Berner Fachhochschule
Haute école spécialisée bernoise
Bern University of Applied Sciences

Fit for BIM
digital integration in the building process

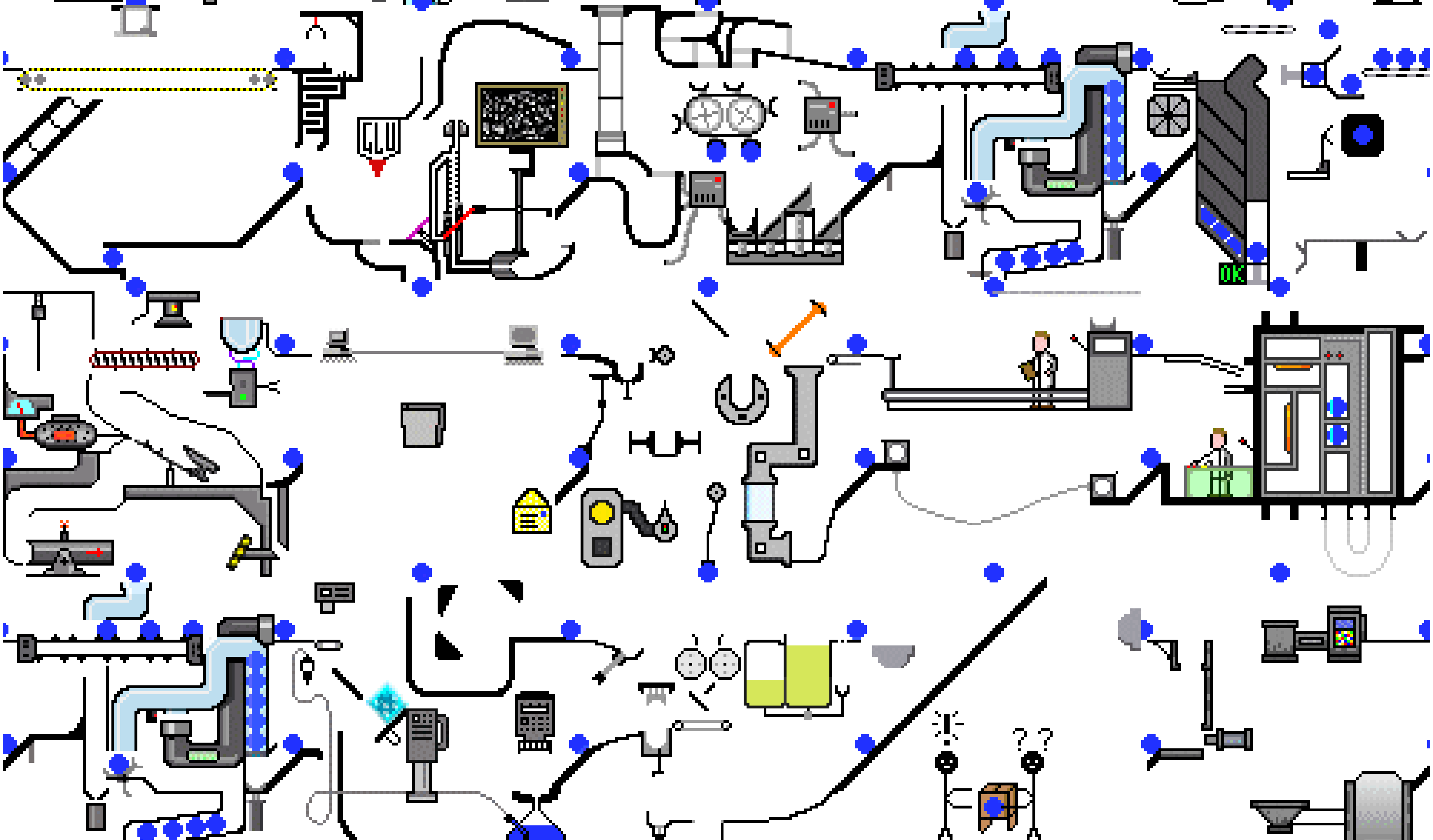
Thomas Rohner

Professor for Timber Construction and BIM

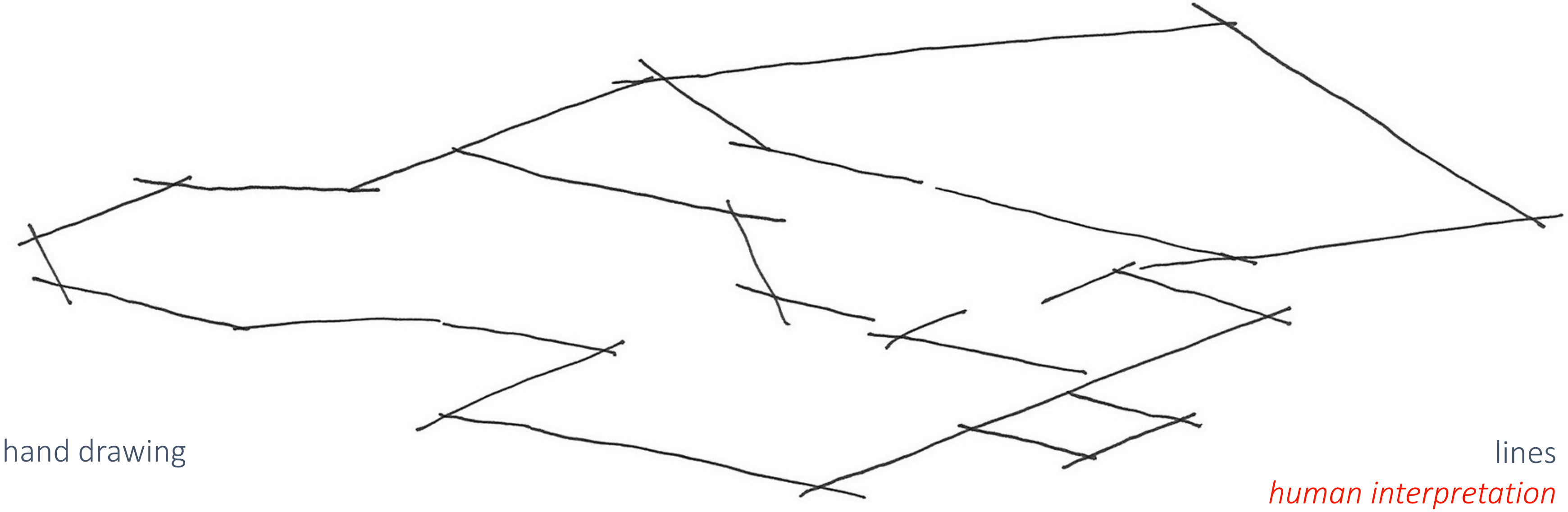
Thomas Rohner

- Professor for Timber Construction, Bern University
- CEO & Integration Coach Kuratle Group
- Research coordinating body FOEN
- BIM-Service Provider, Coach
- Member Bauen digital Schweiz
- Member of the Central Committee timber Switzerland
- Member of board Création Holz AG
- Member of CEI-BOIS Roadmap 2010
- shareholder cadwork informatik AG
- Engineer FH for wooden constructions
- Carpenter

Curriculum vitae


CLU
OK

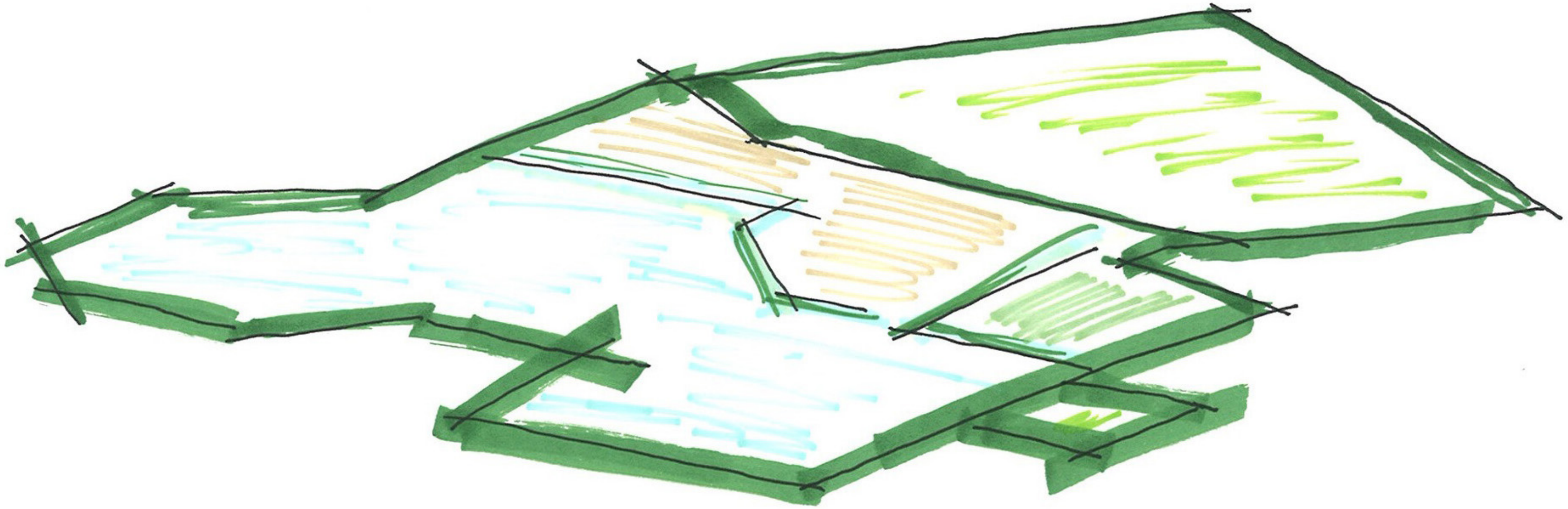
From 2D to 3D



Line – hand drawing

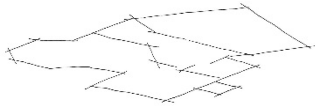
lines

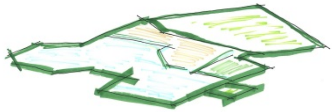
human interpretation



The line

From human drawn line to digital line

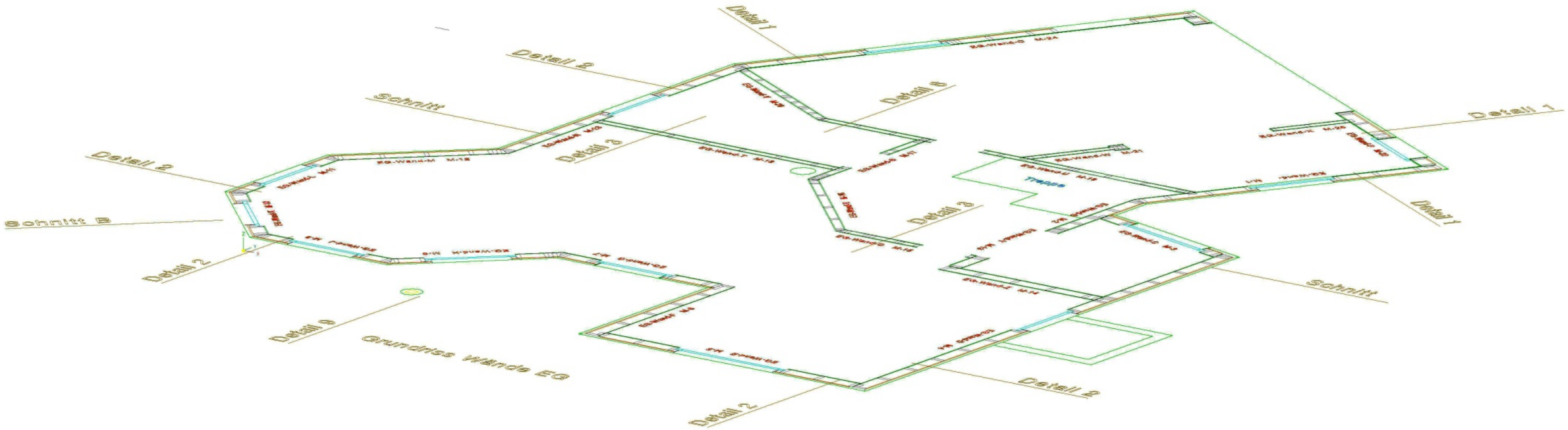




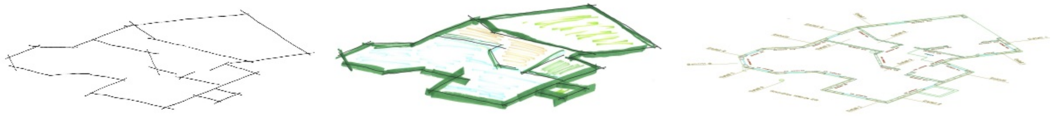
line – digital lines

digital lines

human interpretation

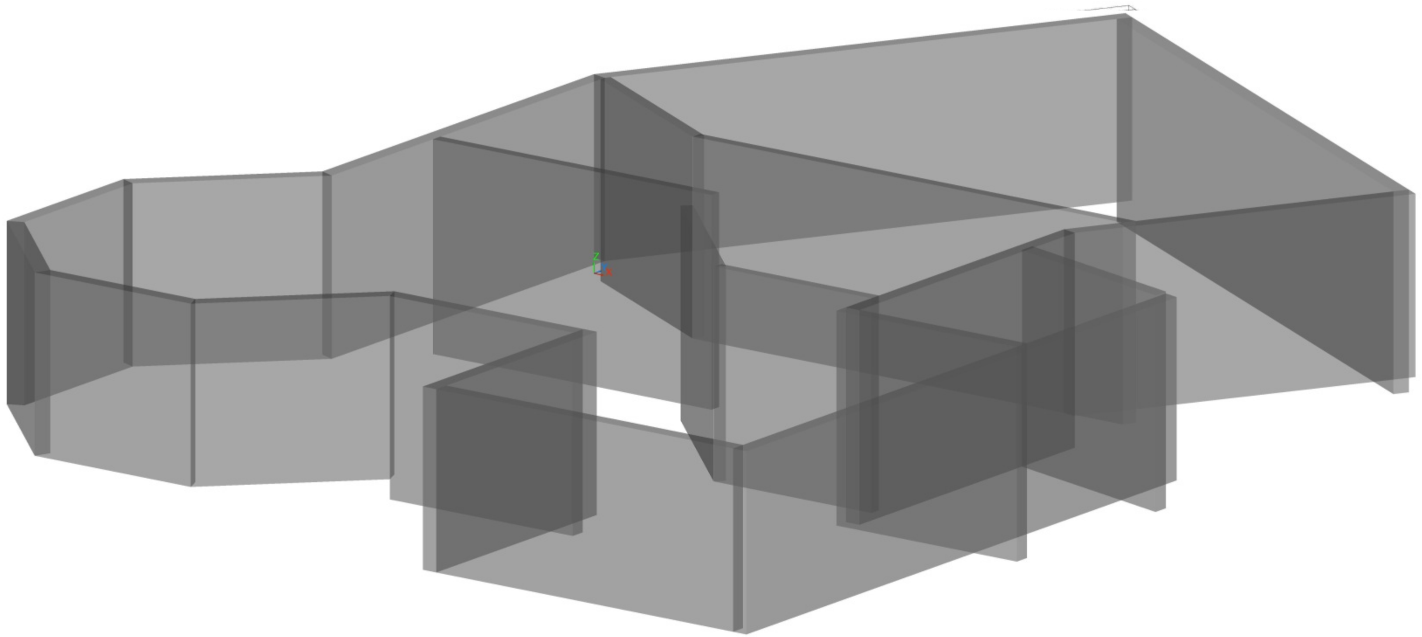


From lines to surfaces to volumes



Volumes & surfaces

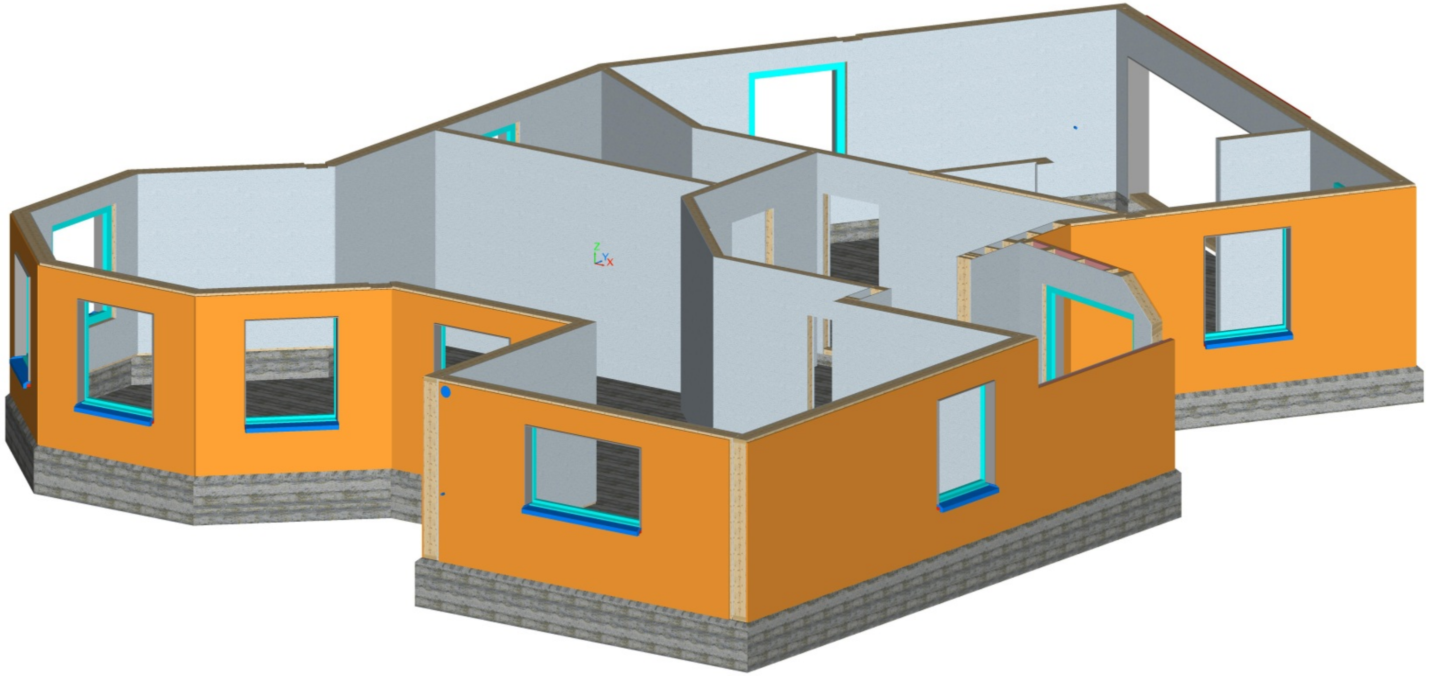
volumes & surfaces
building
shape & form



