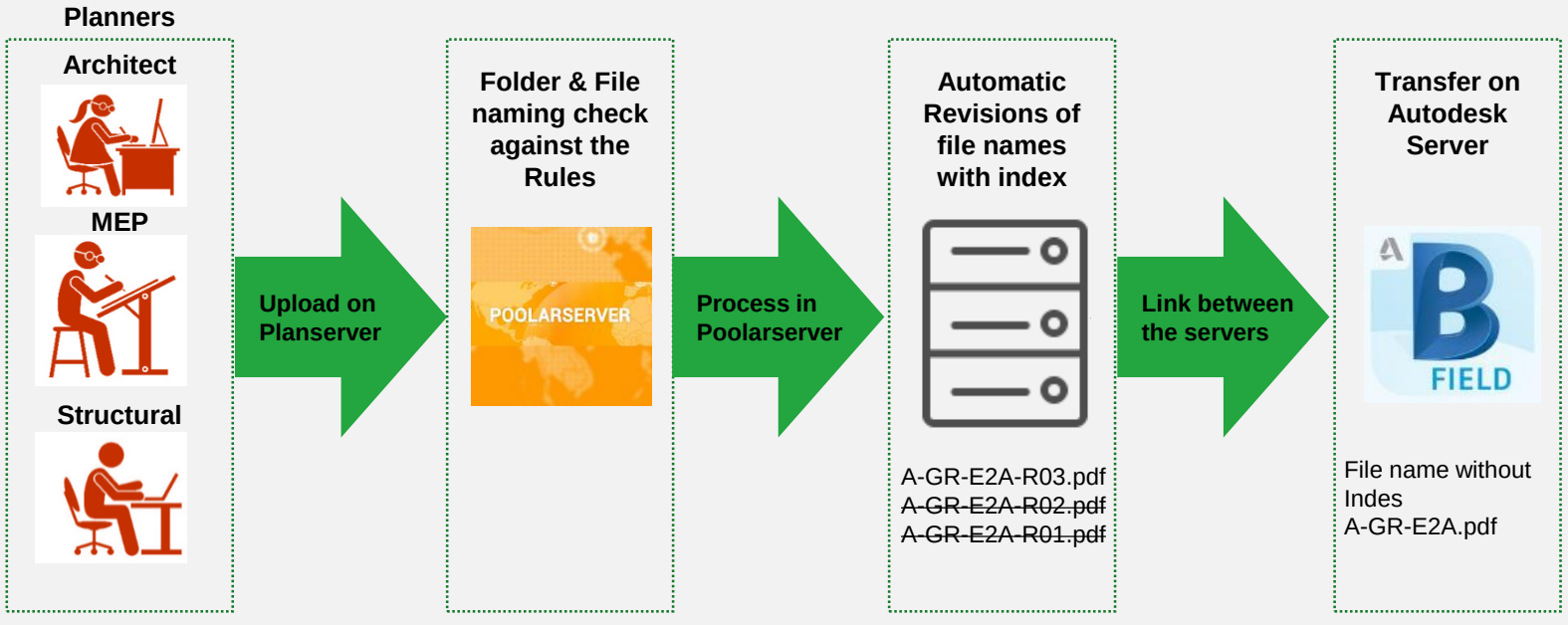
Defect survey



Building diary

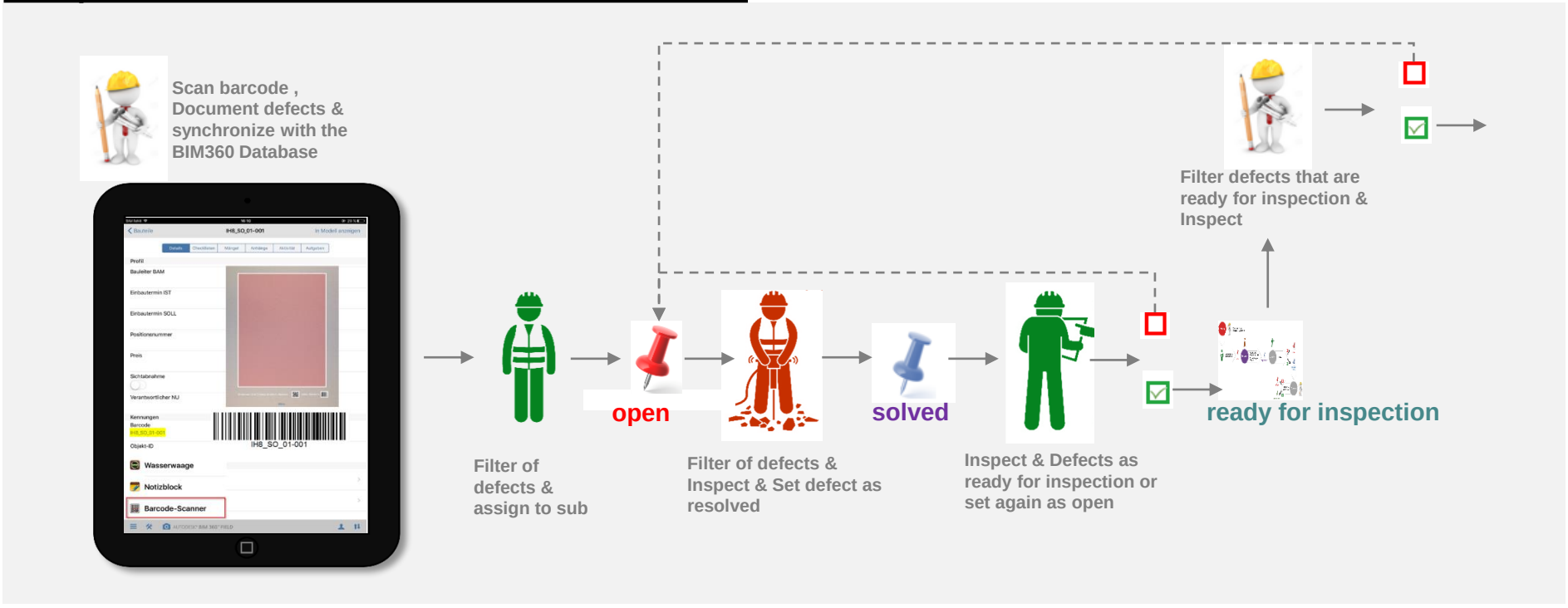
Documentation

Automatic Synchronization between Planserver - BIM360



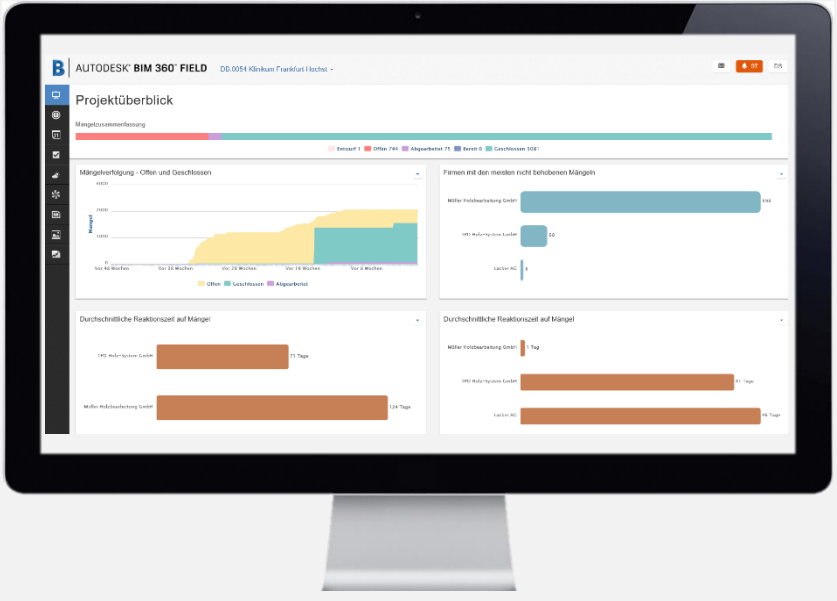
Model-Based Construction Management Workflow on a Tablet

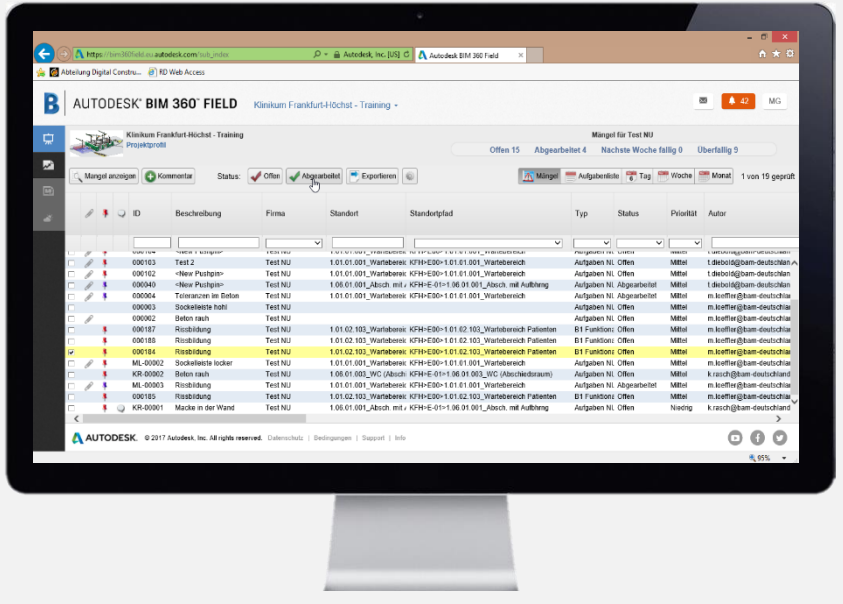
Acceptance of work and Documentation of defects