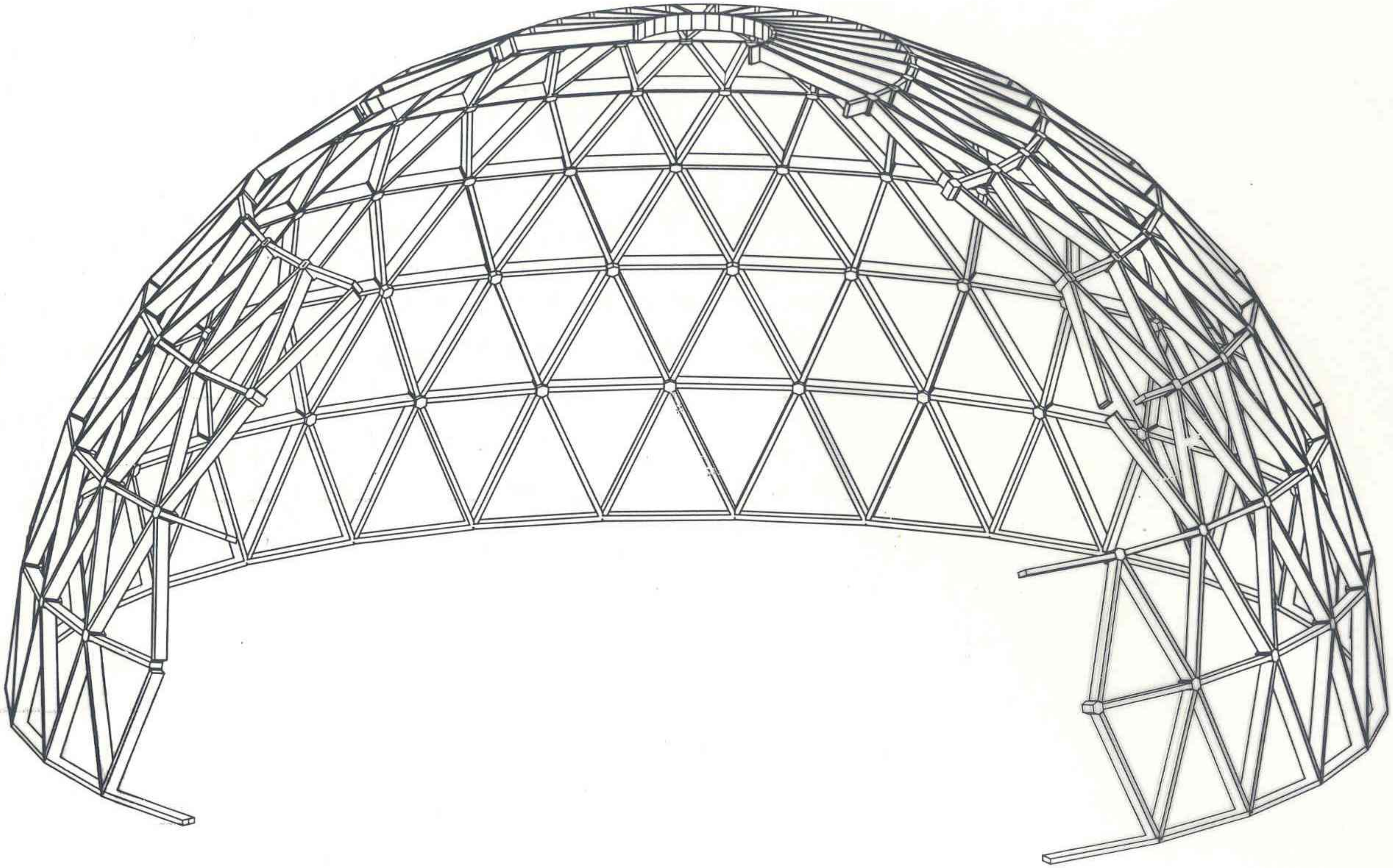
Digitai Information model

Digital objects & components

digital objects & components
properties, relations
machine interpretations




FM
7D
Facility management
LC-BIM-Strategy
QM Manuals
BIM as build
Maintenance
Plans & Technicals
Support
SUSTAINABILITY
6D
Energy
LEED
Materials
ESTIMATION
5D
Costs
Processes
Monitoring
Commodities
Pre-fabrication
SCHEDULING
4D
Time axis
Project phase
Simulation
Visualisation
Cashflow
Monitoring
MODEL
3D
Specialised information mode
Geometry
Production
BIM-driven prefabrication



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AXO	OBS	PT.VIS		des. :
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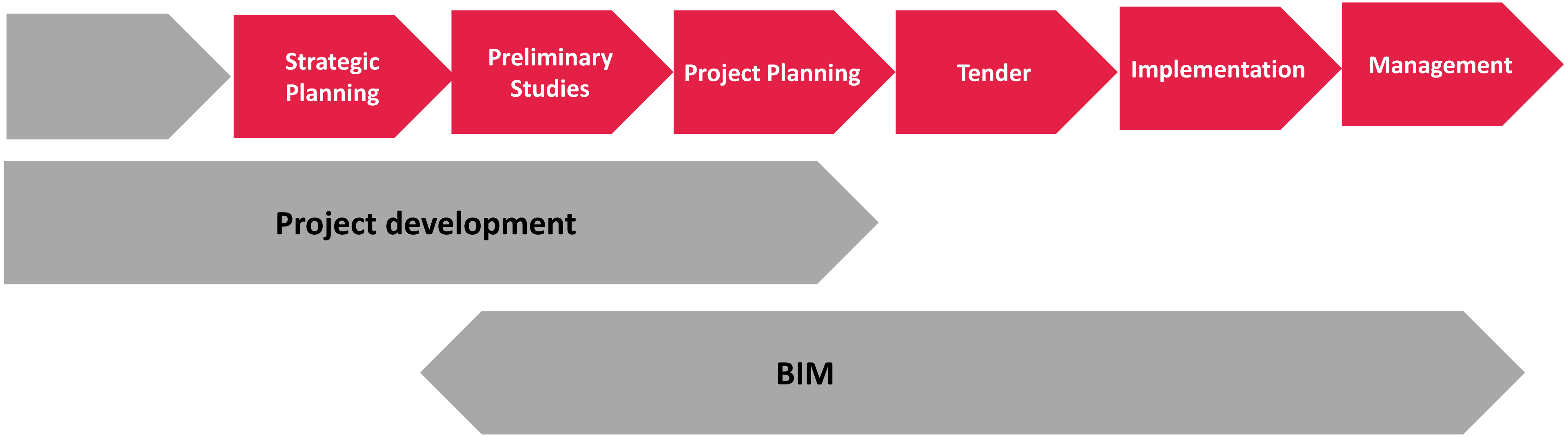
y	-771.95	0.00		
z	267.50	0.00		Plan No:

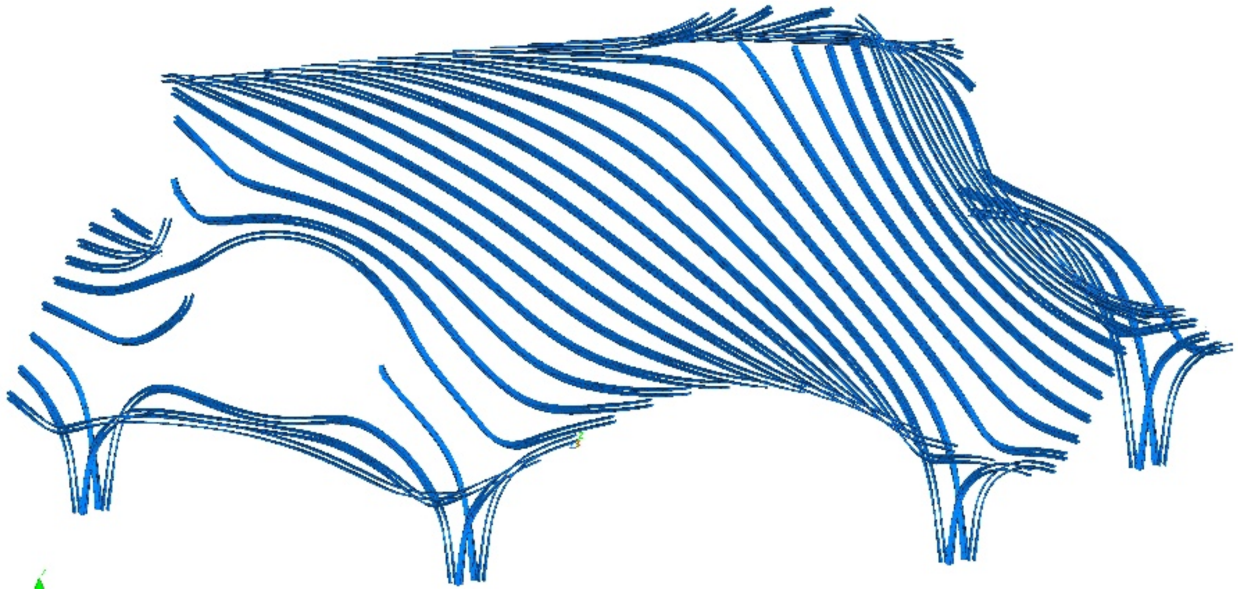
What is BIM ?

Building Information Modeling

Connecting all relevant meta data with a geometric element.

When BIM ?


Strategic Planning
Preliminary Studies
Project Planning
Tender
Implementation
Management
Project development
BIM



Virtualization of the building industry

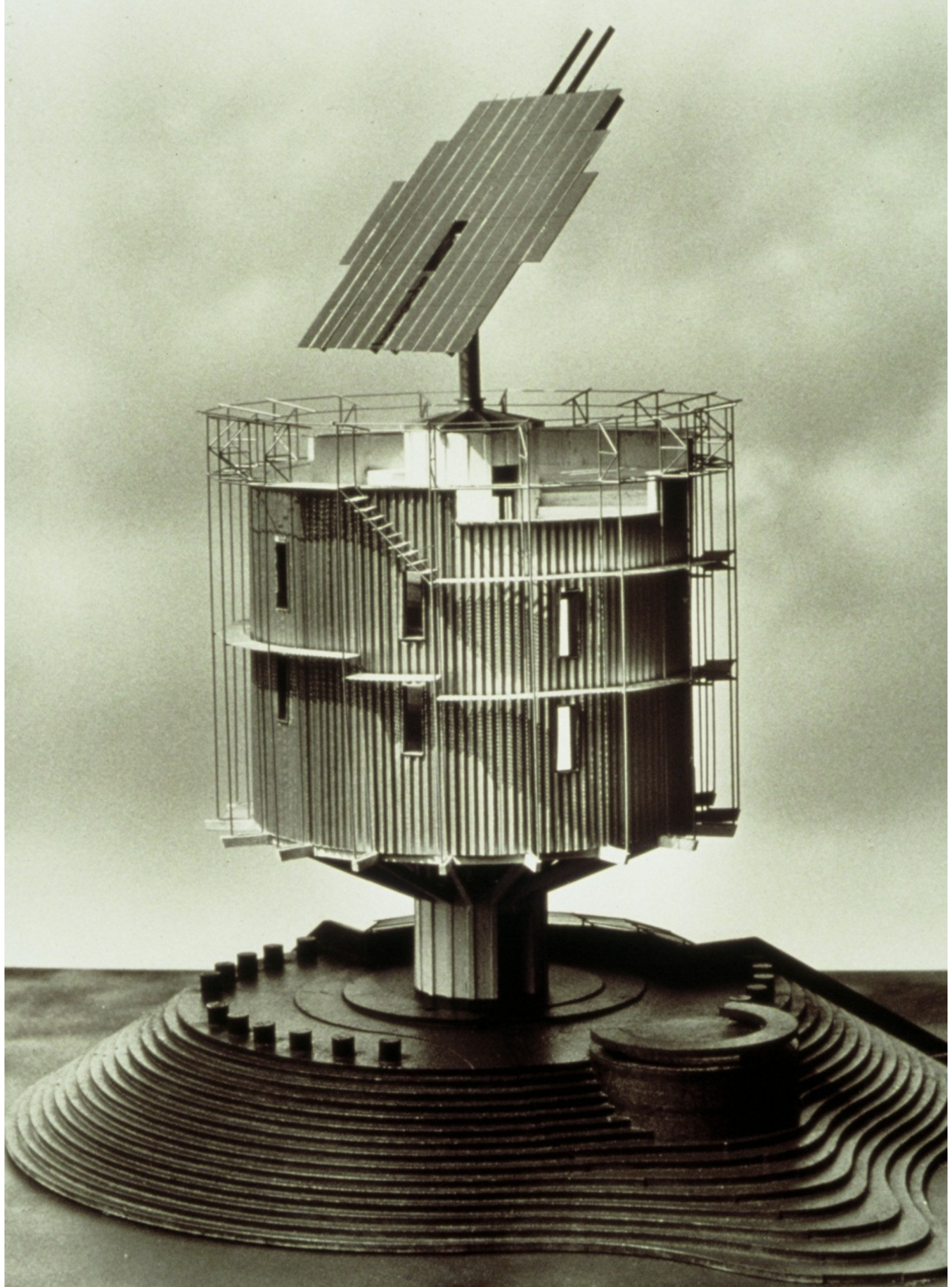
We will simulate the whole of the building process virtually (cradle to cradle)

Error rate in the building industry: xx%

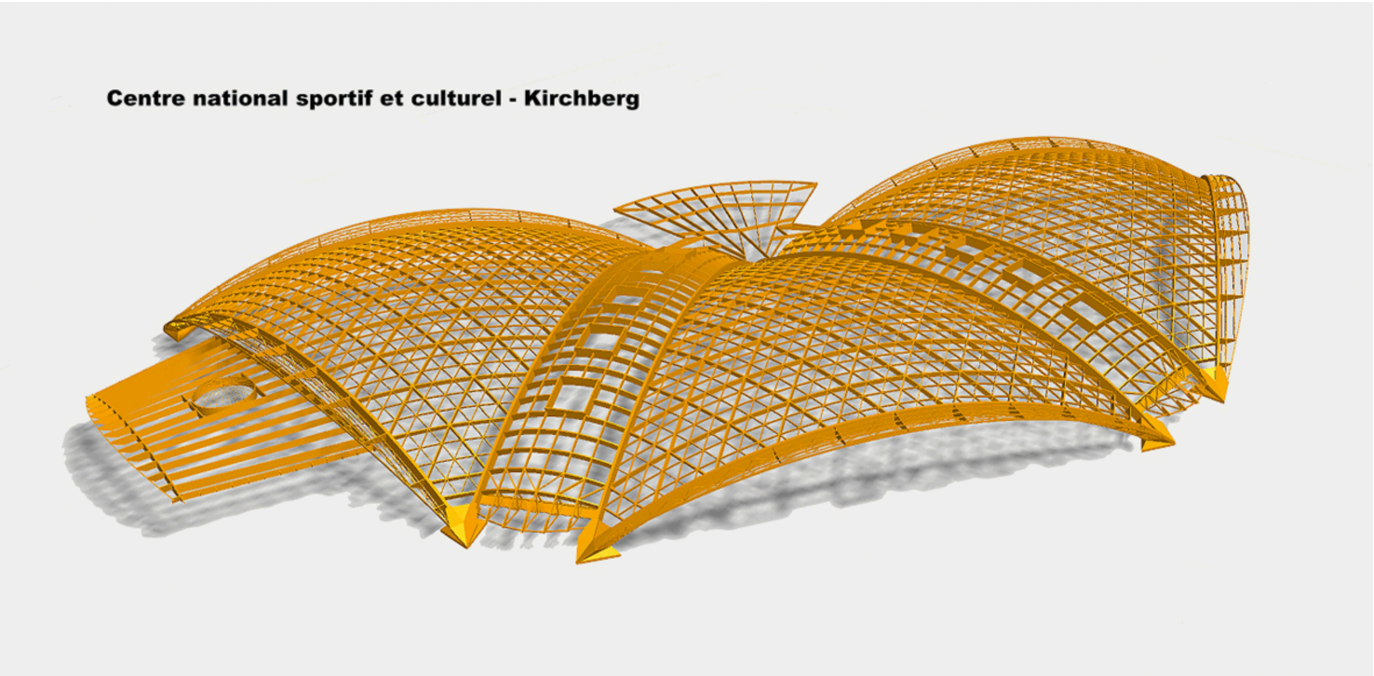
If we did not make any mistakes, our buildings would cost xx% less.

Repeat effect in the building industry: xx%

Surveys of practice reveal much more potential.