Model-Based Construction Management Evaluation on PC

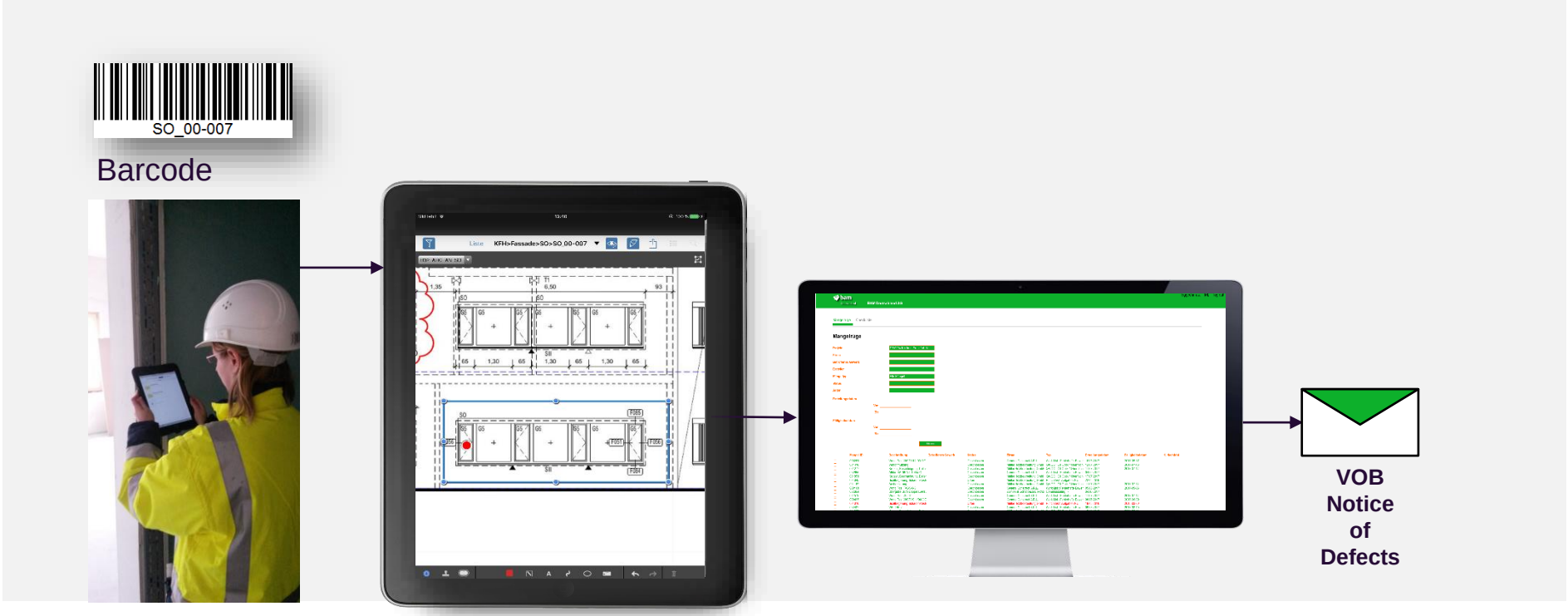
Acceptance of work and documentation of issues





Model-Based Construction Management Using a Tablet

VOB–Compliant Notice of Defects

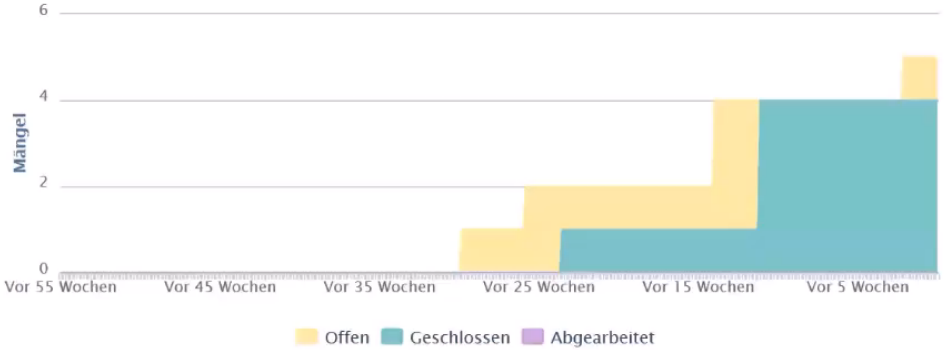


Projektüberblick

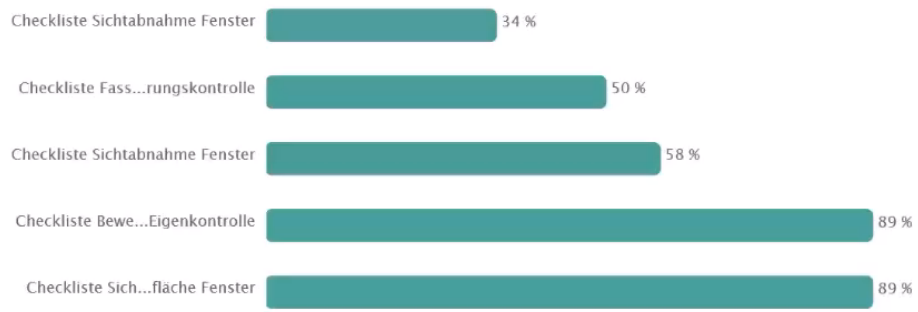
Mängelzusammenfassung

Entwurf 1 Offen 848 Abgearbeitet 84 Bereit 0 Geschlossen 3109

Mängelverfolgung - Offen und Geschlossen

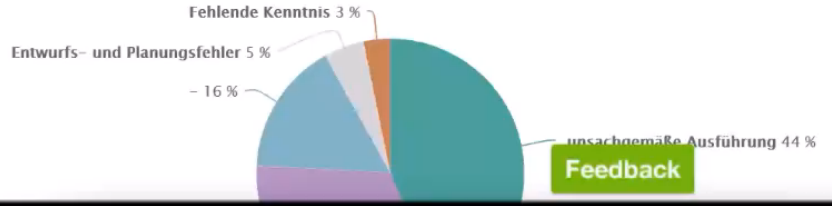


Checklisten-Konformität



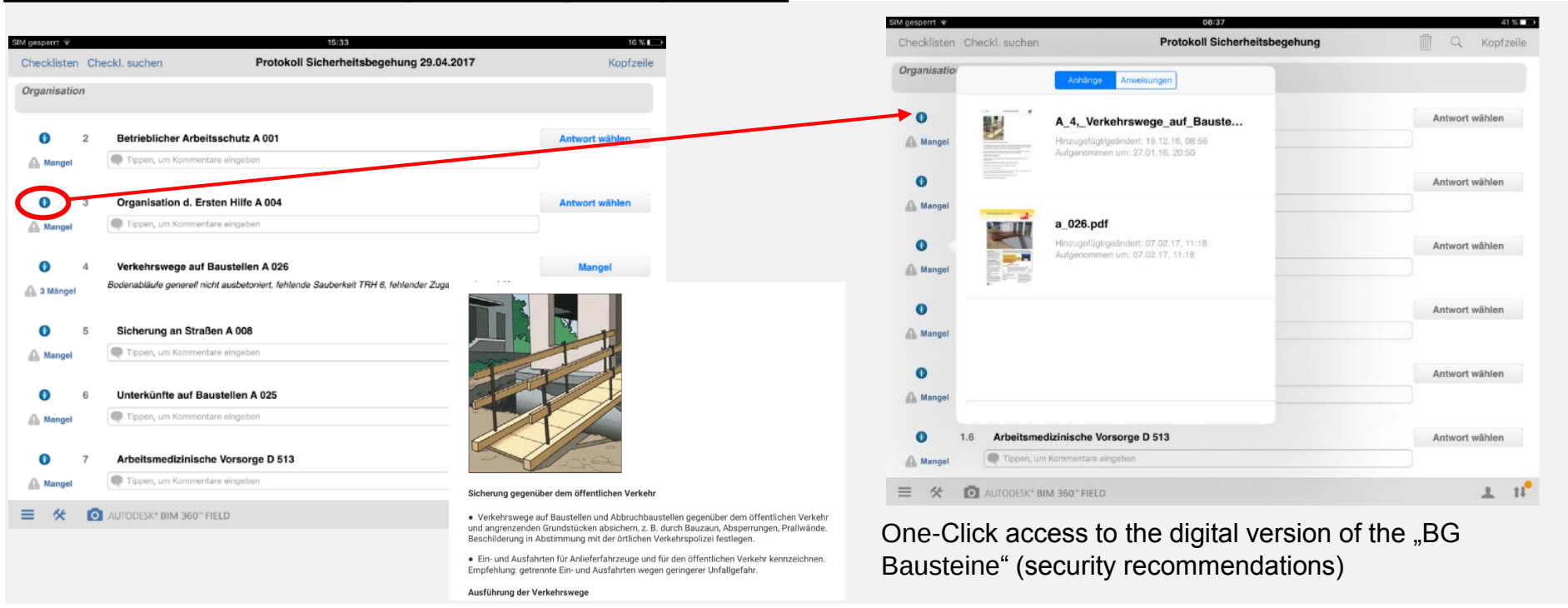
Durchschnittliche Reaktionszeit auf Mängel

Häufigste Fehlerursachen



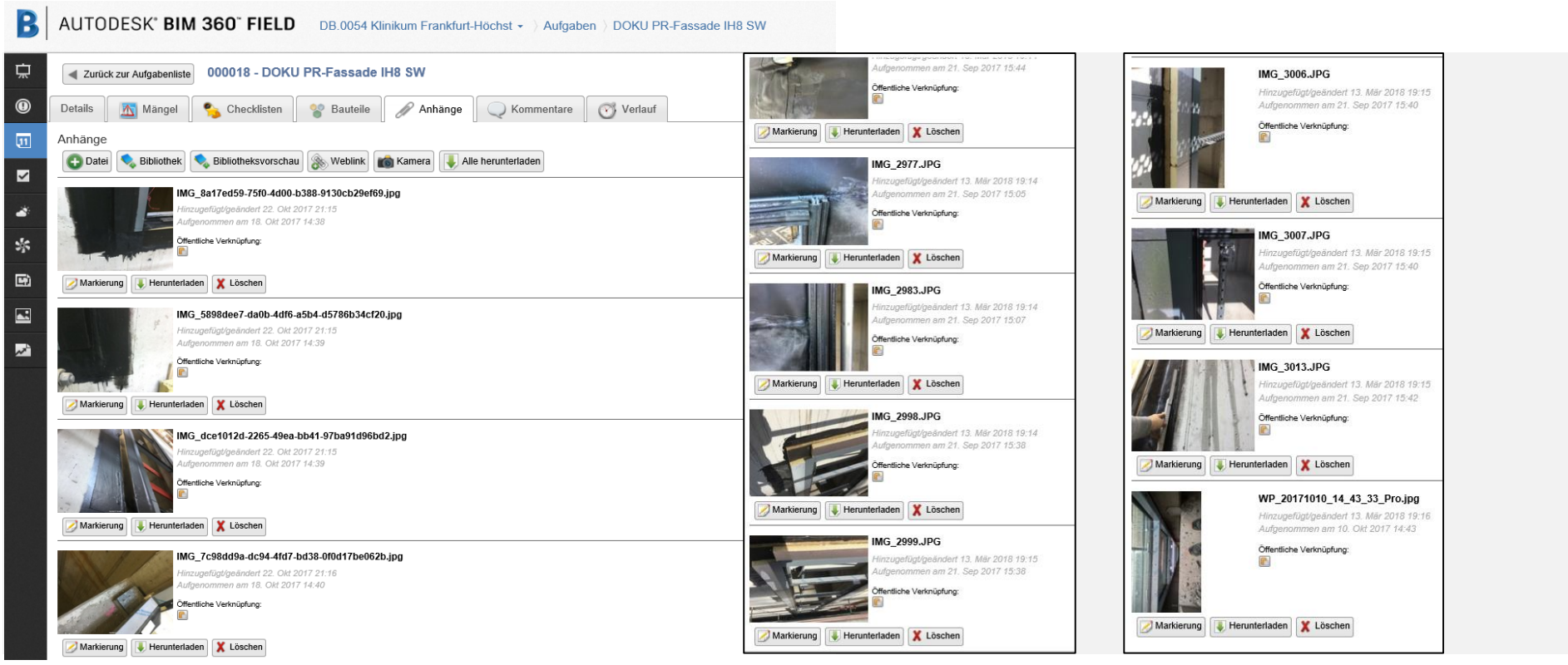
Checklists for Work Safety and Quality Control

Simulation of construction process– Quantity control



One-Click access to the digital version of the „BG Bausteine“ (security recommendations)

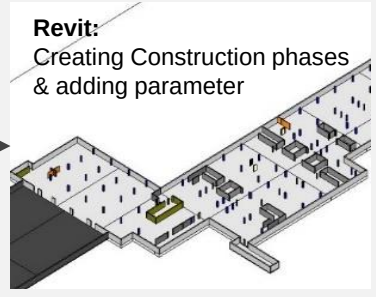
Documenting the Construction Progress



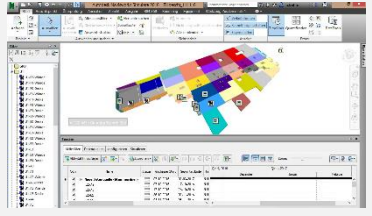
Simulating & Quantifying

Architectural Revit Model

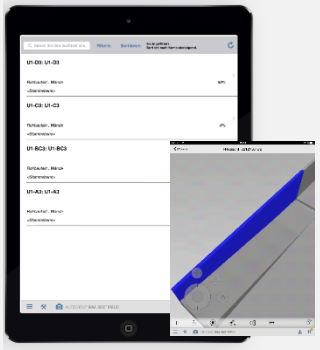
Revit:
Creating Construction phases & adding parameter



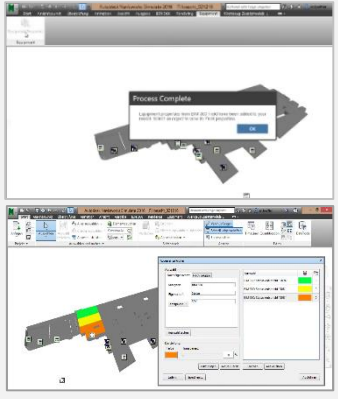
Navisworks:
Link with Schedule



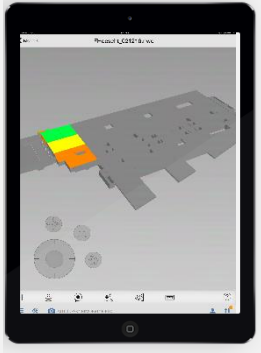
BIM 360
Construction status update of the phase like 30%, 50%, 80%, 100%



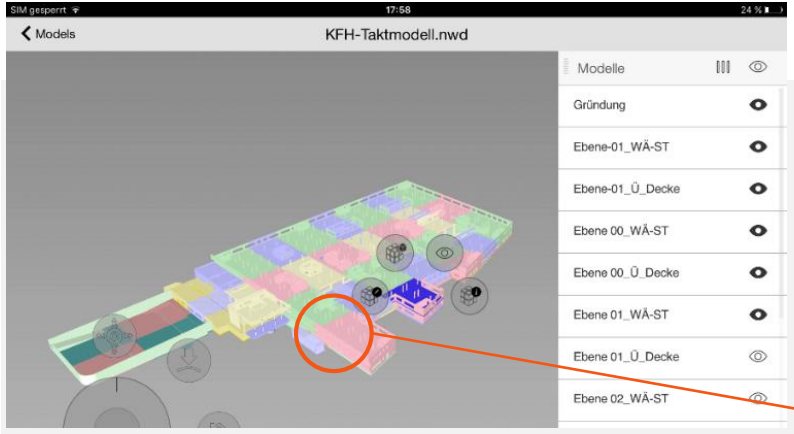
Navisworks
Synchronizing the construction status, Updating visualization

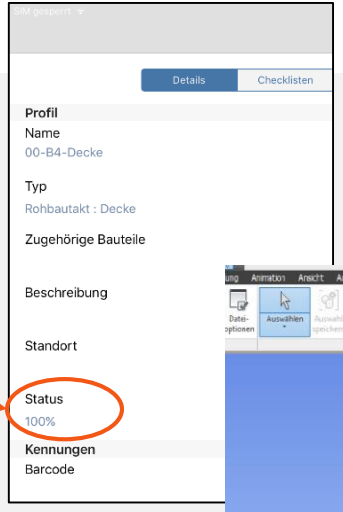


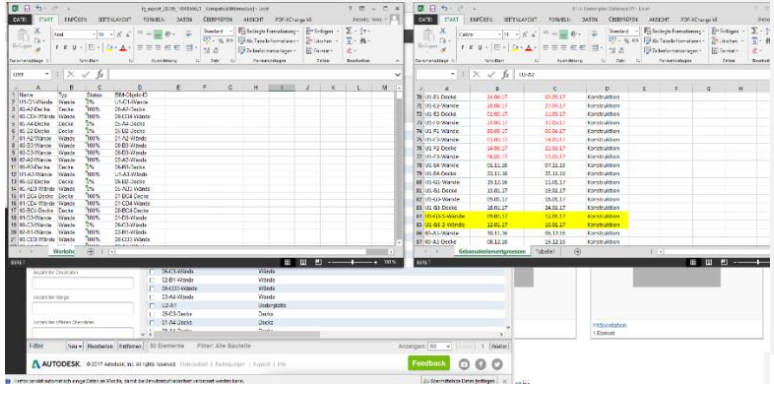
On-Site
Visualization the construction status