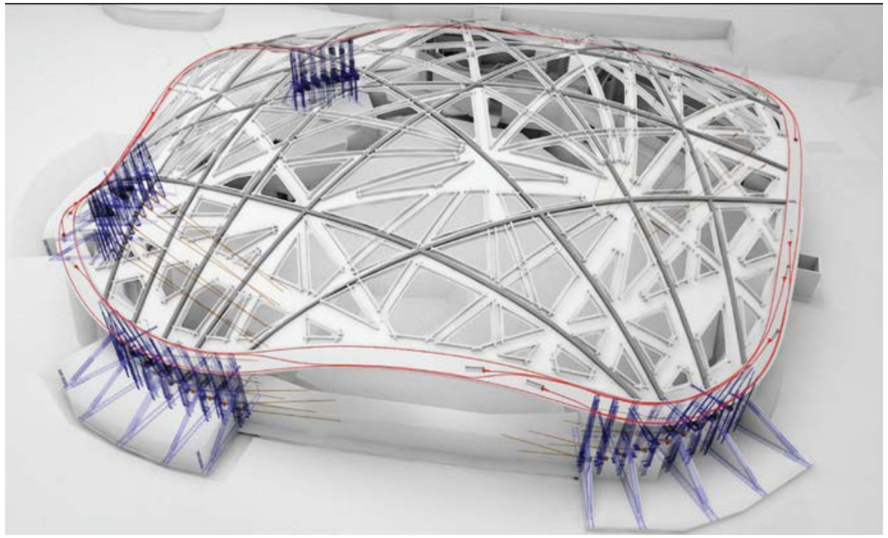

Tyvek



digital twin

Centre Pompidou 2010

Shigeru Ban
作品づくりと社会貢献の両立を目指して

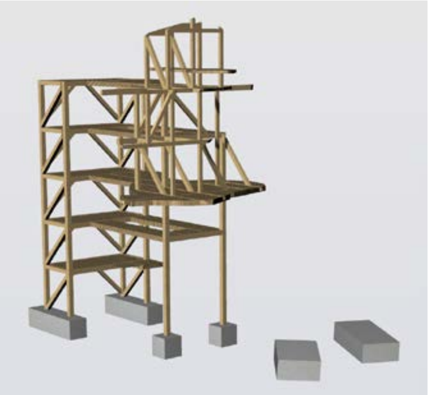
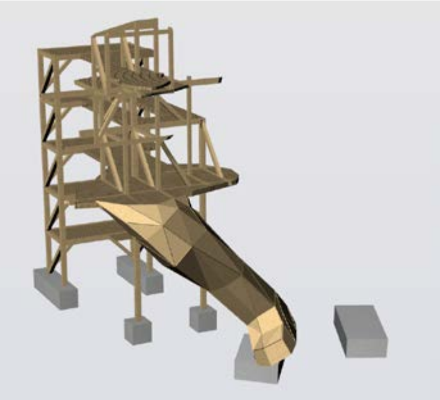
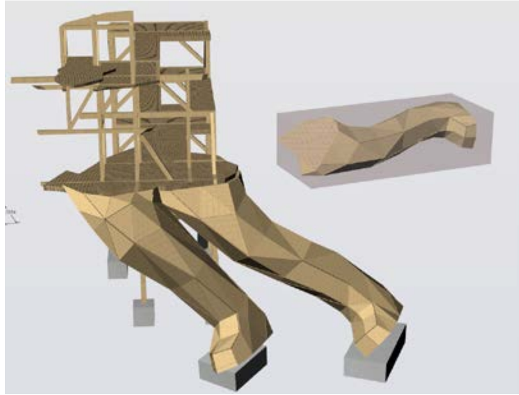


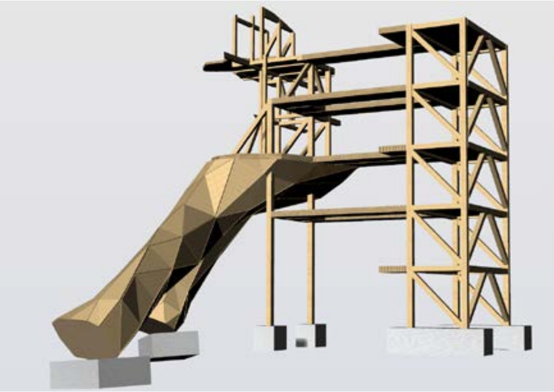
Elephant House Zoo Zürich

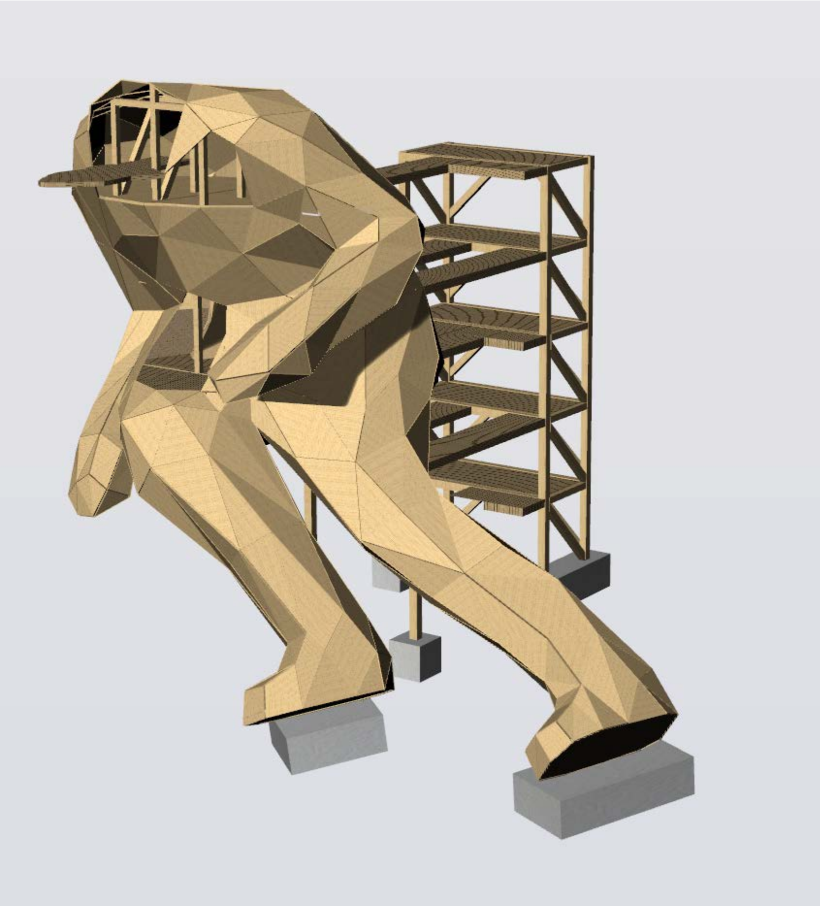
Markus Schietsch Architekten

I-Park by Helen&Hard 2012


ipark




création holz

A. FREUND

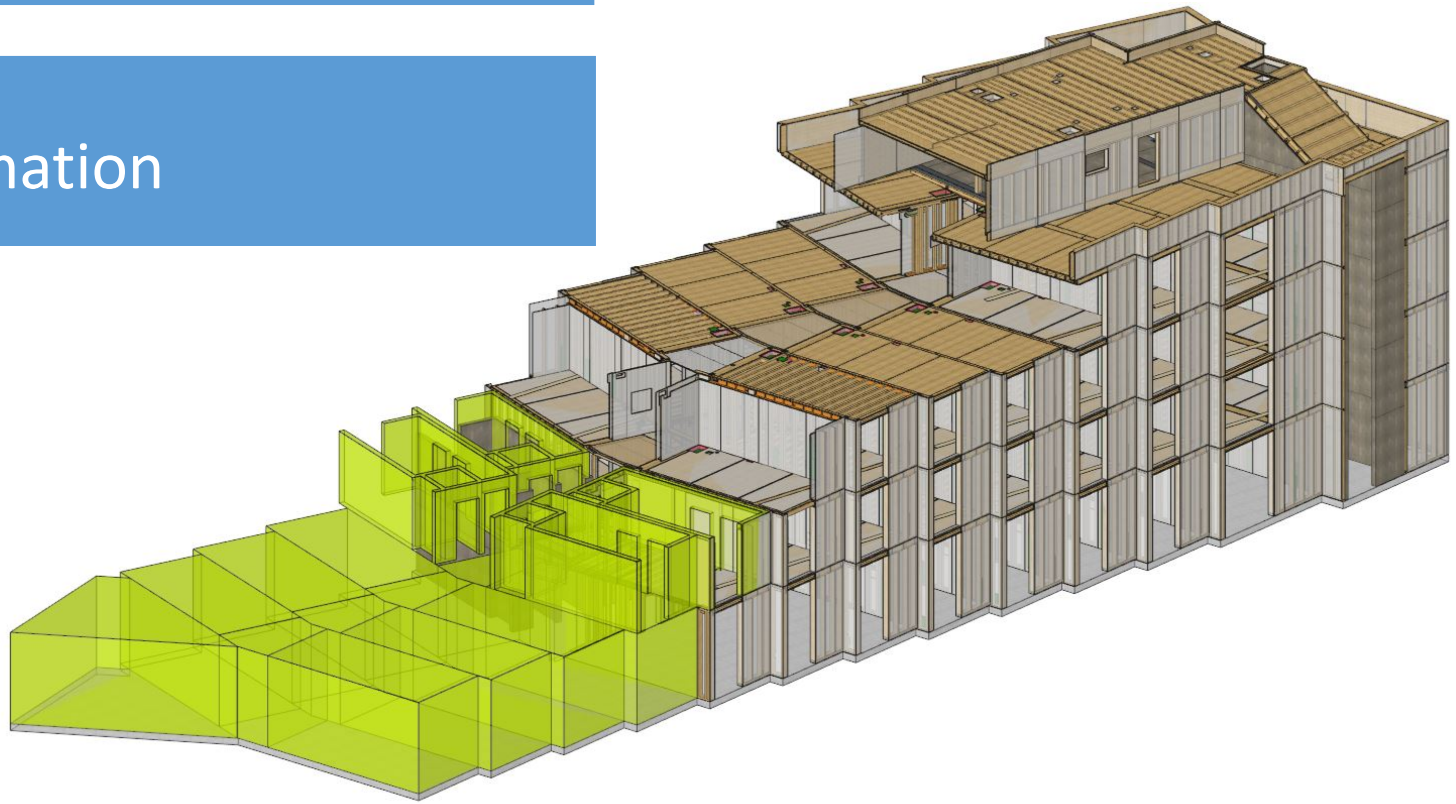
design to production

Level of Detail

LOD Level of Development

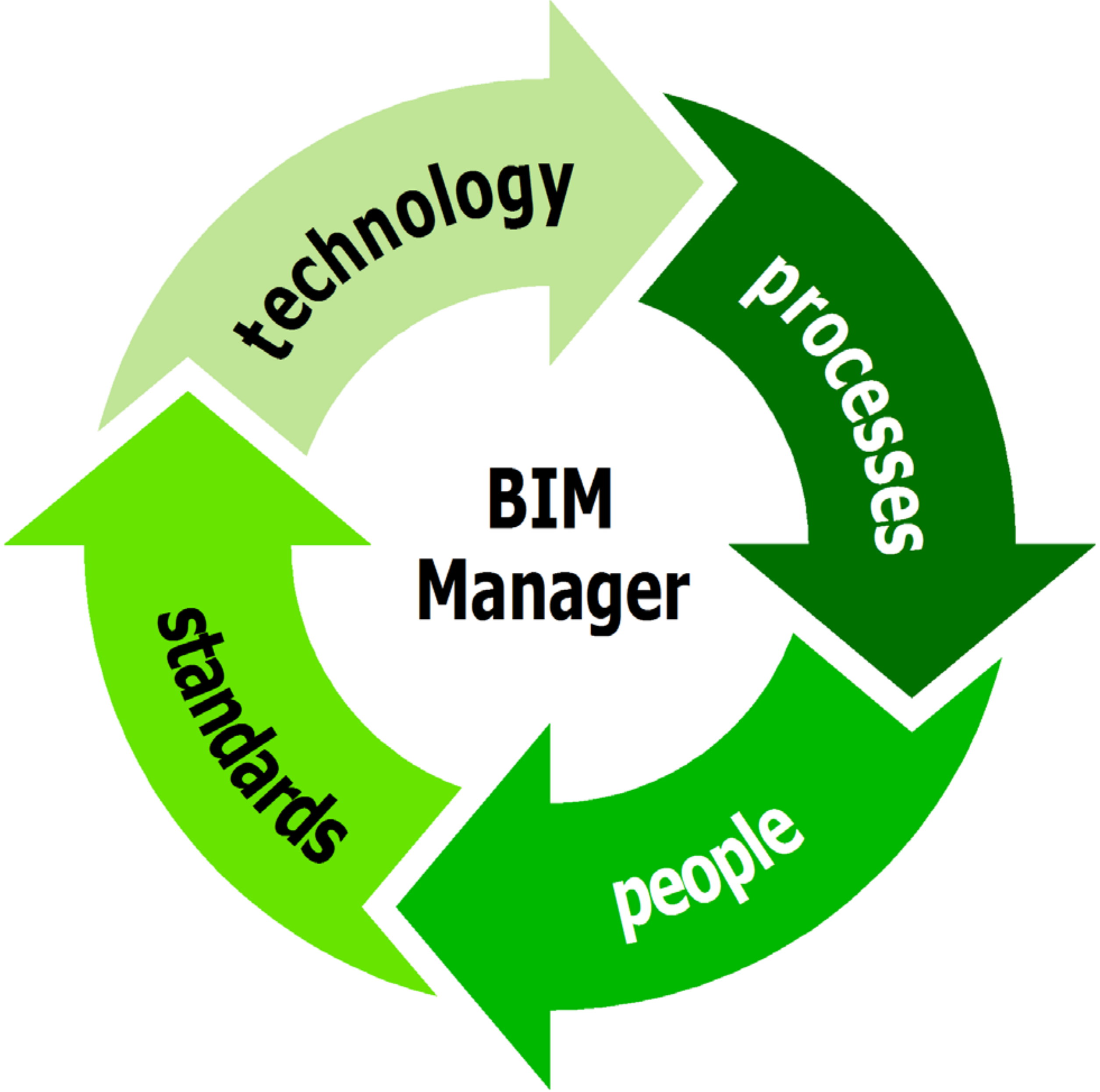
LOG Level of Geometry

LOI Level of Information

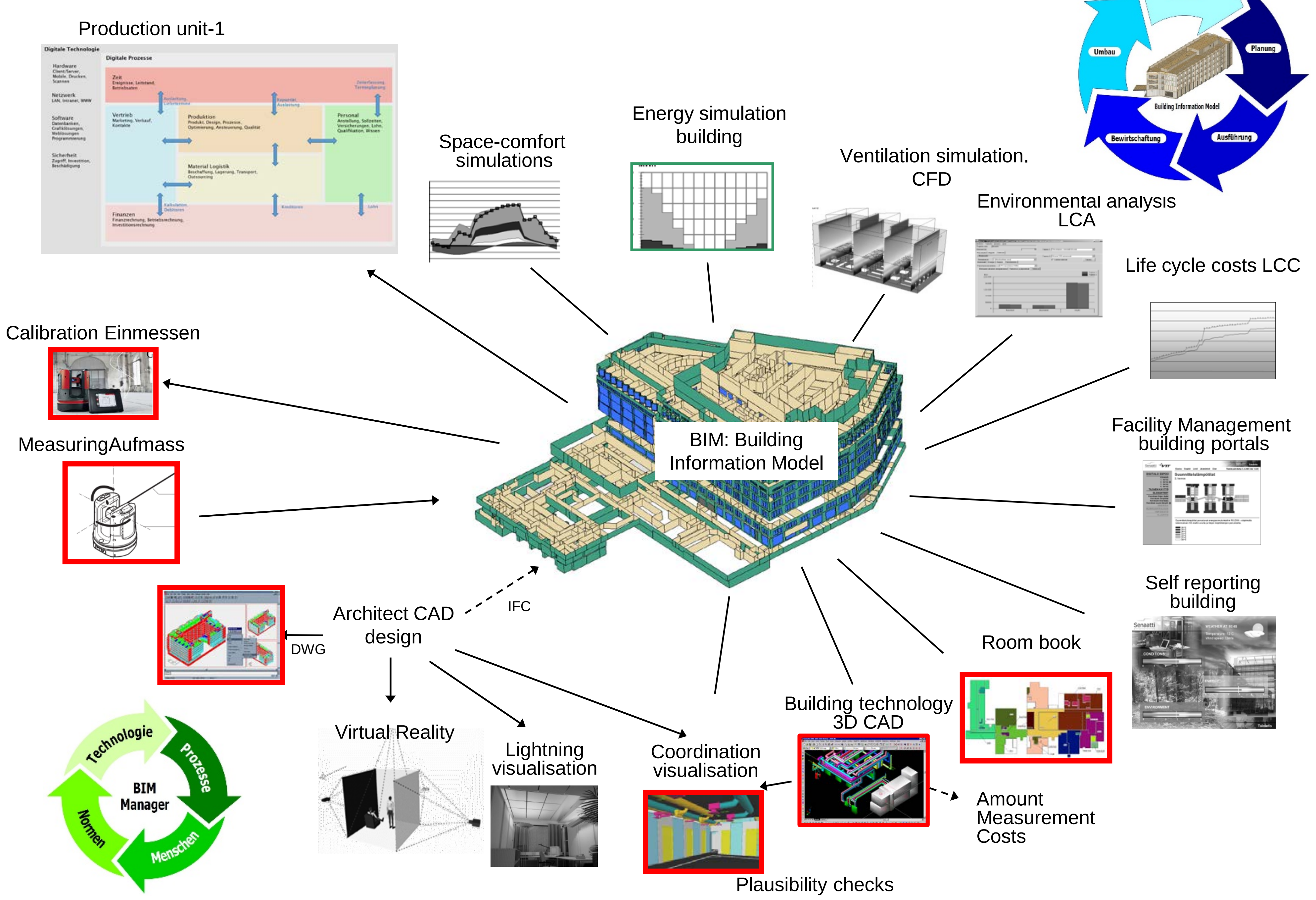


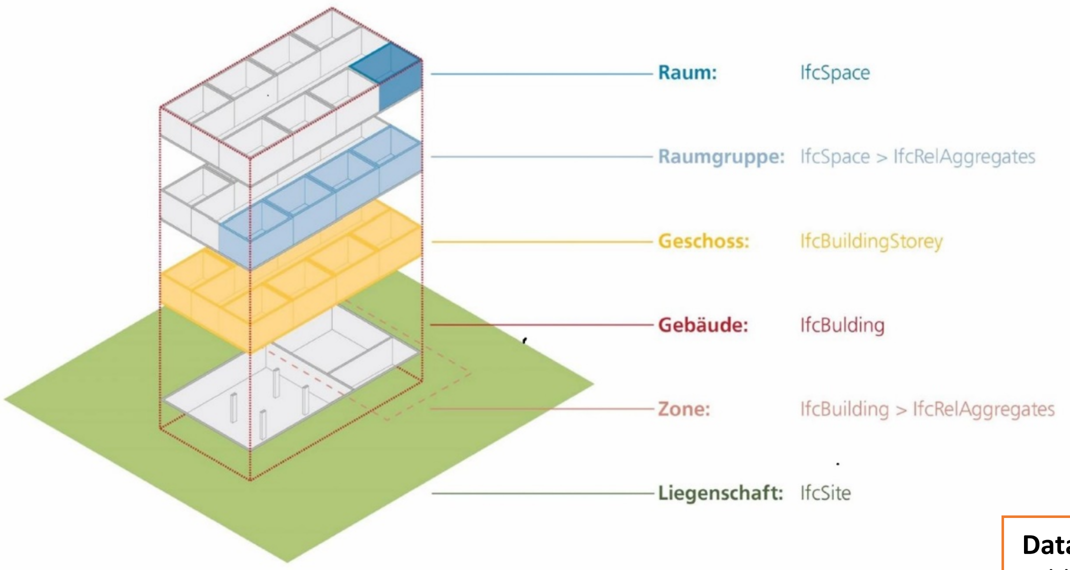
Building Information Modeling (or Management)

Connects all relevant meta data with a geometric element.



Extended idea of a model: BIM in timber construction





Data structure IFC

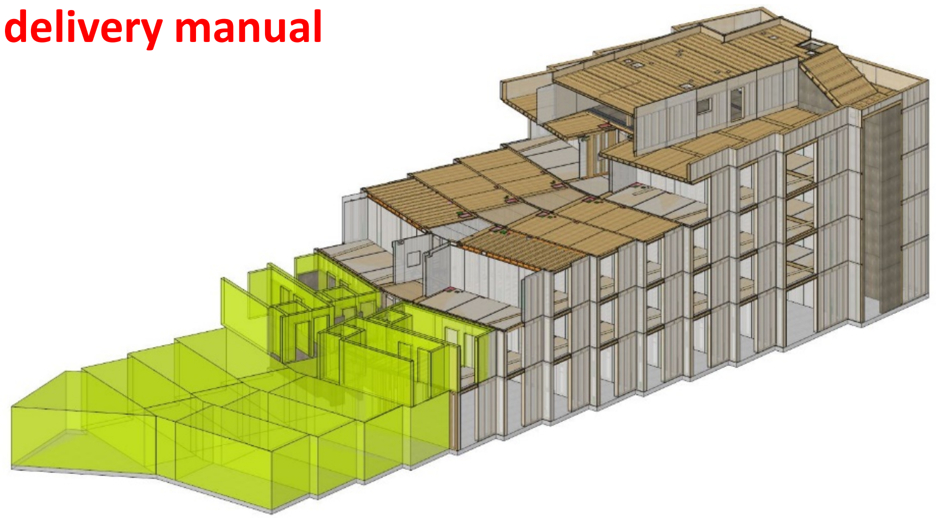
Quality assurance & coordination
The coordination of architectural, structural and building technological models will be carried out together with you in coordination workshops.
The check for data consistency is performed based on the defined types. In case of deviations between the model and the type data, the type data take precedence. Thus, particular attention should be paid to the tracking of type.

Data enrichment
Additional information of the components such as U value, acoustic rating, fire rating etc. are entered by specialist in the form of excel lists or directly into the database, based on type. Only after the data has been defined by the specialist should they be taken over in the type components of the architecture model.
For this purpose, it is recommended that libraries with the appropriate types be created, so that the correct values for fire protection, soundproofing and thermal transmission are recorded per type; this reduces the pressure on the draftsmen.

General information & use of the models
From the initial phases of the building project up to tender, graphic details and data will successively be added to enrich the informed 3D model as well as its associated database. We will use the provided models mostly to assess the requirements (target- actual comparison of the order), perform quantity surveying, coordinate the project between architecture, structural engineering and HVACS, and the economical optimisation of building and maintenance.

IDM = information delivery manual

Types
Based on the specification from the “IDM initiated/generated by models”, the concept of type is used as much as possible. This means that as little information as possible and only as much as necessary is to be stored in the model.
Determining types will be undertaken with you, according to the specific standards of project and practice. It includes:
- Rooms e.g. use/rental area/standard of development
- Type of structure for floor, ceiling, wall, depending on type of construction, e.g. raised floor
- Type of components for windows, doors, prefabricated elements



In general, supplement components with :
Fire Rating according to information from fire protection planners
Thermal transmission value according to information from building physicists
Acoustic Rating according to information from building physicists

Existing building <IFC Space>
Name of building <name> according to ***room program/space allocation***
eBKP-H <defined according to project>

Property line<IFC Space>
Name of building <name> according to ***room program/space allocation***
eBKP-H <defined according to project> Q1

Space (outside and inside) <IFC Space>
Room name <name> according to space allocation
Room number <number> according to space allocation
Room use <defined according to project > abbr. SIA416
Requirements according to indications BH/TU
G2.2 type of floor structure <defined according to project>
- underlay
- underfloor heating
- raised floor
- cavity floor
- dry screed

G4.2 type of ceiling structure <defined according to project>
- no false ceiling
- cast false ceiling
- grid ceiling
- metal grid ceiling
- acoustic ceiling

F1 type of roof structure <defined according to project>
- flat roof with gravel
- flat roof greened
- flat roof extensively greened
- flat roof intensively greened

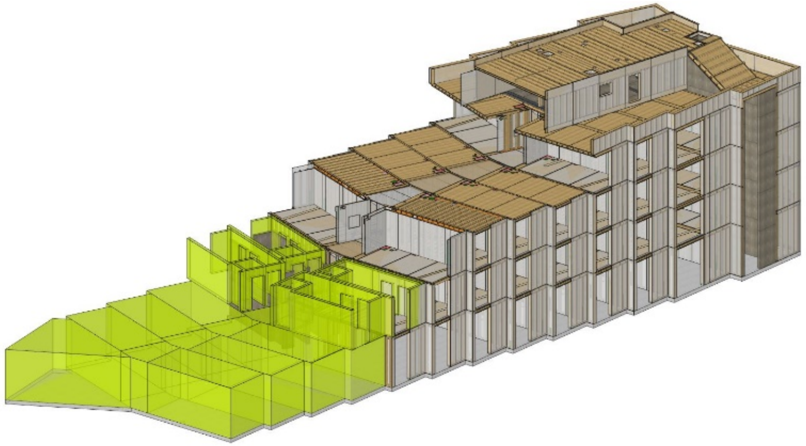
G2.3 floor coverings <defined according to project>
- according to list of materials

G3 wall coverings <defined according to project >
- according to list of materials

G4 ceiling coverings <defined according to project >
- according to list of materials

requirements according to indications BH/TU

stairs/ramps <IFCStairs>
eBKP-H <defined according to project>
C4.2 /stairs and ramps)
Materials/type <defined according to project >
- reinforced concrete
- timber
- steel
- prefabricated reinforced concrete components



Windows/doors IFCWindows / IFCDoor>
eBKP-H <defined according to project>
- E3.1 (external window)
- E3.2 (external door)
- D4.6 (RWA) G1.4 (interior door)
- G1.3 (interior window)

Material/type <defined according to project>
- timber
- wood/metal mixture
- metal
- plastic
- glass
- steel
- aluminium
- sectional door
- inspection cover wall
- inspection cover ceiling
- inspection cover floor

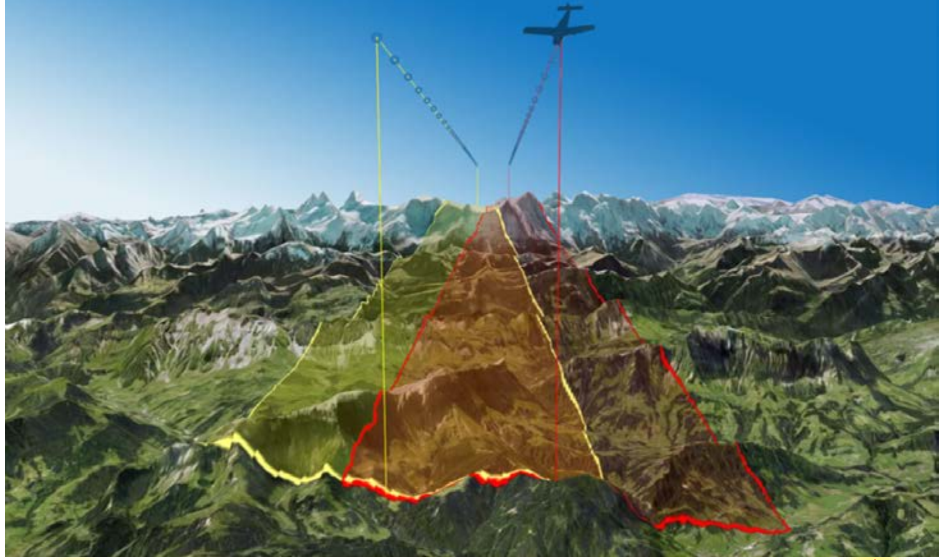
Auxiliary volumes/others <IFC Space>
eBKP-H <defined according to project>
- B6.2 (excavation)
- B6.3 (excav. contaminated)
- B6.5 (excavation end)
- B6.6 (materials installation)

Types of auxiliary volumes <Name>
- service spaces
- equipment location
- access space
- usable exterior space (e.g. terraces, balconies, loggias)

Sanitary objects<IFCSanitaryTerminal>
eBKP-H <defined according to project> Q1
D8.1 (fittings, appliances)
Material/type <defined according to project>
- wash stand
- wash basin
- toilette
- urinal
- shower
- bath tub
- gutter
- floor drain

BIM to field
Field to BIM

Photogrammetry



Disto handheld distance meter

95	2.690,74	4.651,58	72,87	1.96
160	4.288,40	4.660,96	8,69	37
45	3.257,92	3.001,95	-7,86	-25
25	1.182,00	970,28	-17,91	-21
4	1.075,75	1.042,26	-3,11	-3
20	830,66	976,00	17,50	14
[illegible]	1.013,84	910,20	-10,22	-10
70	2.214,35	2.522,66	13,92	30
45	2.197,76	1.775,25	-19,22	-42
25	991,95	1.263,58	27,38	27
40	1.153,68	1.340,20	16,17	18
25	3.277,66	3.156,25	-3,70	-12
13	1.006,85	1.089,98	8,26	8
40	2.921,50	3.497,60	19,72	57
16	2.378,53	2.623,20	10,29	24
100	888,10	1.279,50	44,07	39
20	1.095,42	1.341,80	22,49	24
15	1.355,36	1.272,62	-6,10	-8
30	999,90	854,55	-14,54	-14
34	2.181,61	2.425,46	11,18	24
10	1.095,93	920,65	-15,99	-17
45	2.680,29	2.863,35	6,83	18
5	1.163,97	1.181,75	1,53	1
90	2.427,40	1.968,75	-18,89	-45
50	861,45	1.050,45	21,94	18
30	904,71	1.196,70	32,27	29
35	1.112,90	1.266,13	13,77	15
15	1.001,84	869,93	-13,17	-13