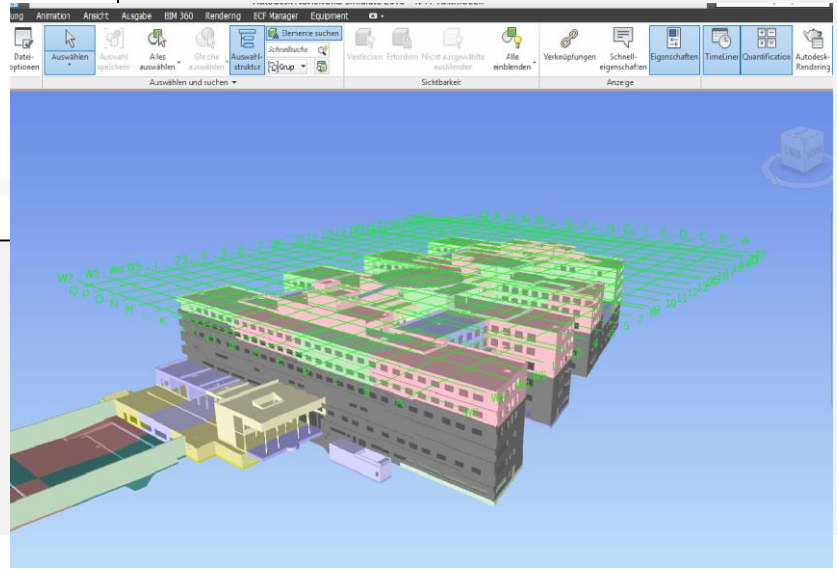


Simulating & Quantifying



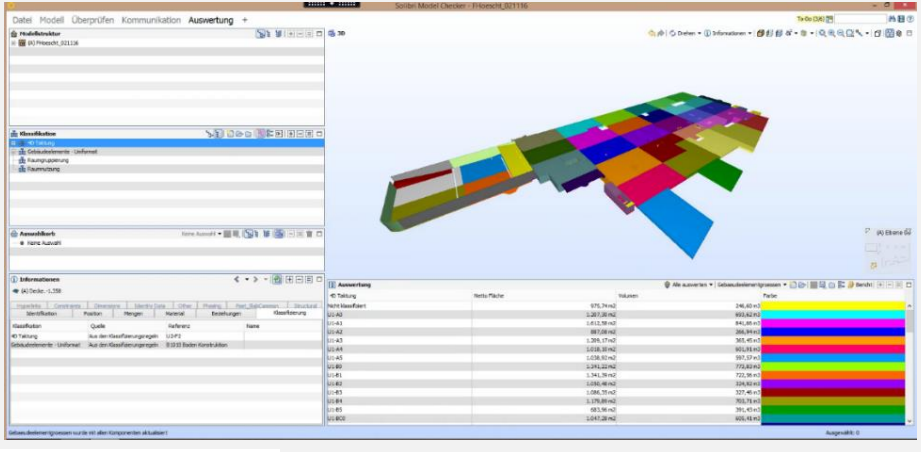






Simulating & Quantifying

Construction Simulation – Controlling the Quantities



Construction Site Monthly Report (Quantities from Construction Dairy)

1.7 Einbau/Montage der Hauptmassen in der Rohbauphase

Beton:	gesamt: ~ 50.000 m³	Stand 10.02.2017: ~ 20.000 m³
Stahl:	gesamt: ~ 8.300 to	Stand 10.02.2017: ~ 3.500 to

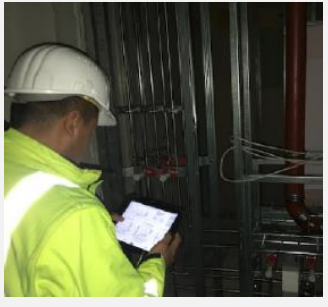
Schalungseinsatz:
Wandschalung -> Schalungsbericht vom 31.01.2017: 2.400 m²
Deckenschalung -> Schalungsbericht vom 31.01.2017: 3.900 m²

Quantities from Construction Simulation (Model linked with Schedule)

89	00-B4-Wände	Ebene 00	08.02.17	14.02.17	55,62	
90	00-B2-Decke	Ebene 00	07.02.17	16.02.17	177,78	
91	00-CD2-Wände	Ebene 00	10.02.17	16.02.17	26,02	
92	00-CD3-Wände	Ebene 00	09.02.17	16.02.17	20,74	20030,09
93	00-A4-Decke	Ebene 00	06.02.17	17.02.17	209,58	