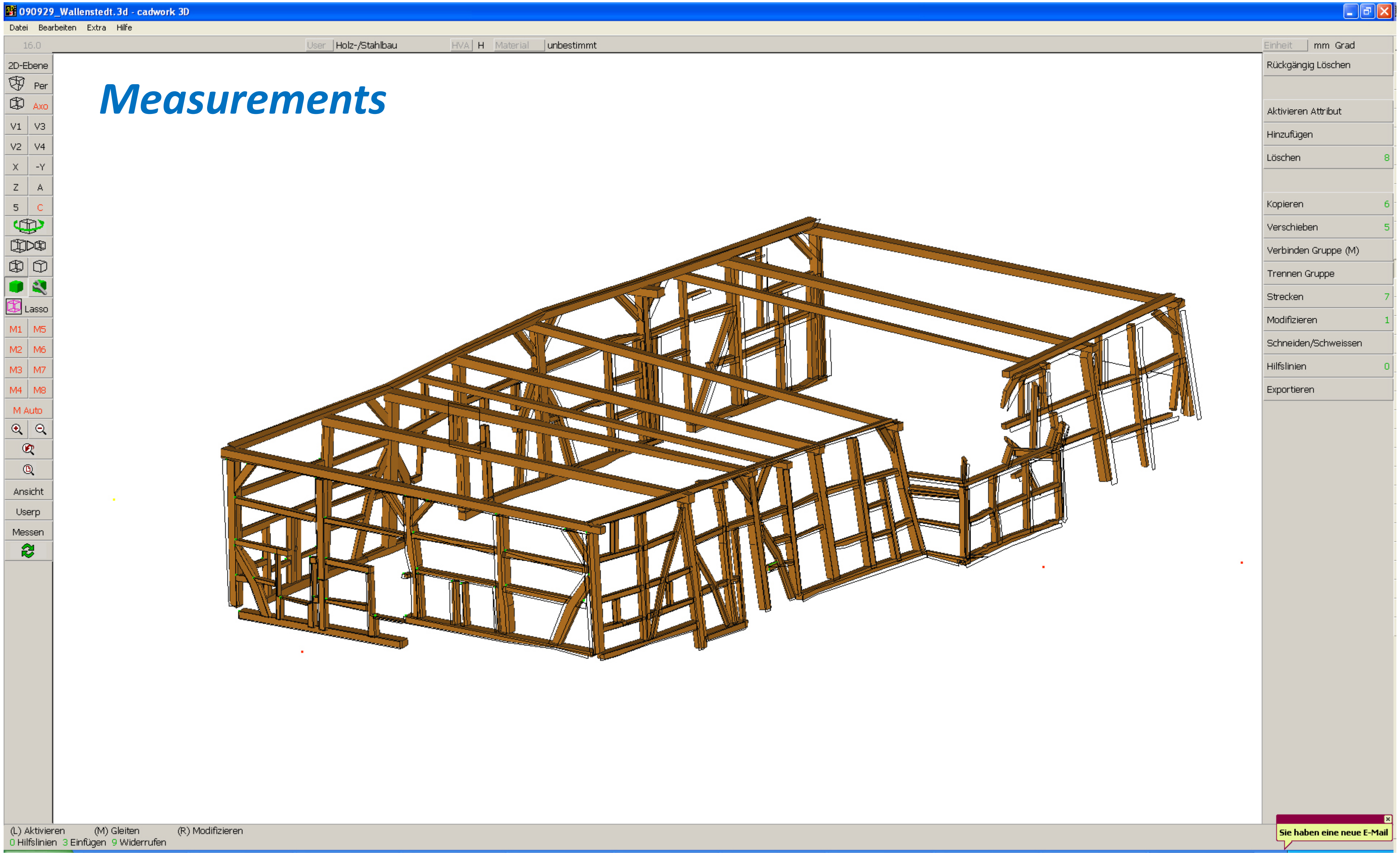
Scanning

Scanning

Surveying by vectors

Surveying by vectors

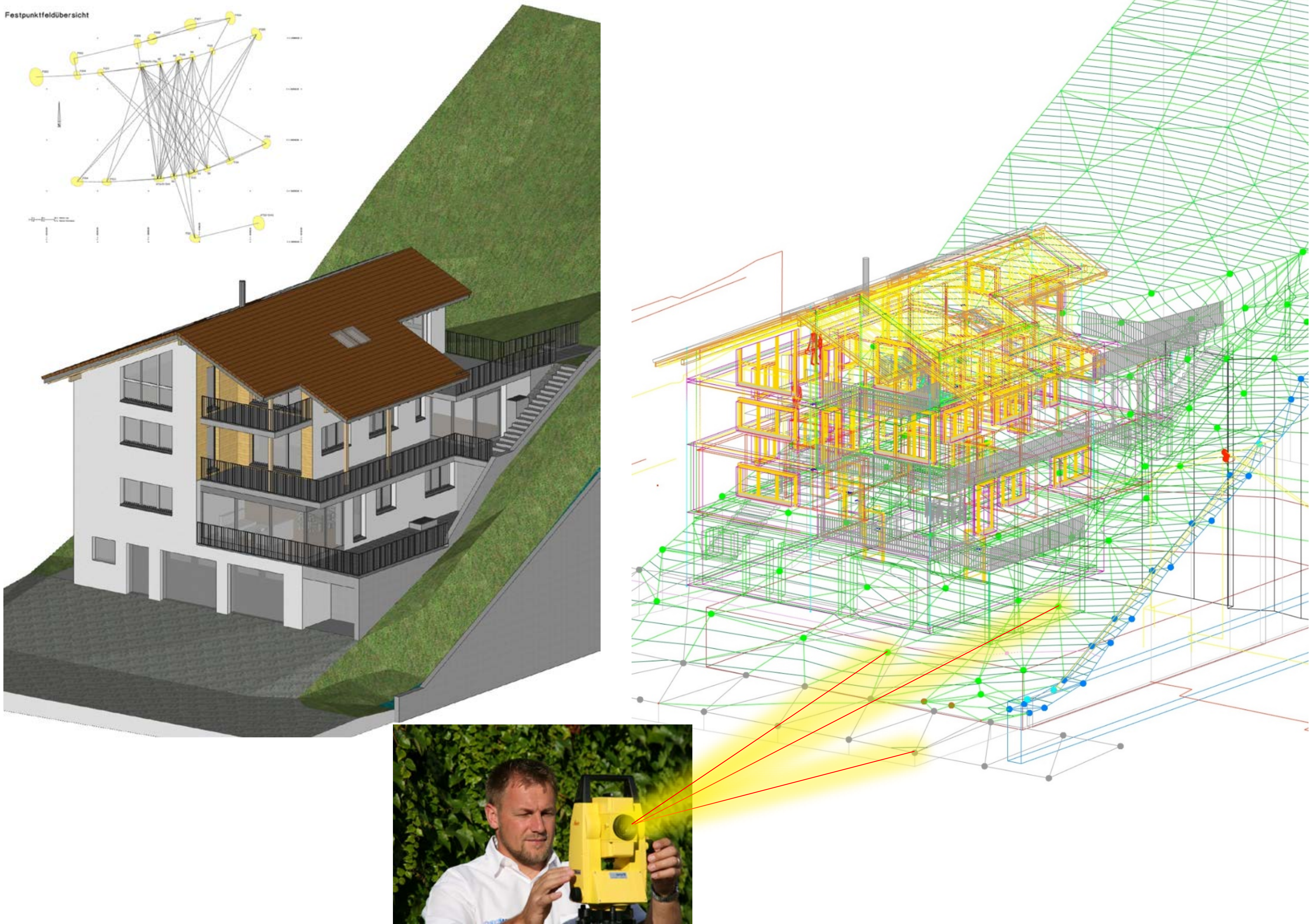
Surveying by vectors



Measurements

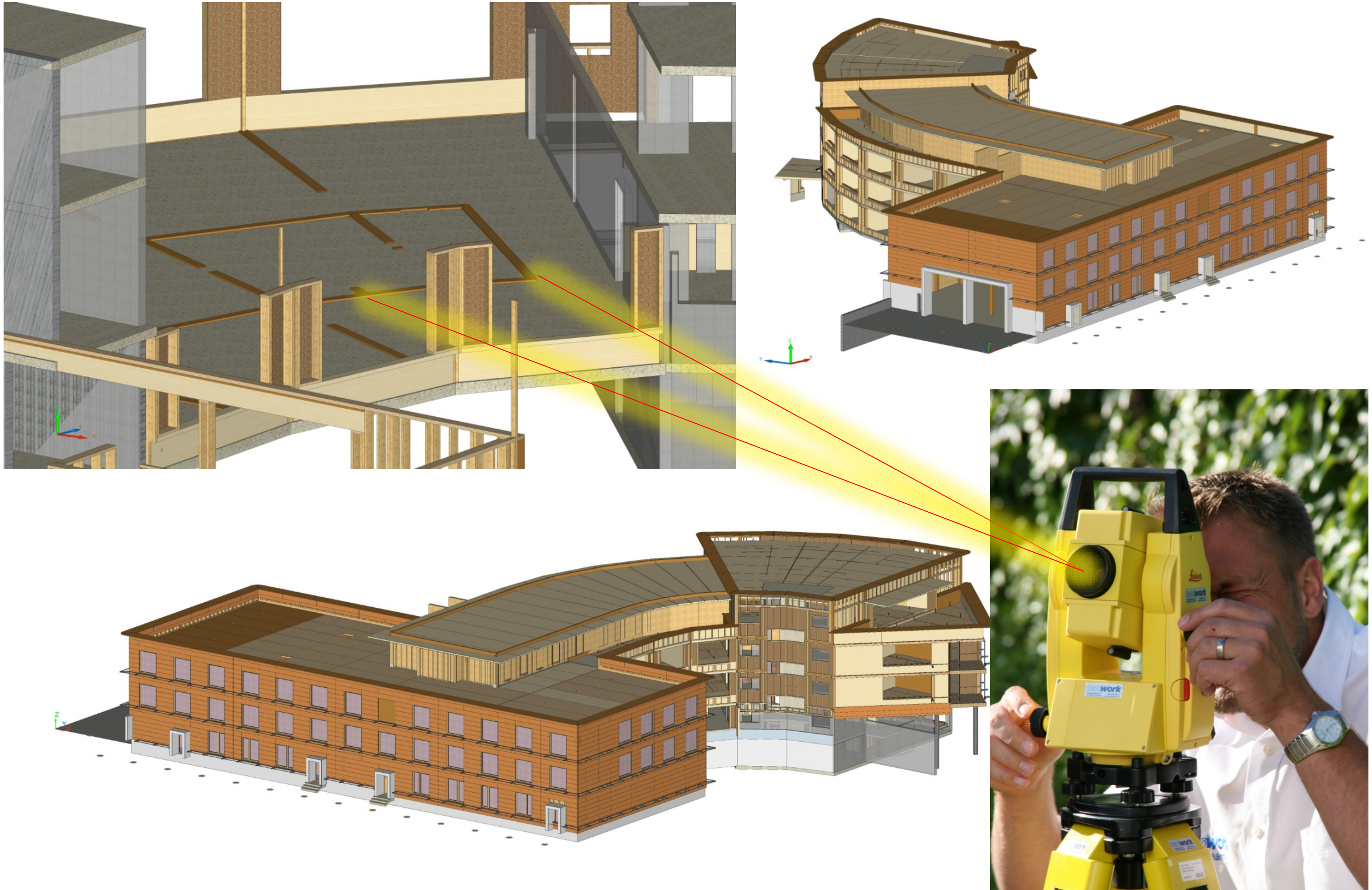
Surveying 3D model projected

Site measuring



Stakeout 3D model on site

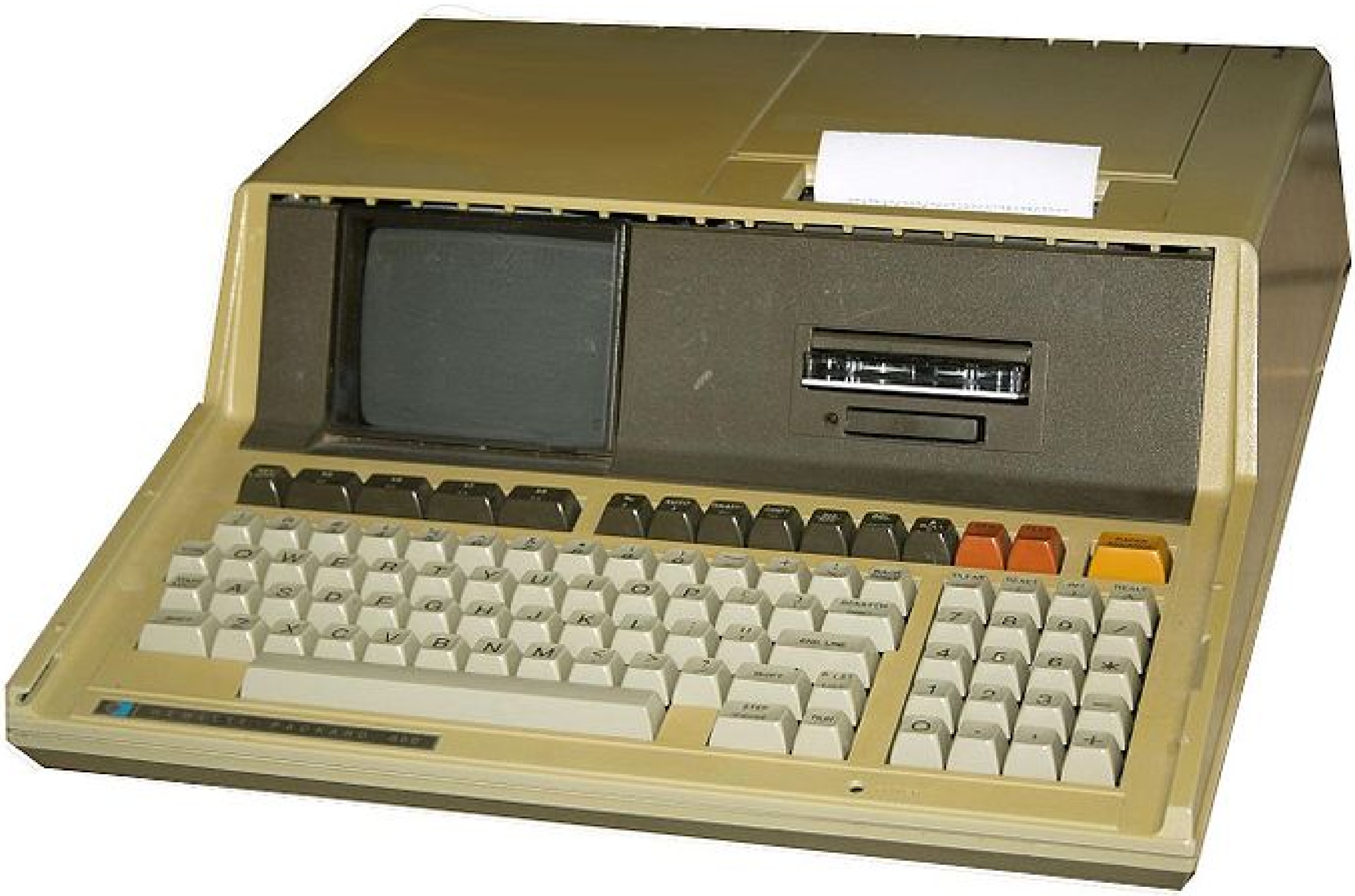
Stakeout 3D model on site

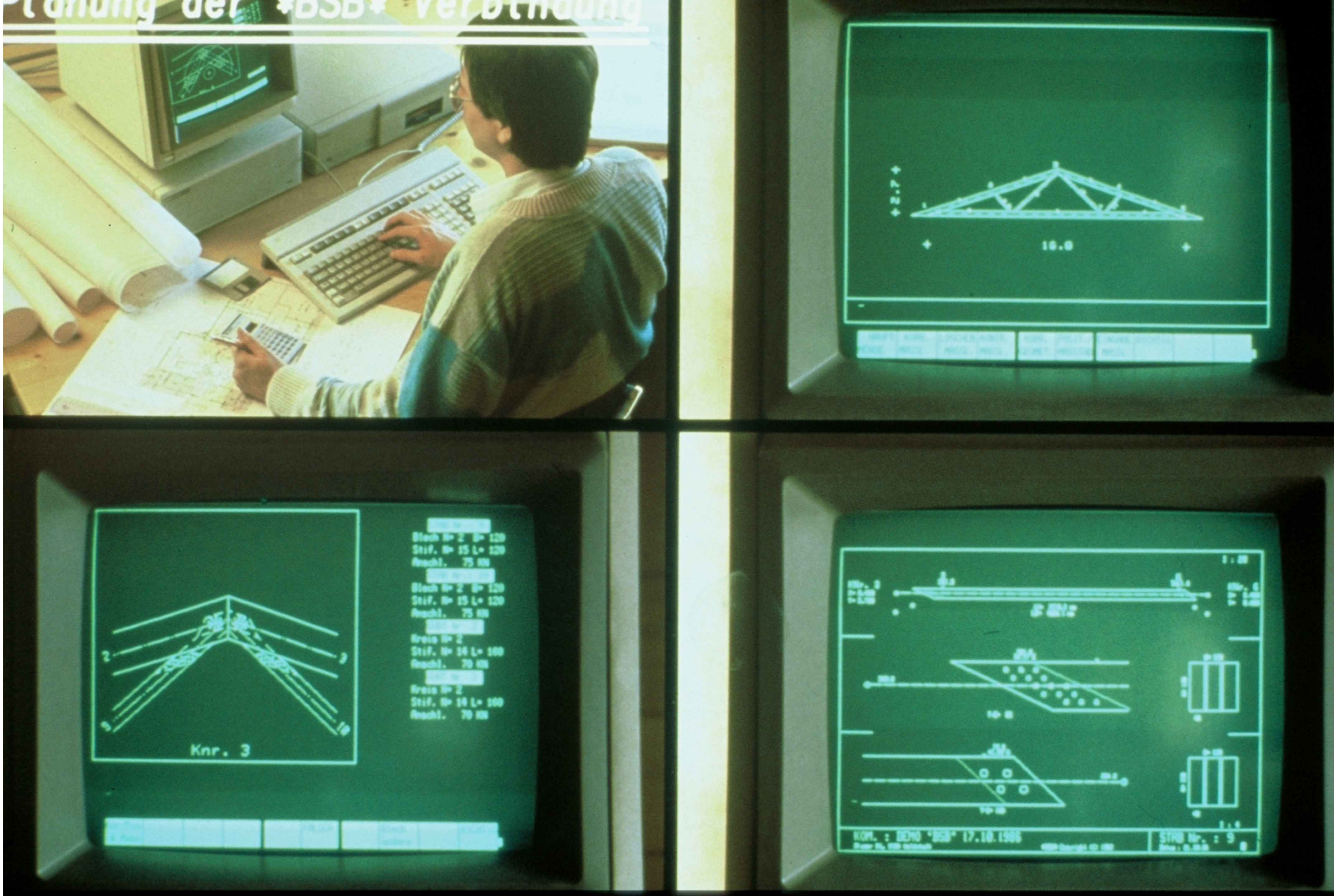


BIM and CAD/CAM

Säntispark 1986 – by RLC Architekten AG

This is the HP computer used to compute the Säntispark




Planung der *BSB* Verbindung
16.0
Blech N= 2 B= 120
Stif. N= 15 L= 120
Anschl. 75 KN
Blech N= 2 B= 120
Stif. N= 15 L= 120
Anschl. 75 KN
Kreis N= 2
Stif. N= 14 L= 100
Anschl. 70 KN
Kreis N= 2
Stif. N= 14 L= 100
Anschl. 70 KN
Knr. 3
KOM. : DEMO "BSB" 17.10.1986
STAB Nr. : 9

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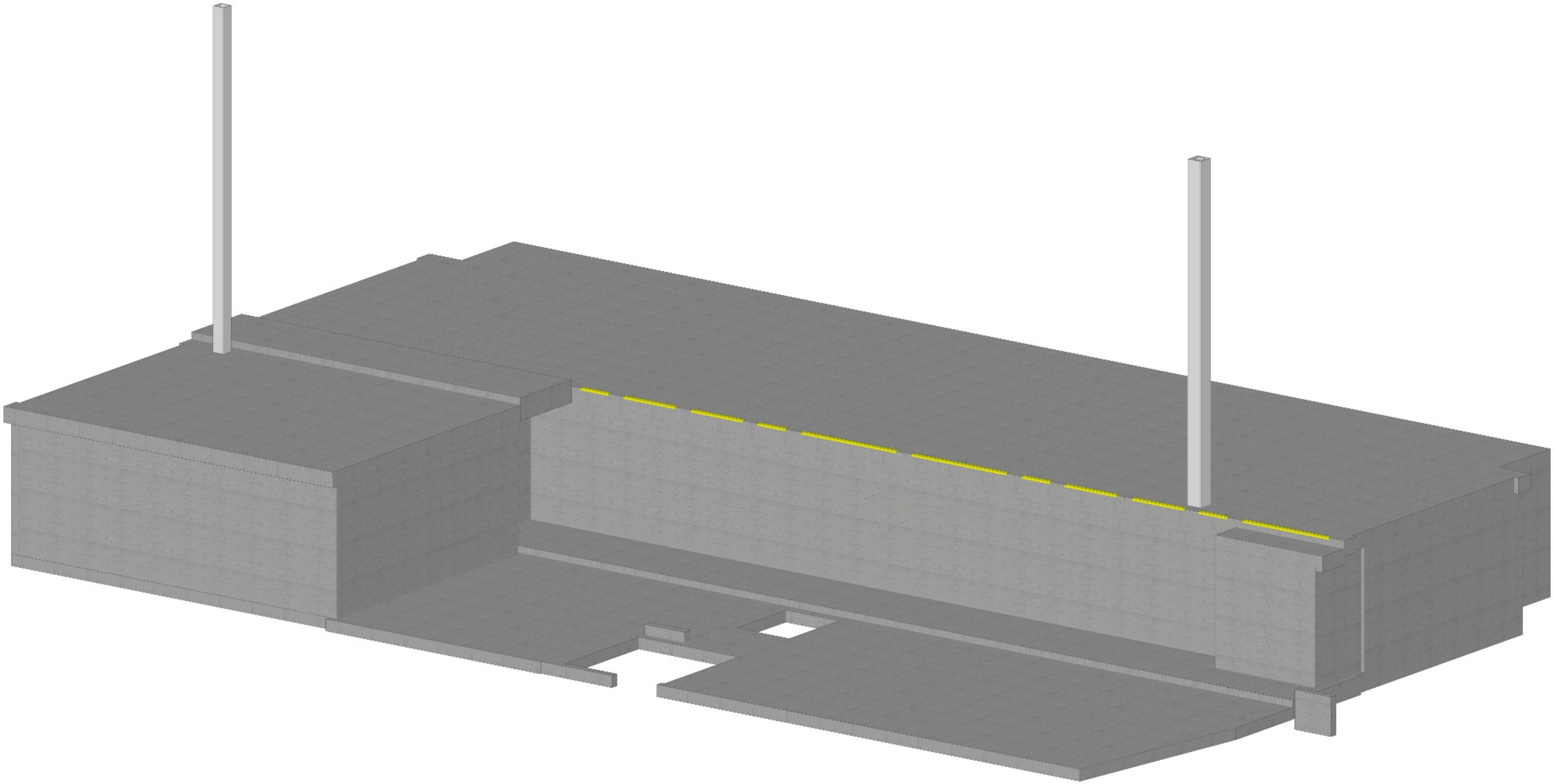
QUADRIN

QUADRIN


QUADRIN
BEVER LODGE



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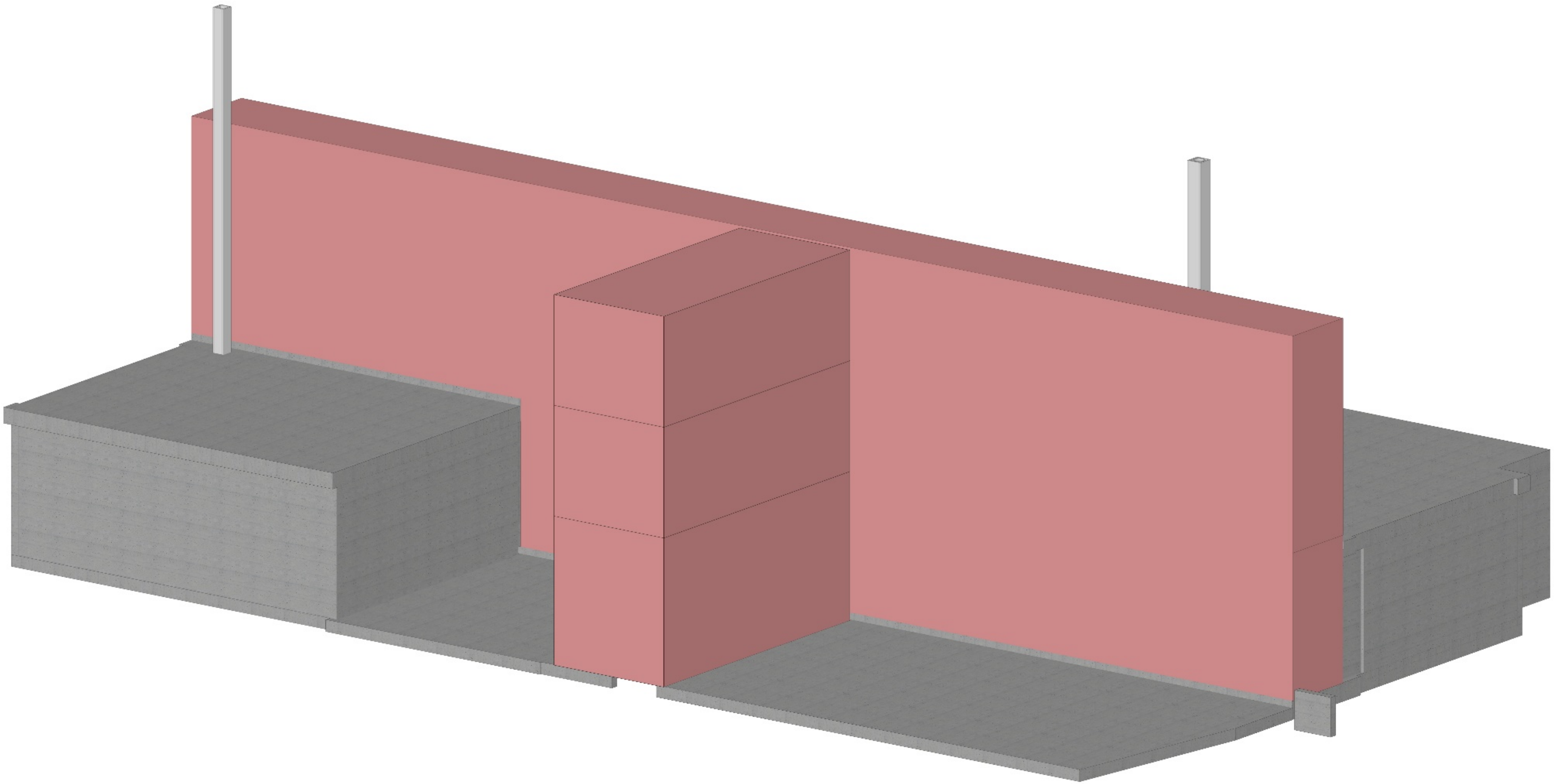
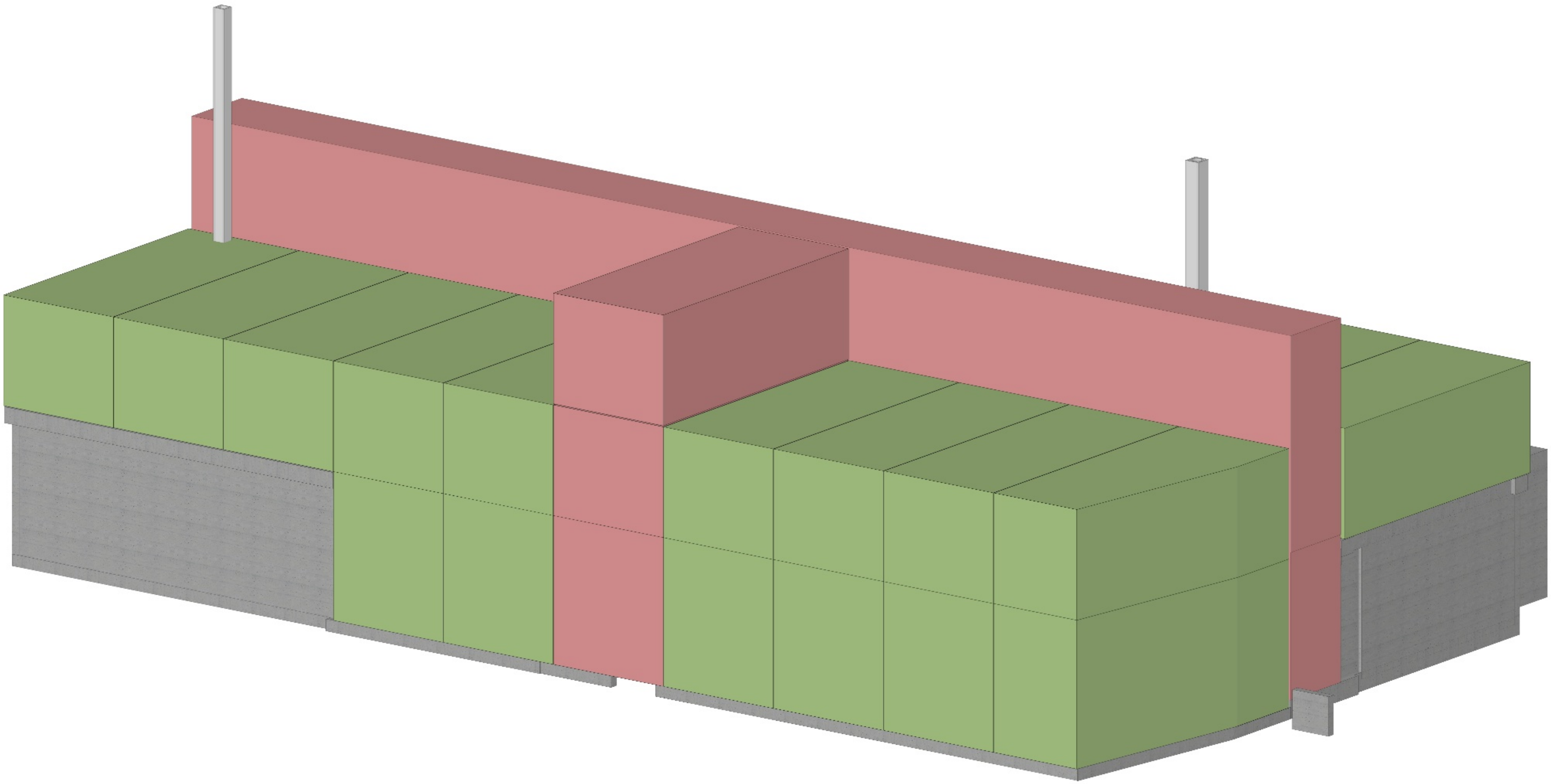
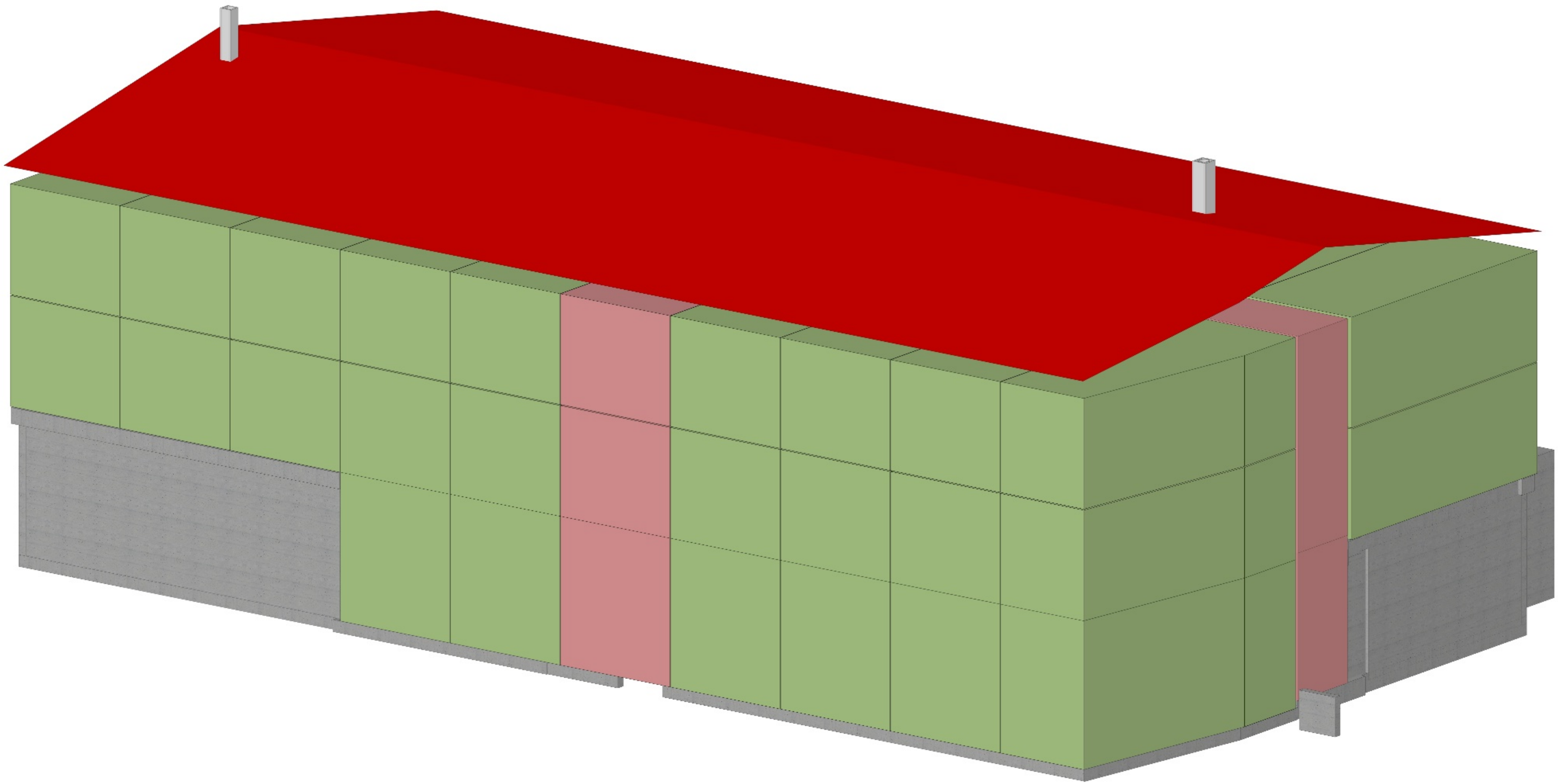
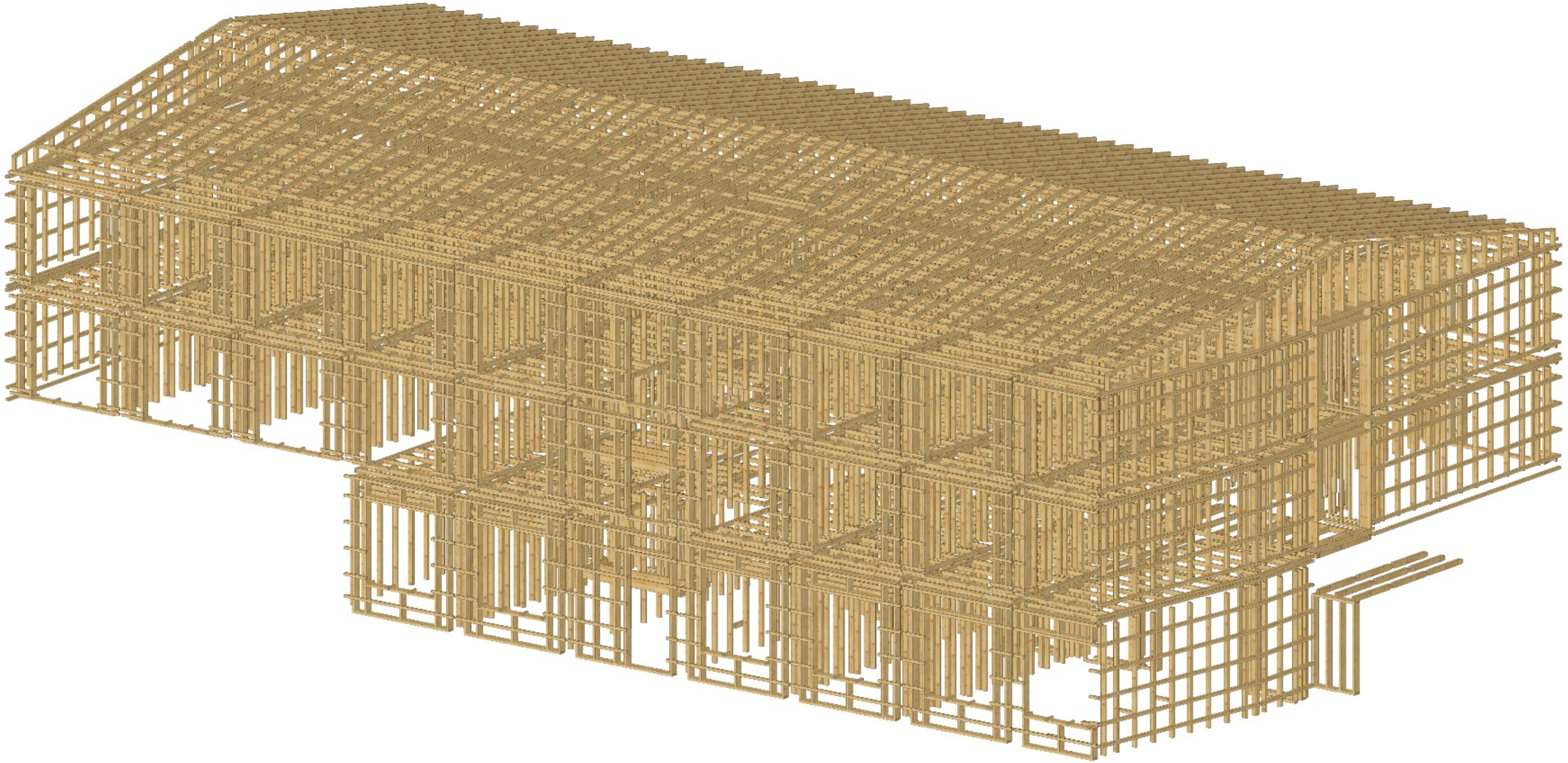