On-Site Applications

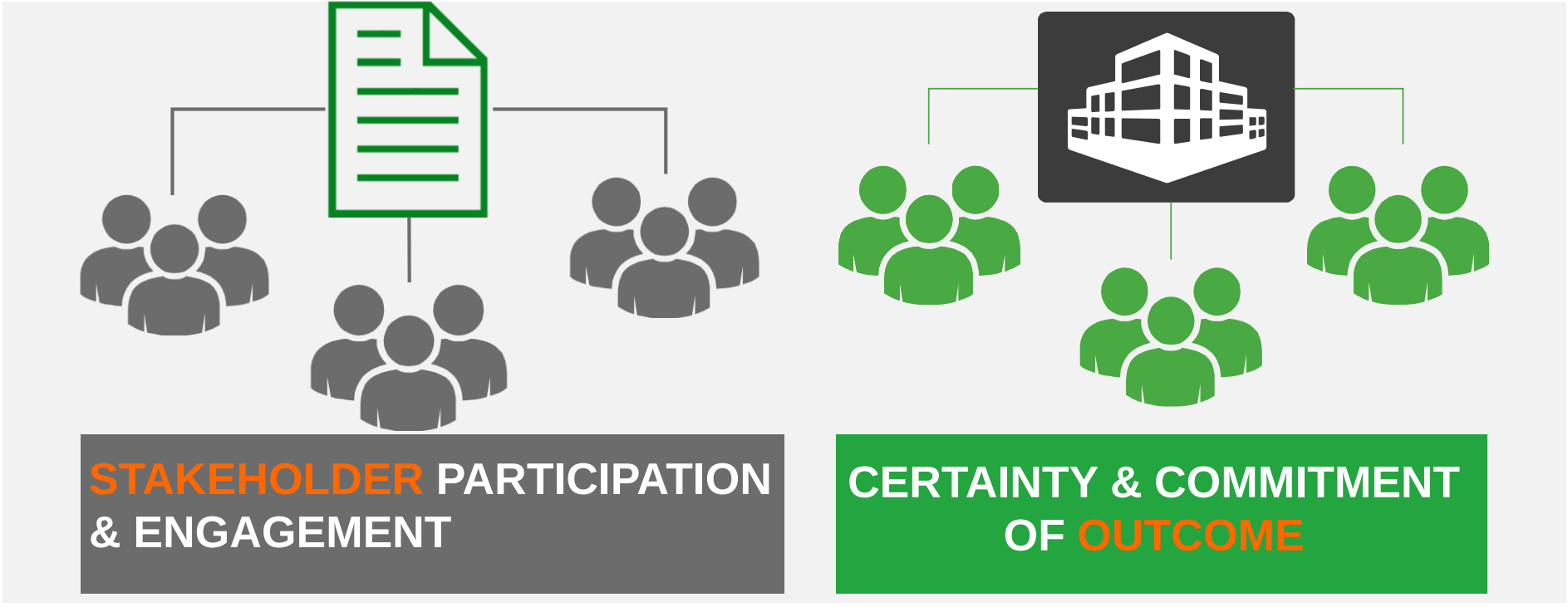
Barcode Applications



Lessons Learned

Dr.-Ing. Amir Elmahdi
Head of Digital Construction – BAM Deutschland AG

You must have always a BEP in Place



Automate Everything, if it is requested…

’’My role as an Architect is to find technology that eliminates waste“

Frank Gehry

ACCURACY + CONSISTENCY + SPEED

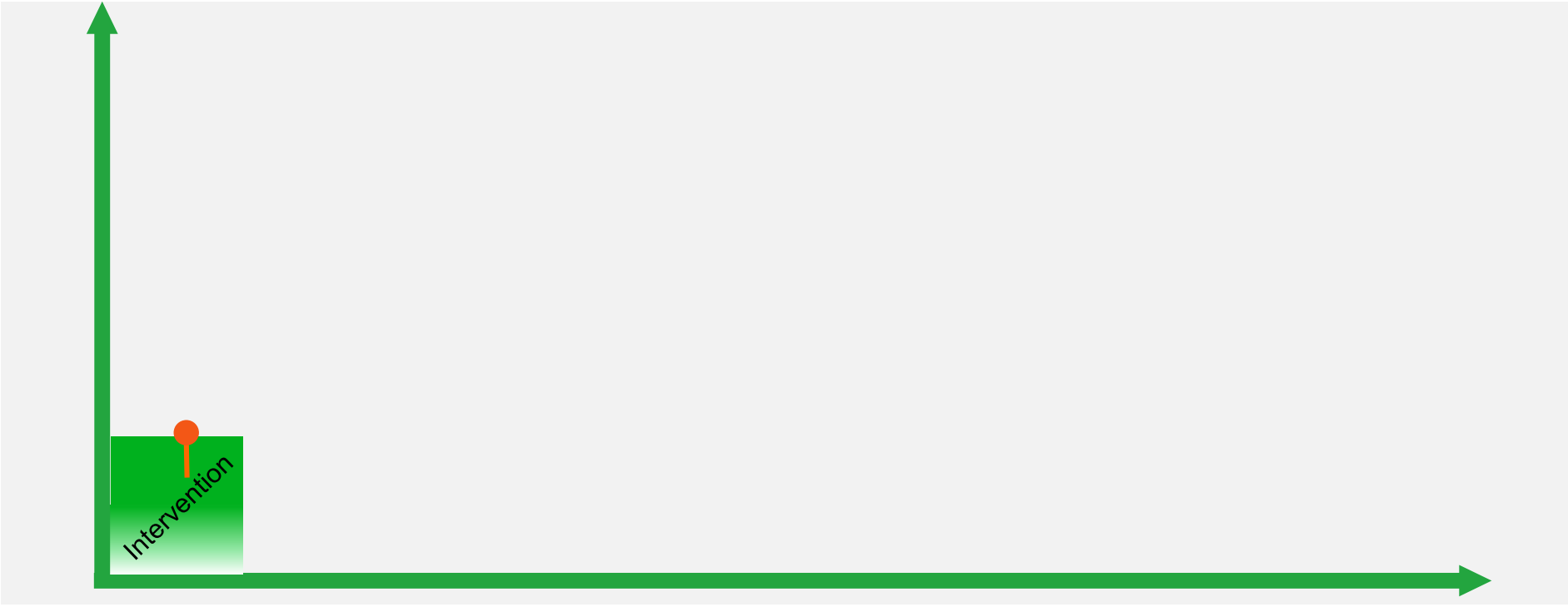
Lasting Relationship: Internally & Externally

- The right mind-set and culture is your greatest assets
  - Provide leadership and guidance
  - Earn trust
  - Develop relationship with site team
  - Use your partner experience to fill your knowledge gaps

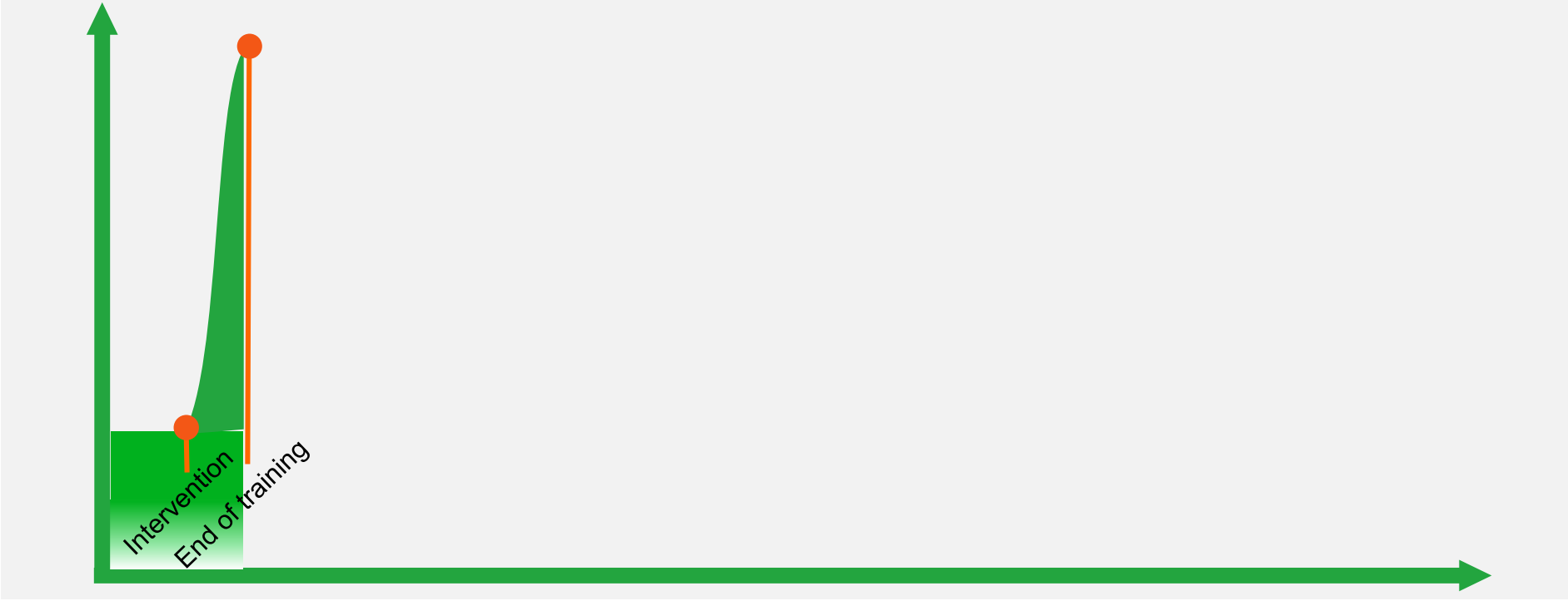
Effective Training program

- Train key Management to understand the BIM process
- Train for all potential users and stakeholder
- Well developed and documented processes