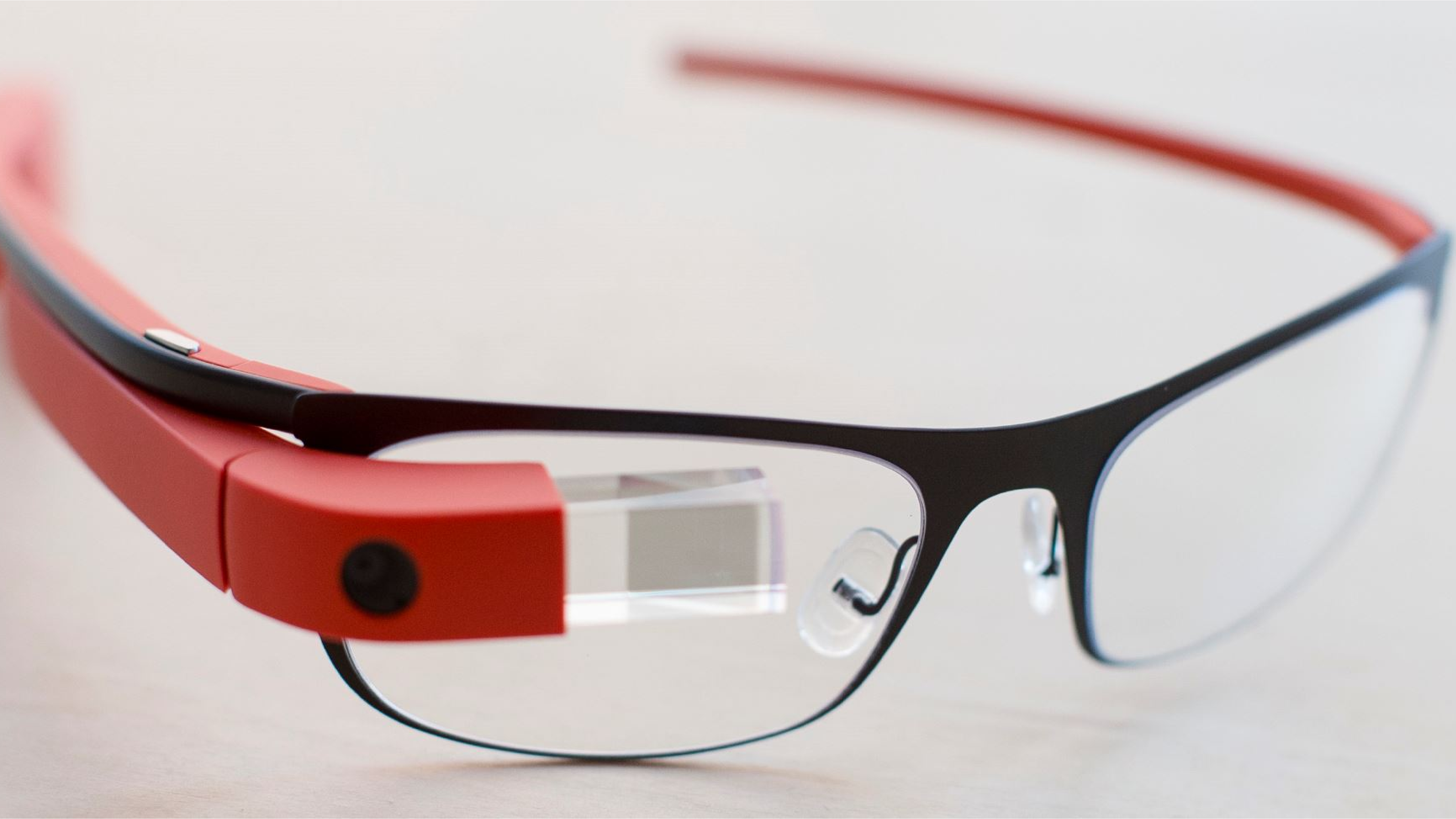







oculus

60
HIGH STREET
400m
60
60

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Roh, Square, Droits, Crudo
N&F2, T+G2 R+L2, M&B2
N&F4, T+G4 R+L4, M&B4
X
Format - Size
Länge x Breite, Length x Width, Longueur x Largeur, Longitud x Ancho
3000 x 2500
Stärke, Thickness, Epaisseur, Grueso
15,0
Stück, Number of pieces, Quantité, Pieza
30
PEFC
Auftragsspezifikation
Auftragsnummer
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Leistungserklärung/DoP-Nr.
KDE_OSB-3_CPR_2016_039
Prod. Datum
13.09.2016
20:23:34
Palettennummer
19 / 20
Kunde: KUNDENLAGER - FICHTE
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AW 159
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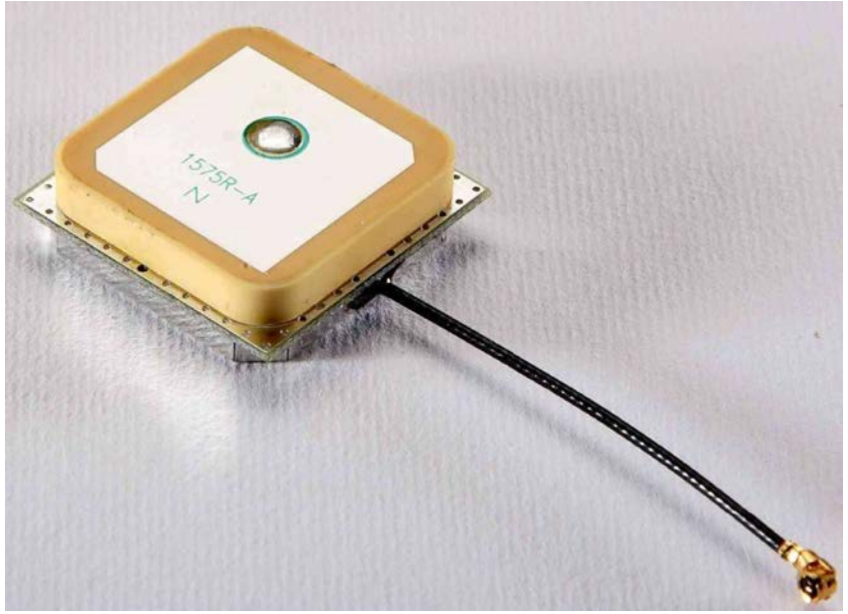
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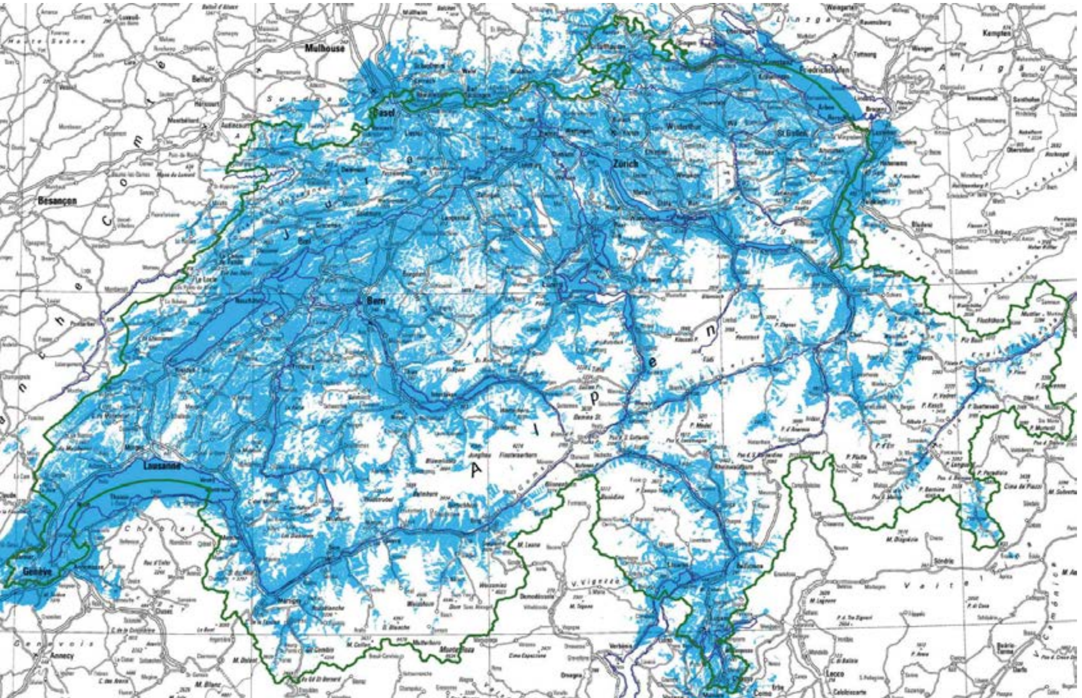
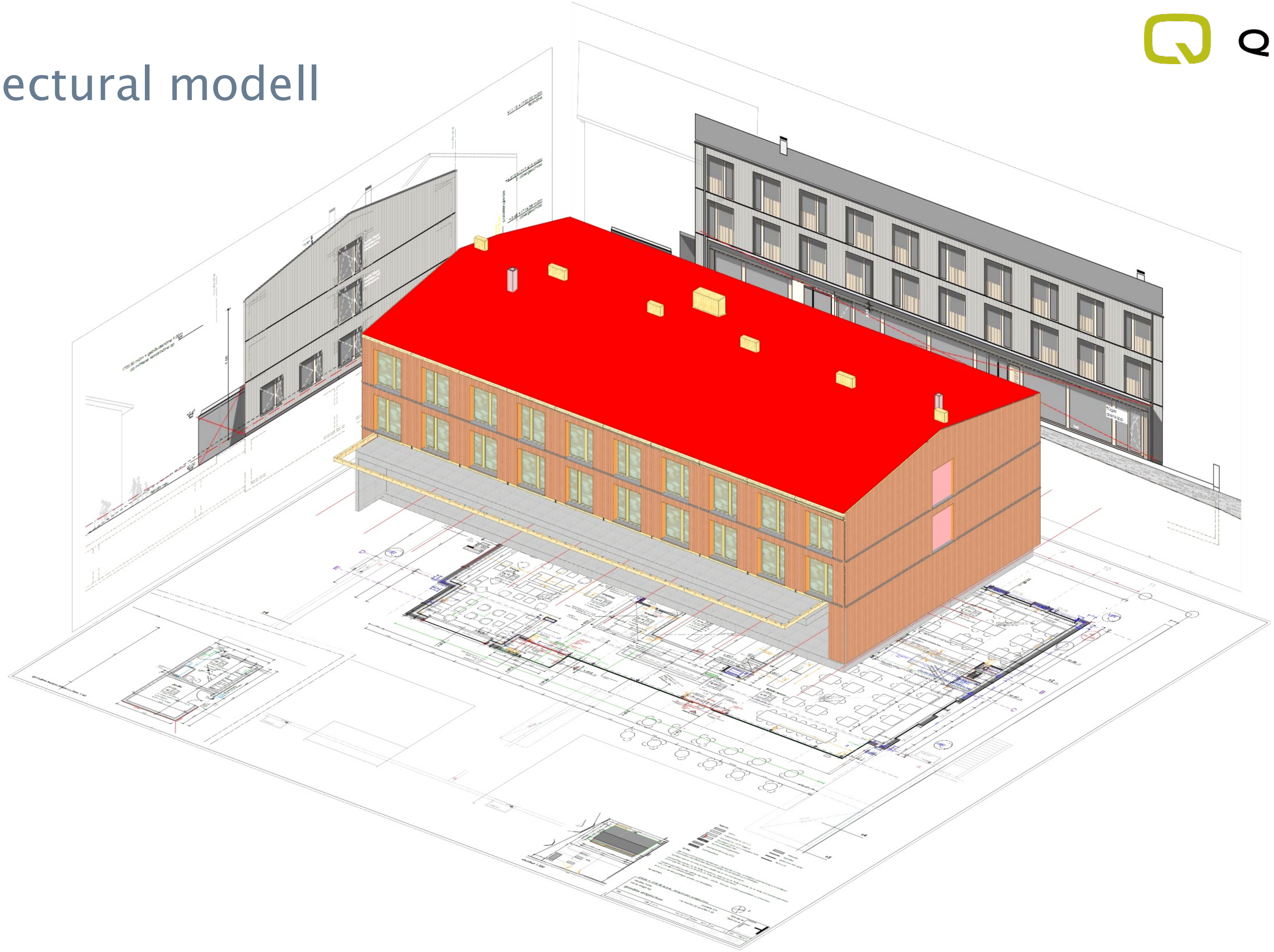



Navigate
Determine directions to something or someone
Track
Follow the path of something or someone
Locate
Find the position of something or someone
Manage
Manage proximity using data fusion