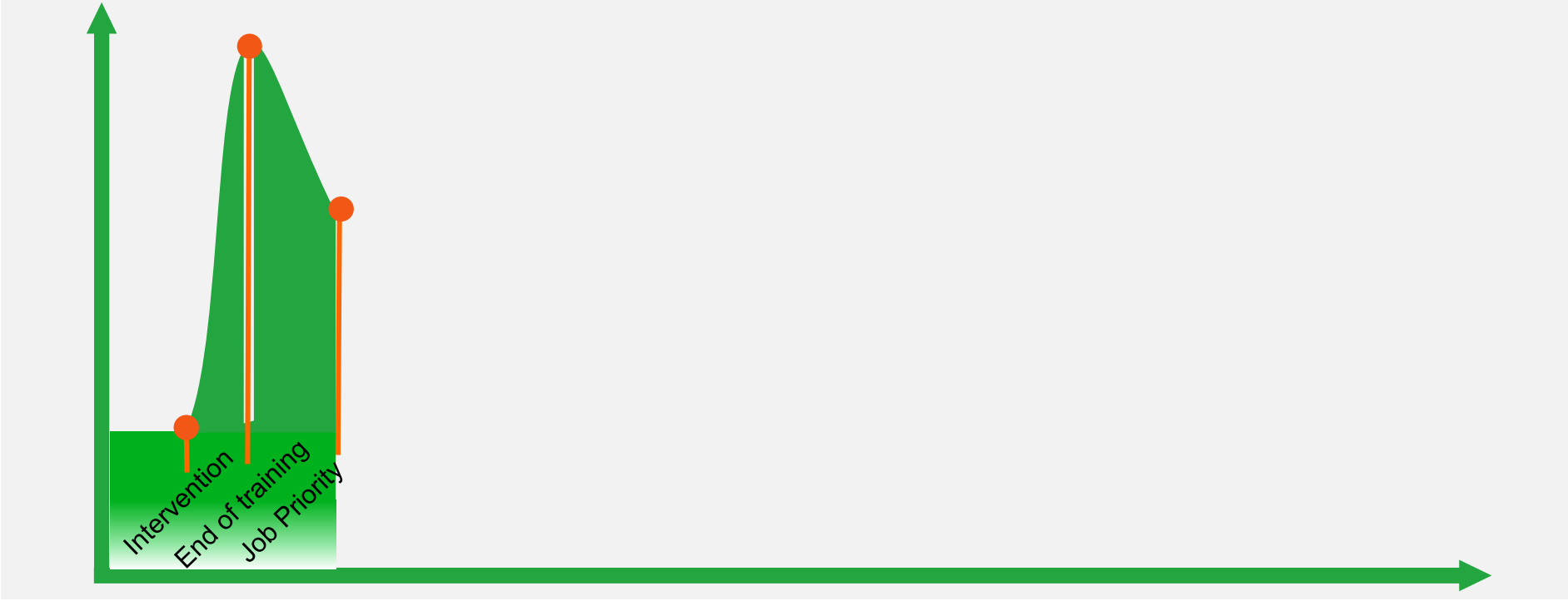
How we measure our sucess



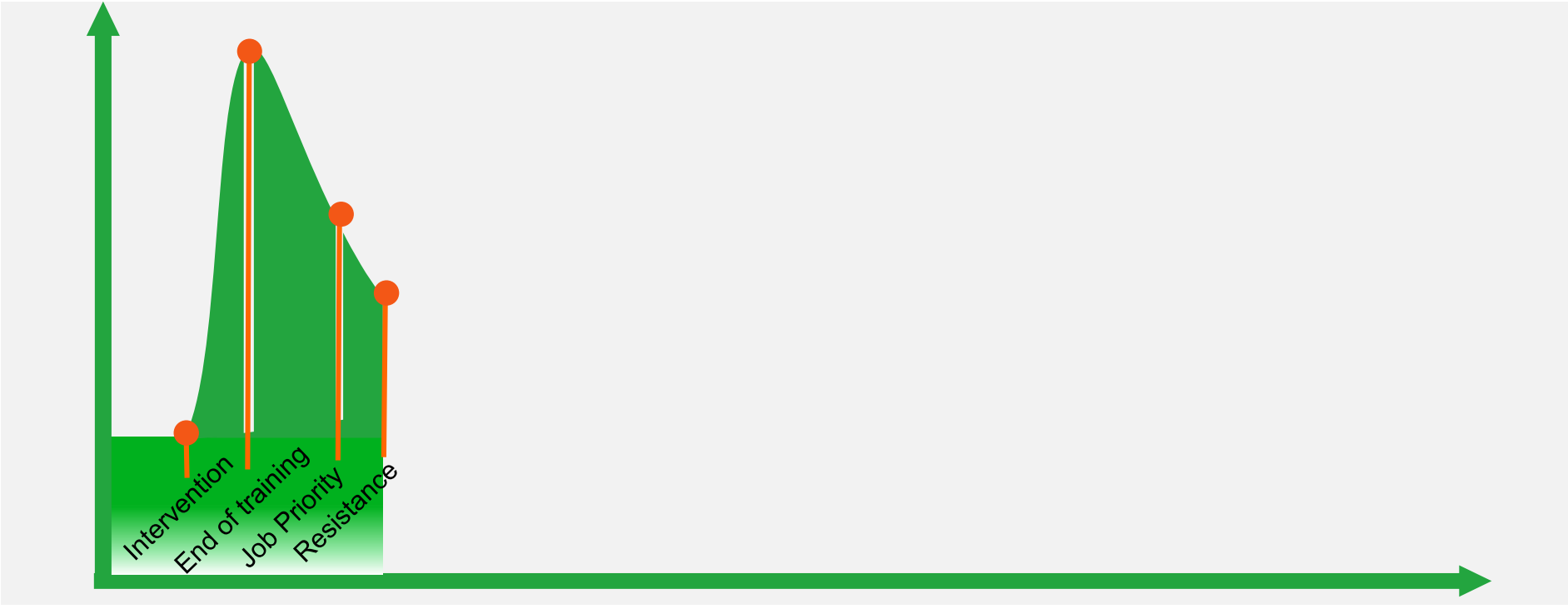
How we measure our sucess



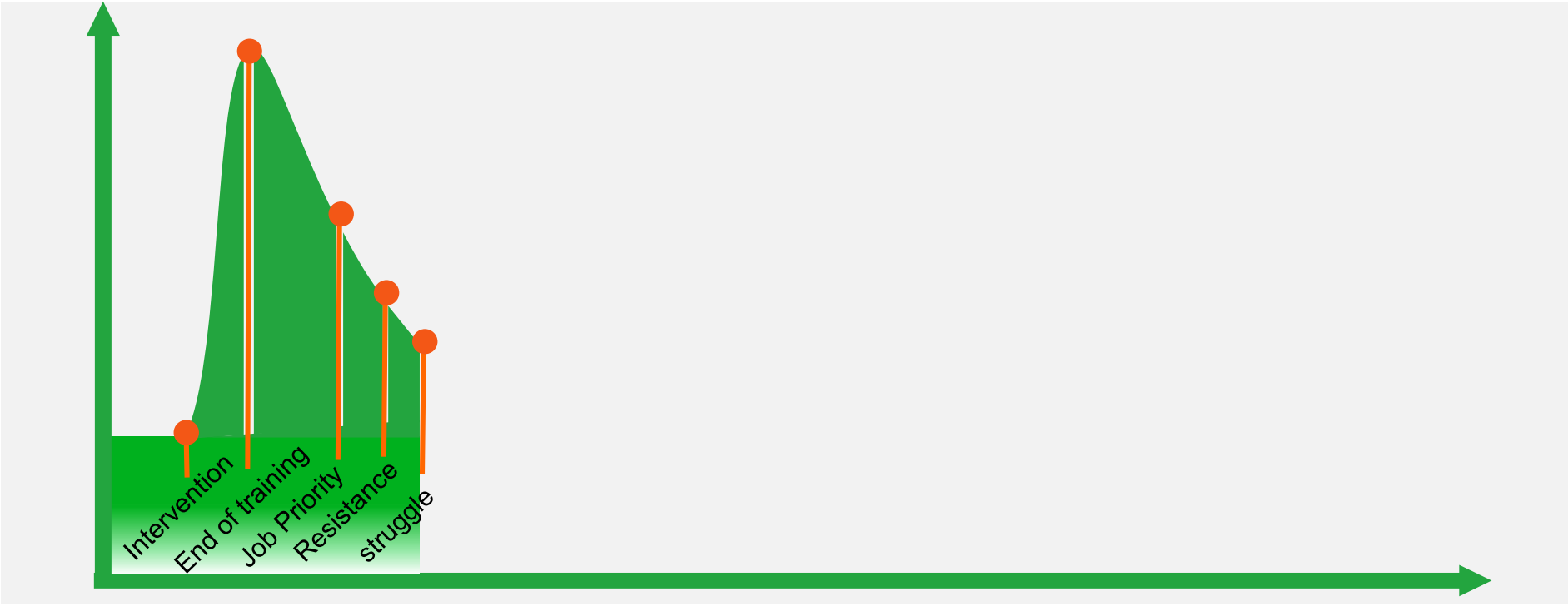
How we measure our sucess



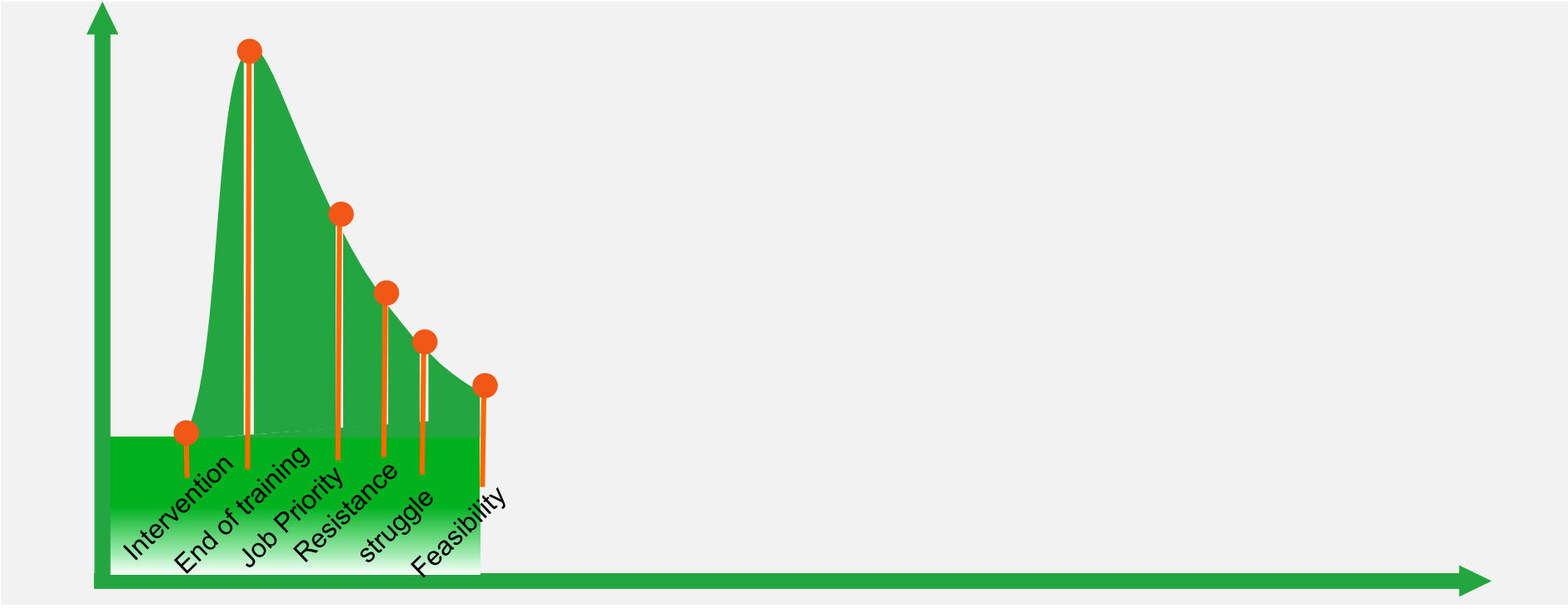
How we measure our sucess



How we measure our sucess

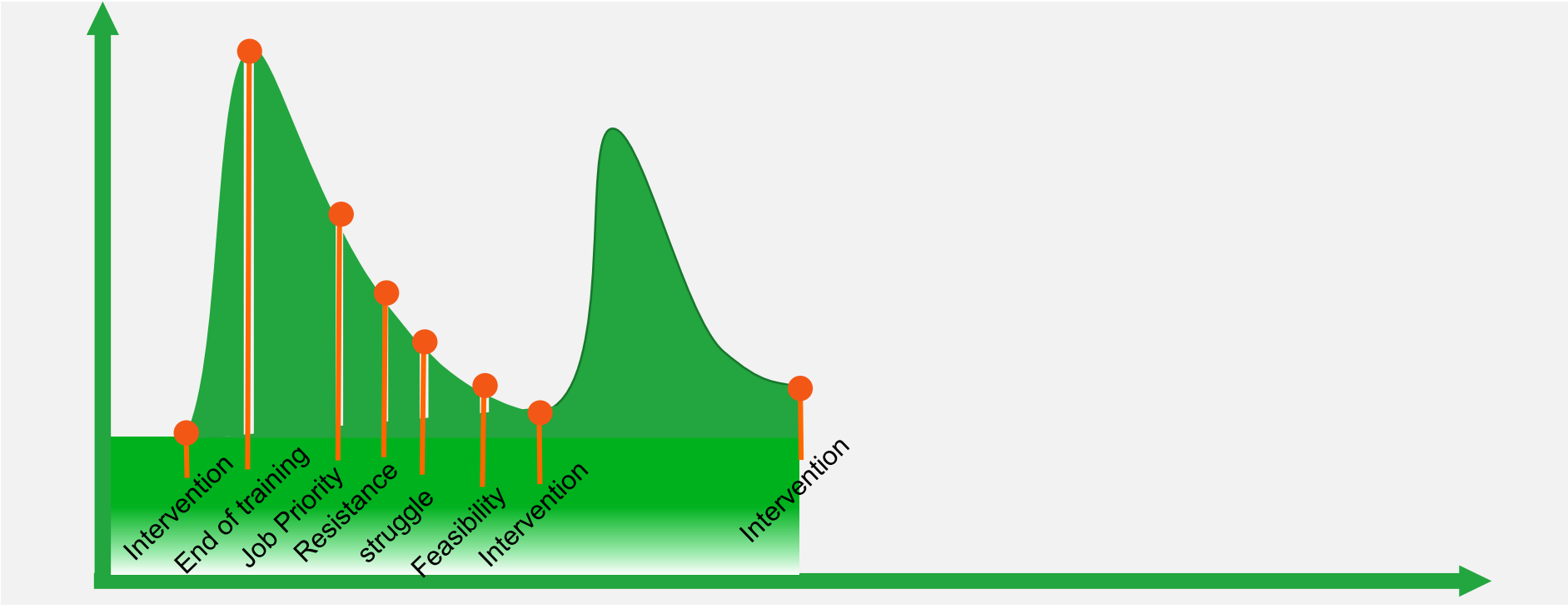


How we measure our sucess

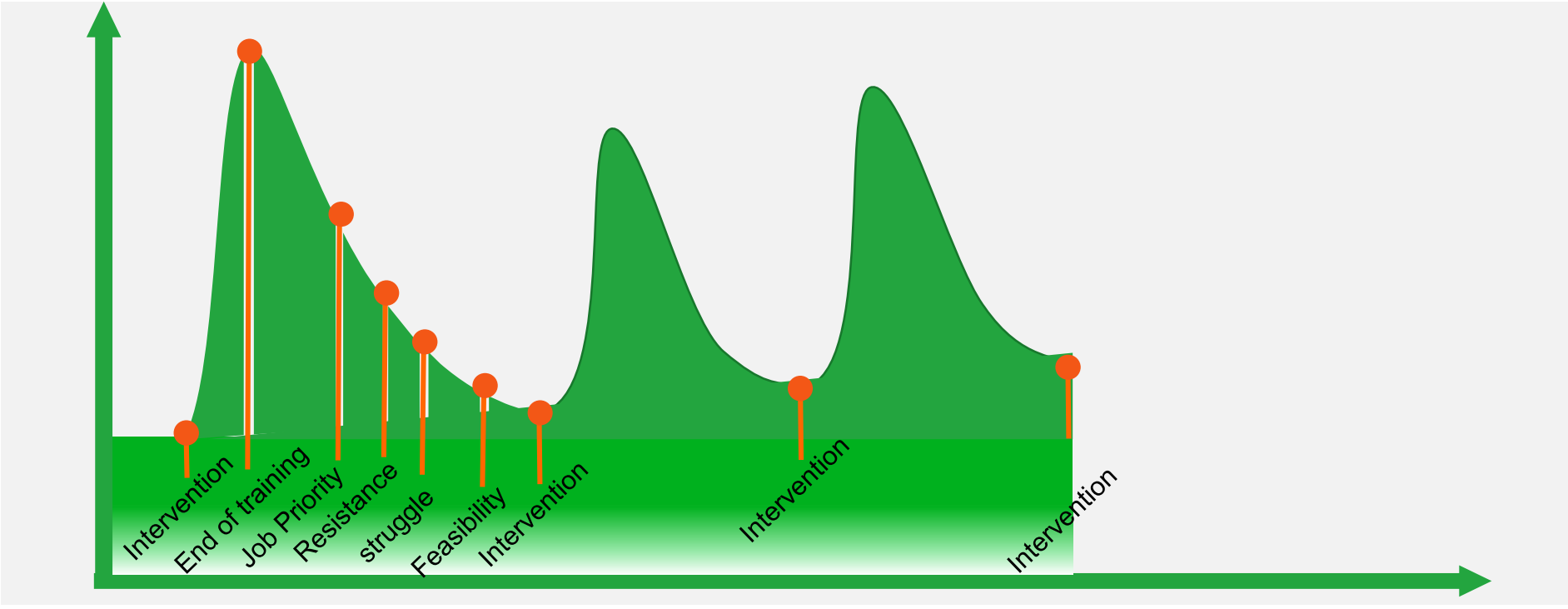


How we measure our sucess

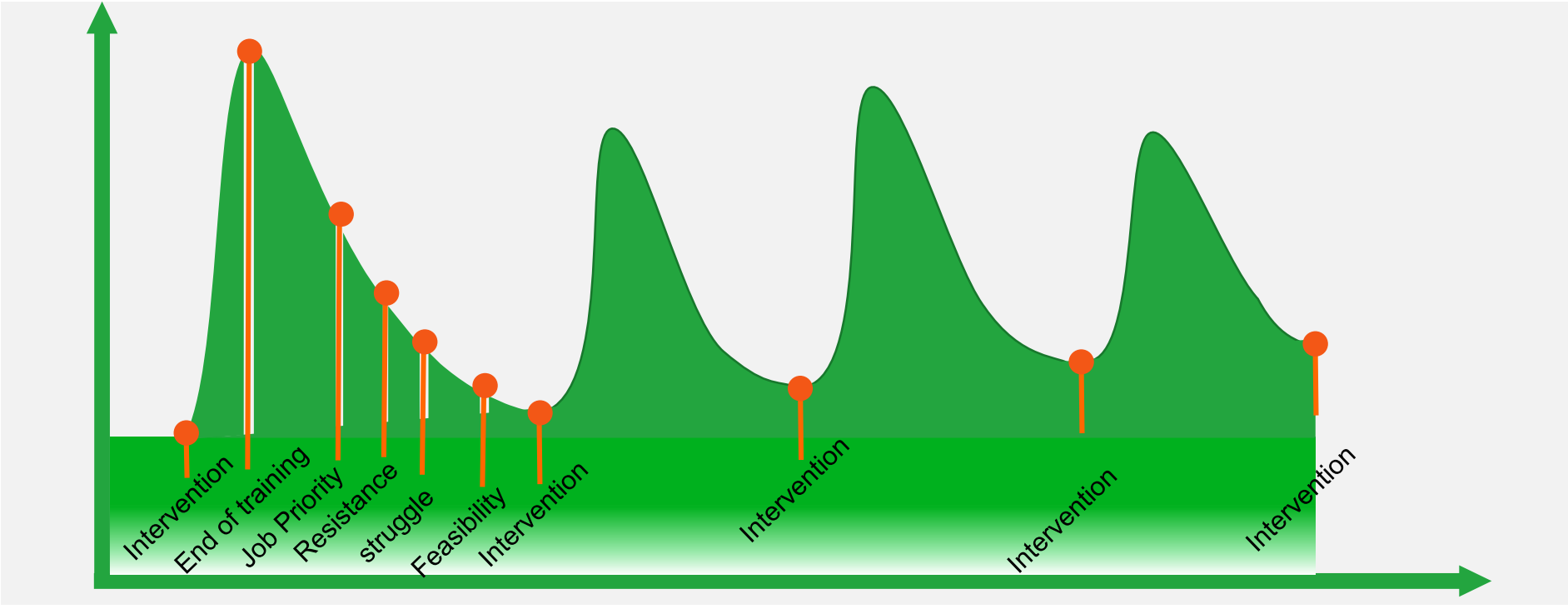
How we measure our sucess



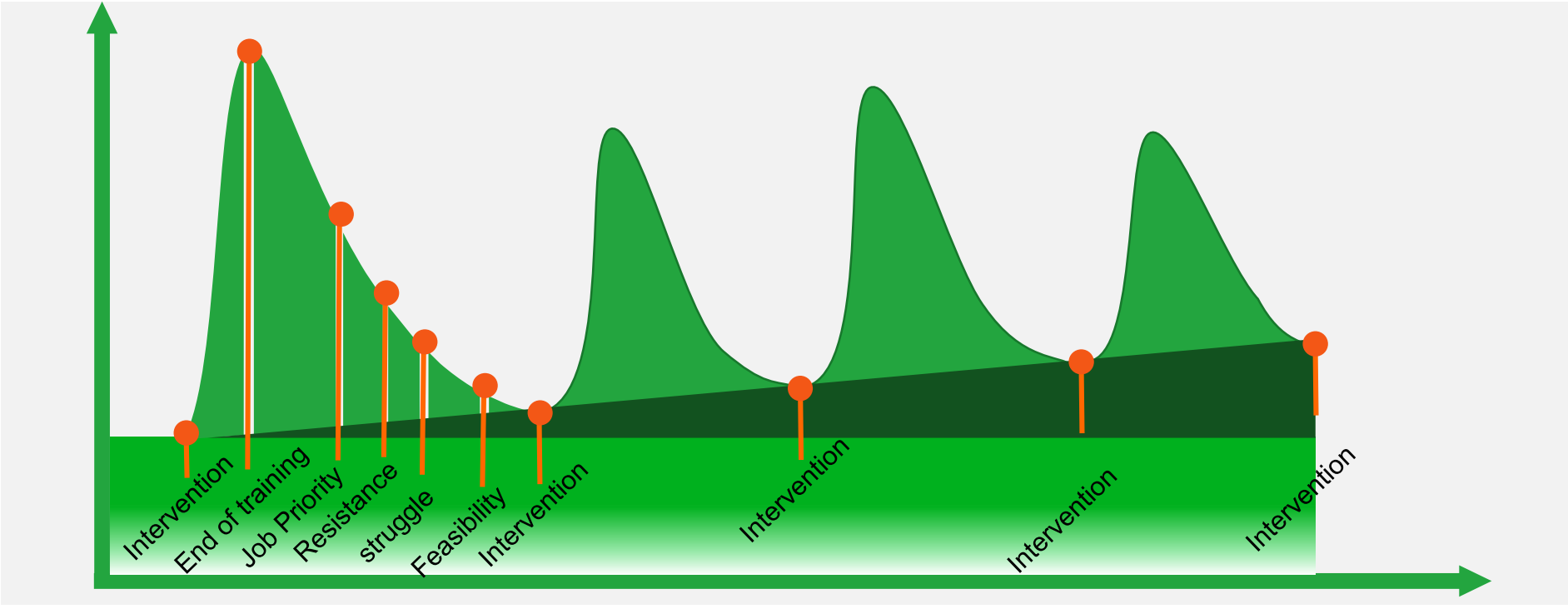
How we measure our sucess



How we measure our sucess



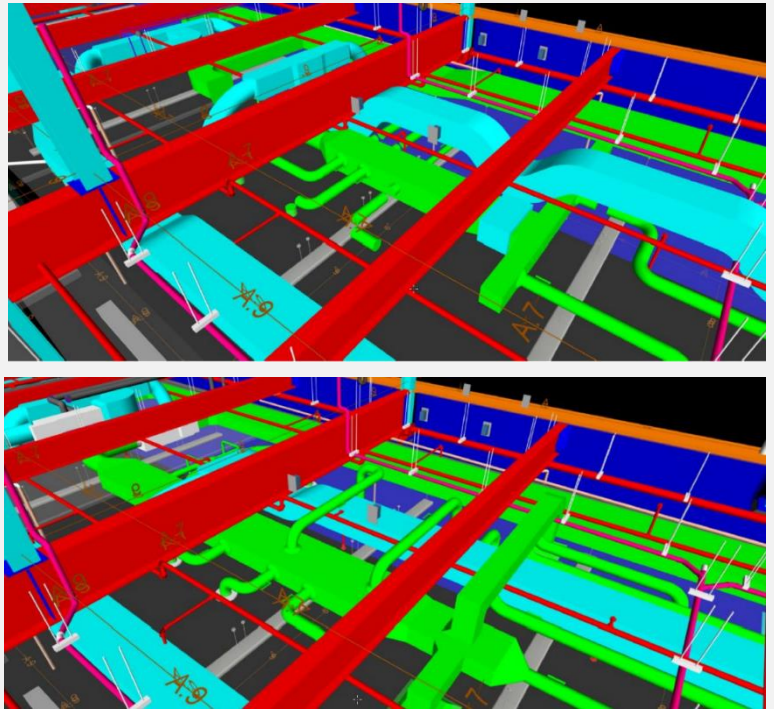
How we measure our sucess



Coordination of Design

- Detect of clashes
- Evaluate and prioritize of clashes
- Communicate via BCF

CONSTRUCTIONABILITY CHECKING

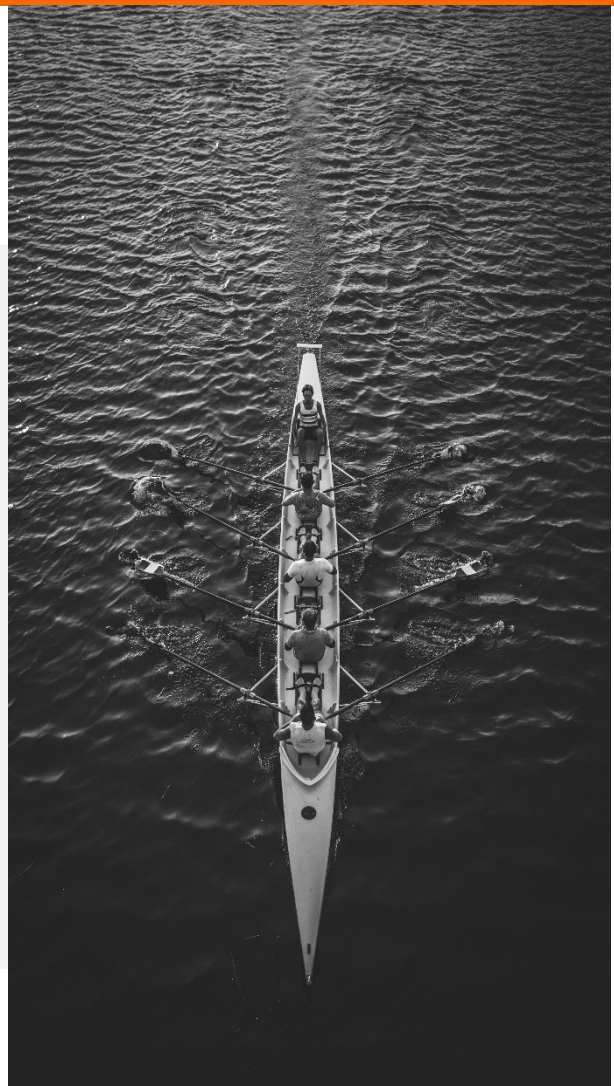


Bring digital construction to site

- Always have field/management member involved with BIM meeting & the process
- Use Software such as BIM 360 to improve communication and delivery of information among Stakeholders (Design-Site)
- Incorporate problems from BIM meeting into subcontractor meetings
- Have minimum weekly BIM meetings and a minimum of 1 monthly review of 4D at critical areas about to be installed

Ongoing Challenges

- Collaboration and Coopetition
- BIM requirements in the MEP‘s specification
- Leveraging the transfer of data for use through the project life cycle
- Potential to become more efficient



Benefits…

Stakeholder Participation & Engagement

Improved Technology Integration

Maximal Utilization of Critical Resources

Discussion !