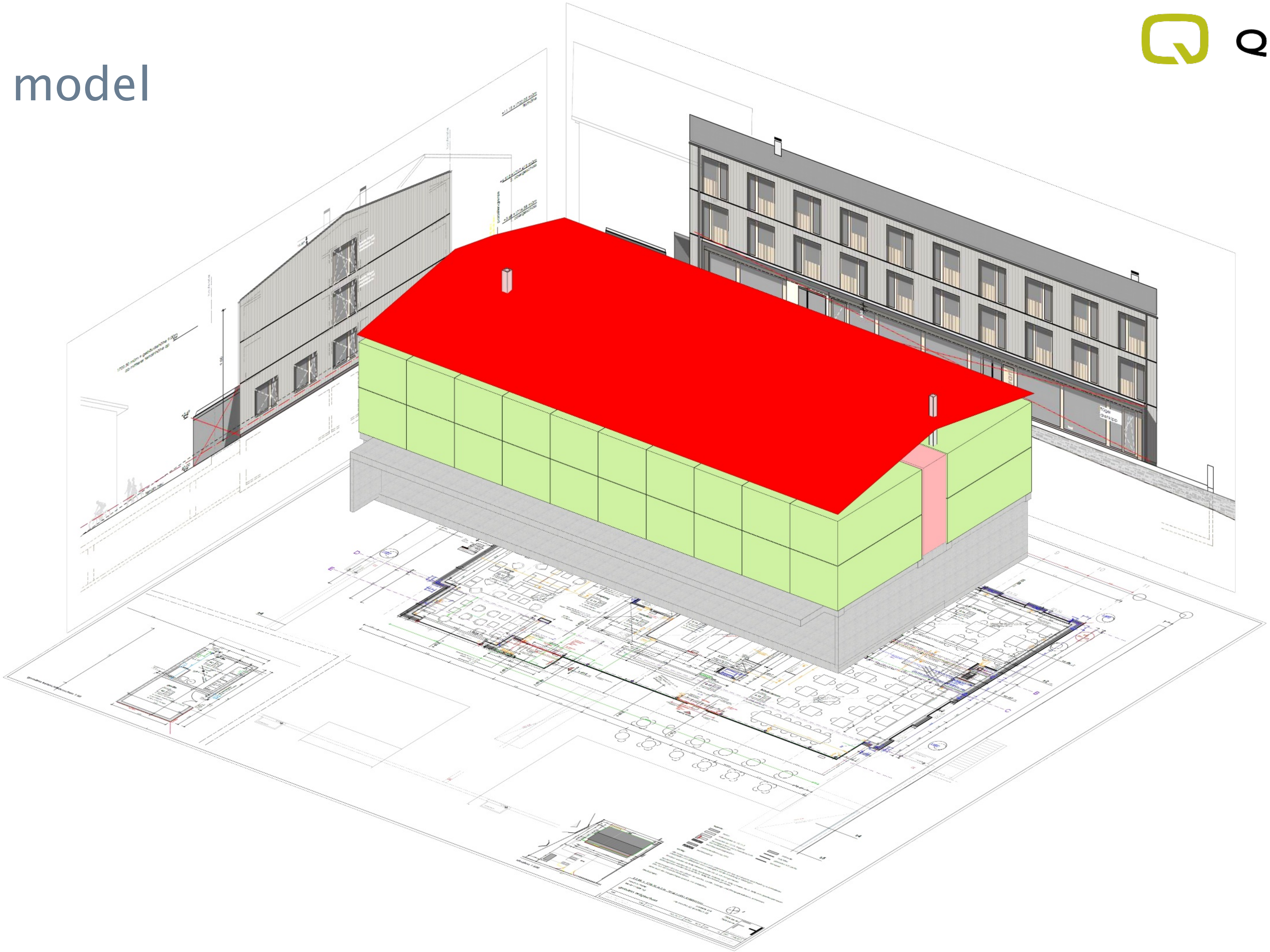

GERKEN

BIM and HVACS

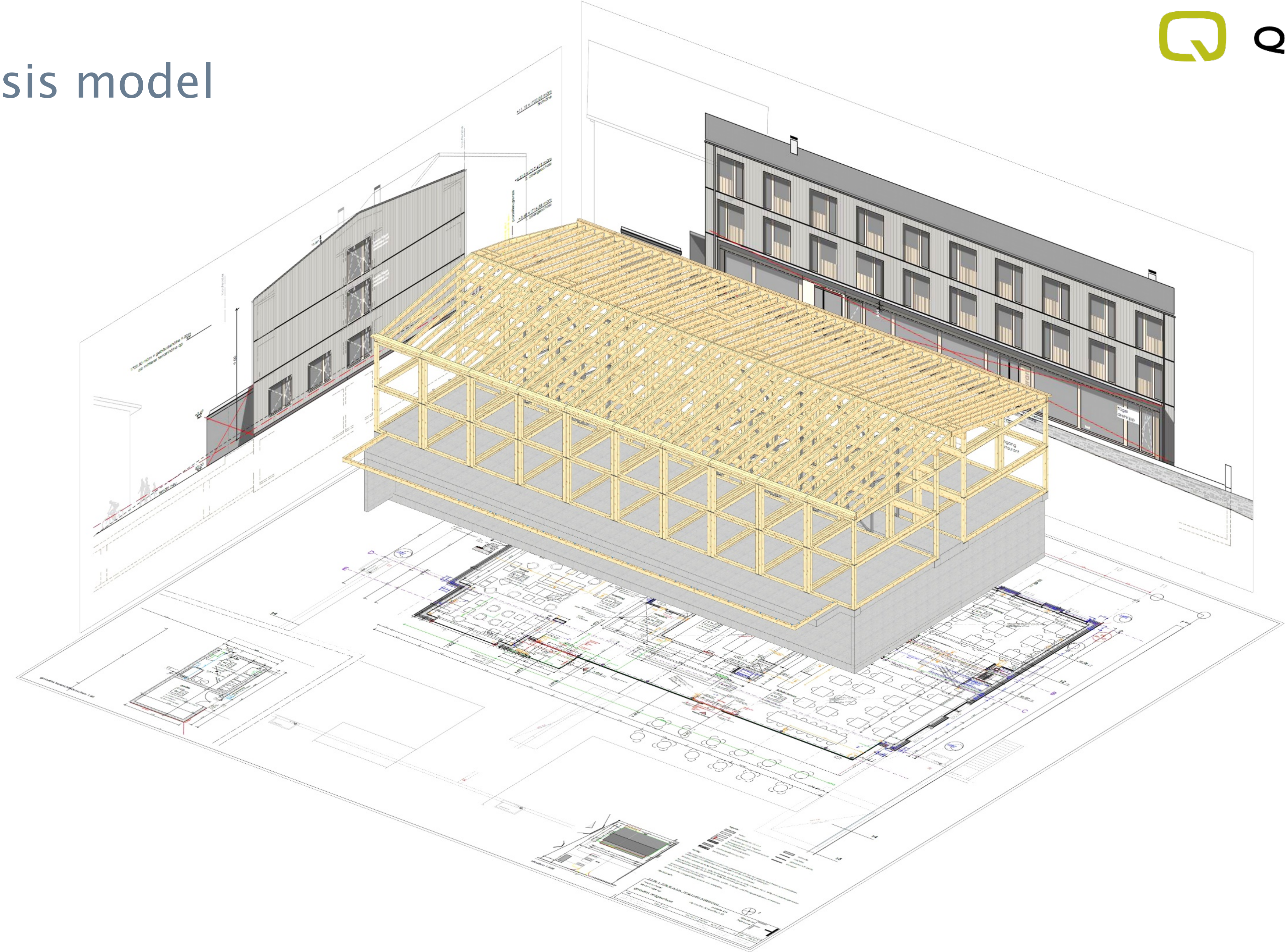
architectural modell



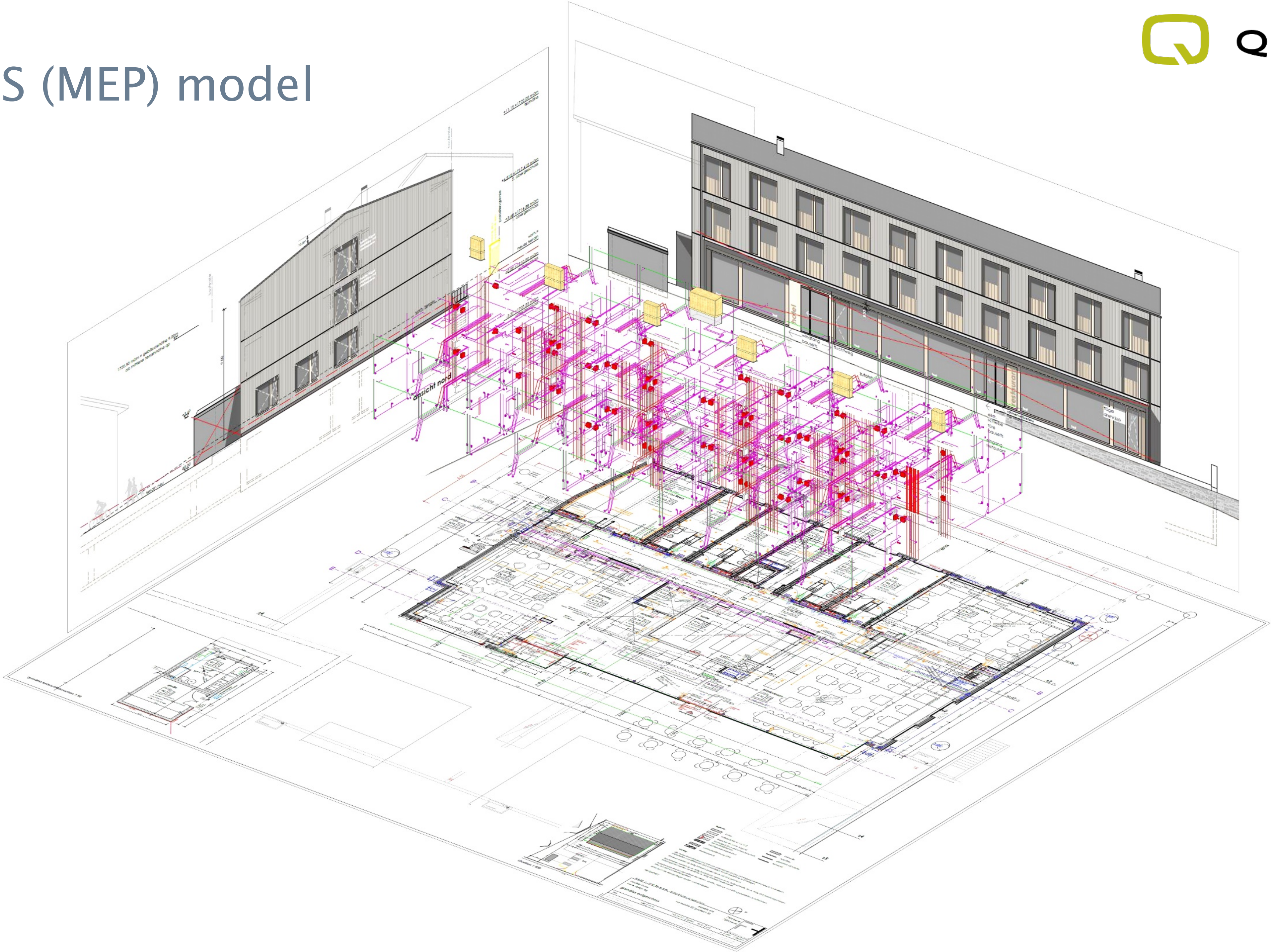
space model

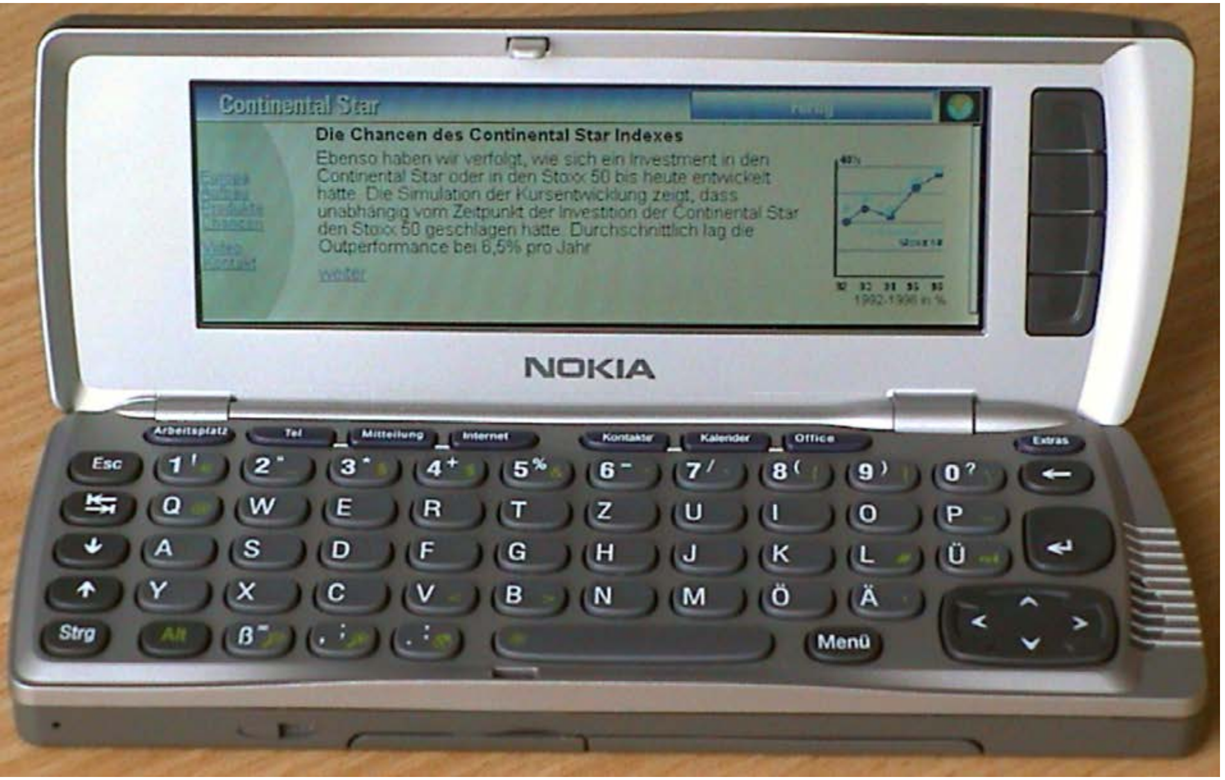


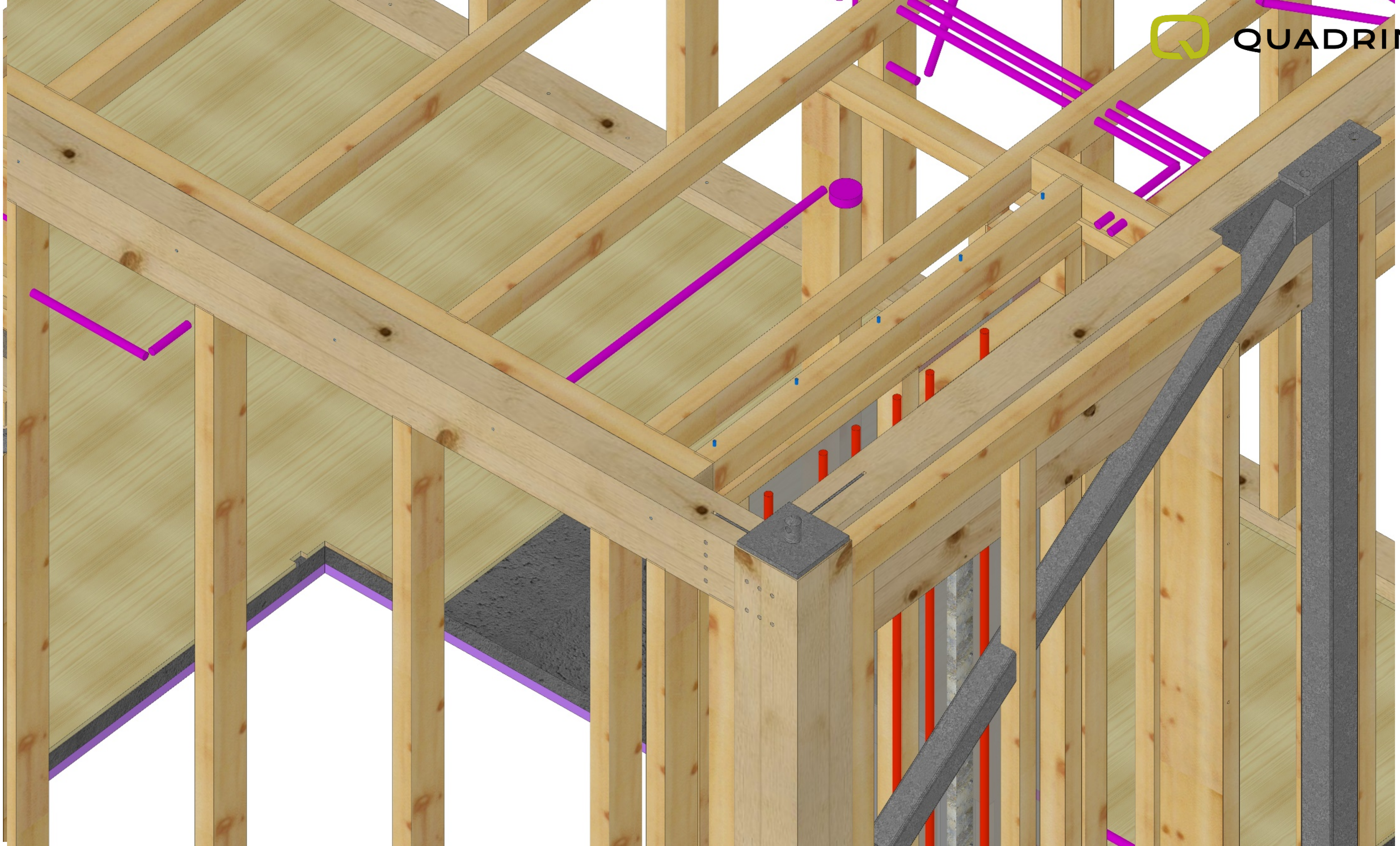
analysis model



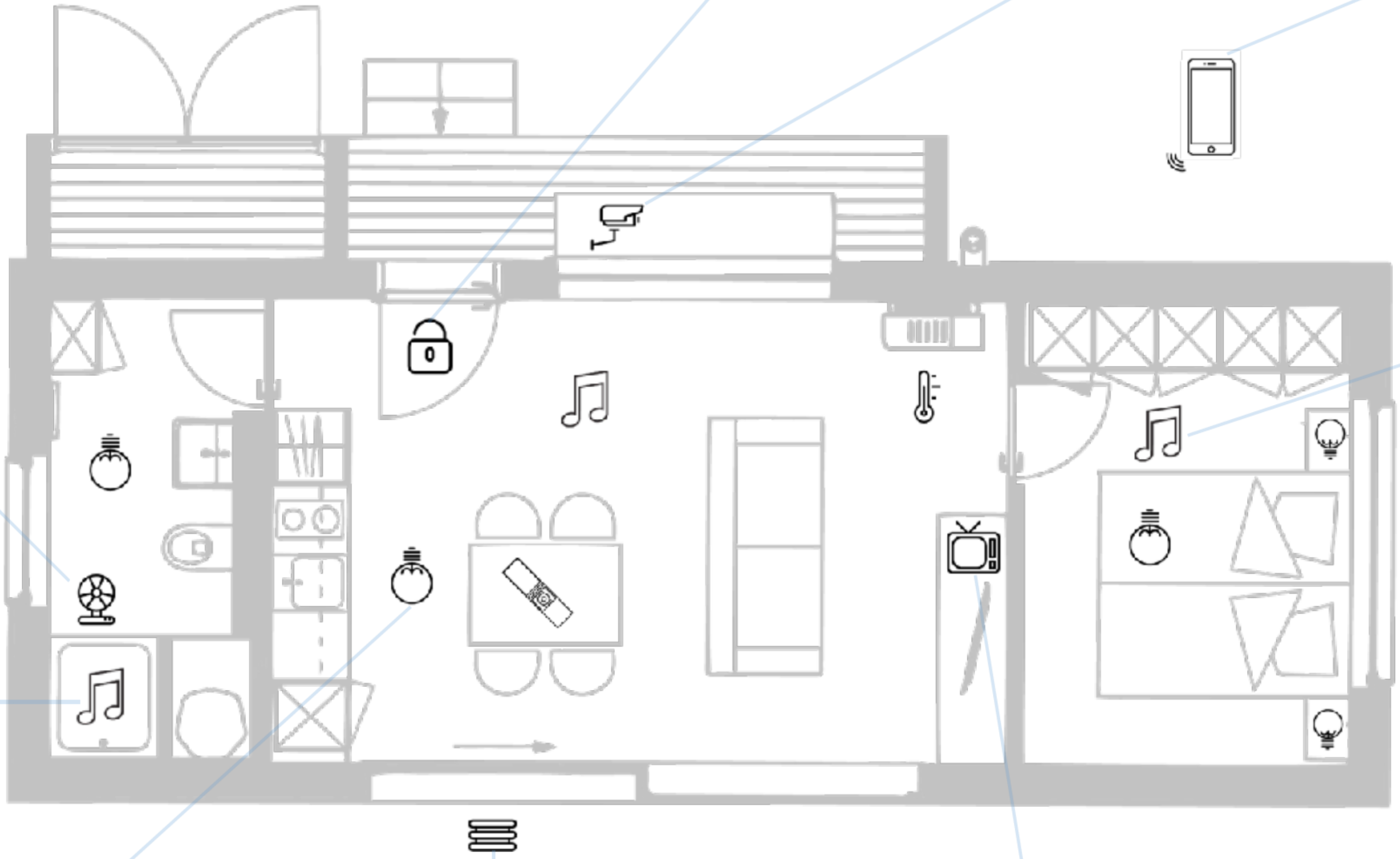
HVACS (MEP) model




Continental Star
Die Chancen des Continental Star Indexes
Ebenso haben wir verfolgt, wie sich ein Investment in den Continental Star oder in den Stoxx 50 bis heute entwickelt hätte. Die Simulation der Kursentwicklung zeigt, dass unabhängig vom Zeitpunkt der Investition der Continental Star den Stoxx 50 geschlagen hätte. Durchschnittlich lag die Outperformance bei 6,5% pro Jahr
weiter
NOKIA
Arbeitsplatz
Tel
Mitteilung
Internet
Kontakte
Kalender
Office
Extras
Esc
Strg
Menü



Eine erster Entwurf, für einen intelligenten Quadrin



QUADRIN

Dahinter steckt NEEO…

light

HVACS

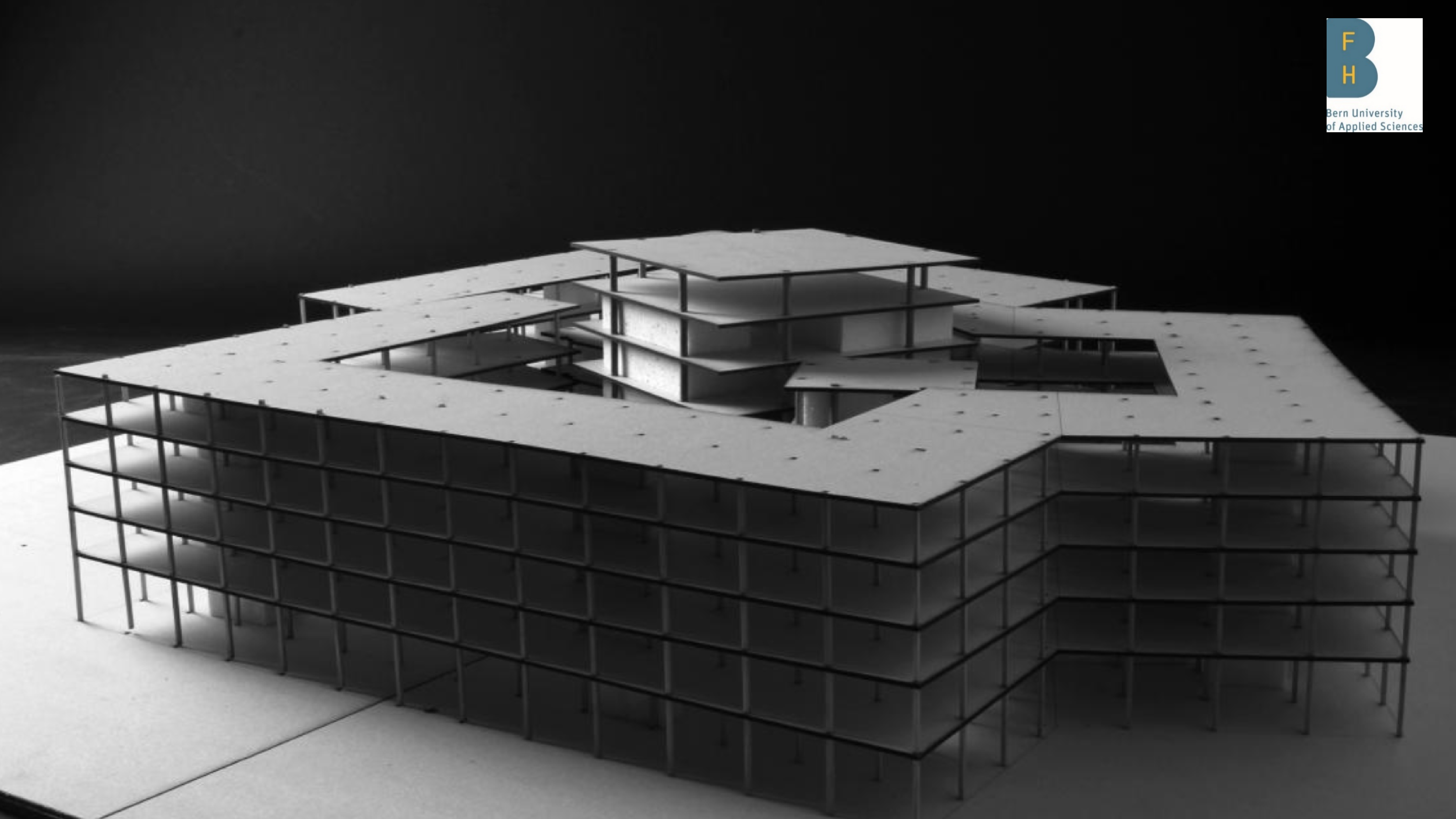
electricity

Music/TV

The NEEO Brain

- Die Intelligenz hinter der Remote
- Verbindet und kontrolliert über 60'000 Devices
- Kommuniziert über Bluetooth, WiFi, Z-Wave, ZigBee, 6LowPan und Infrarot
- Automation 24h im Hintergrund, auch wenn App oder Remote ausgeschalten sind
- Kann das 'Gehirn' des Quadrins werden

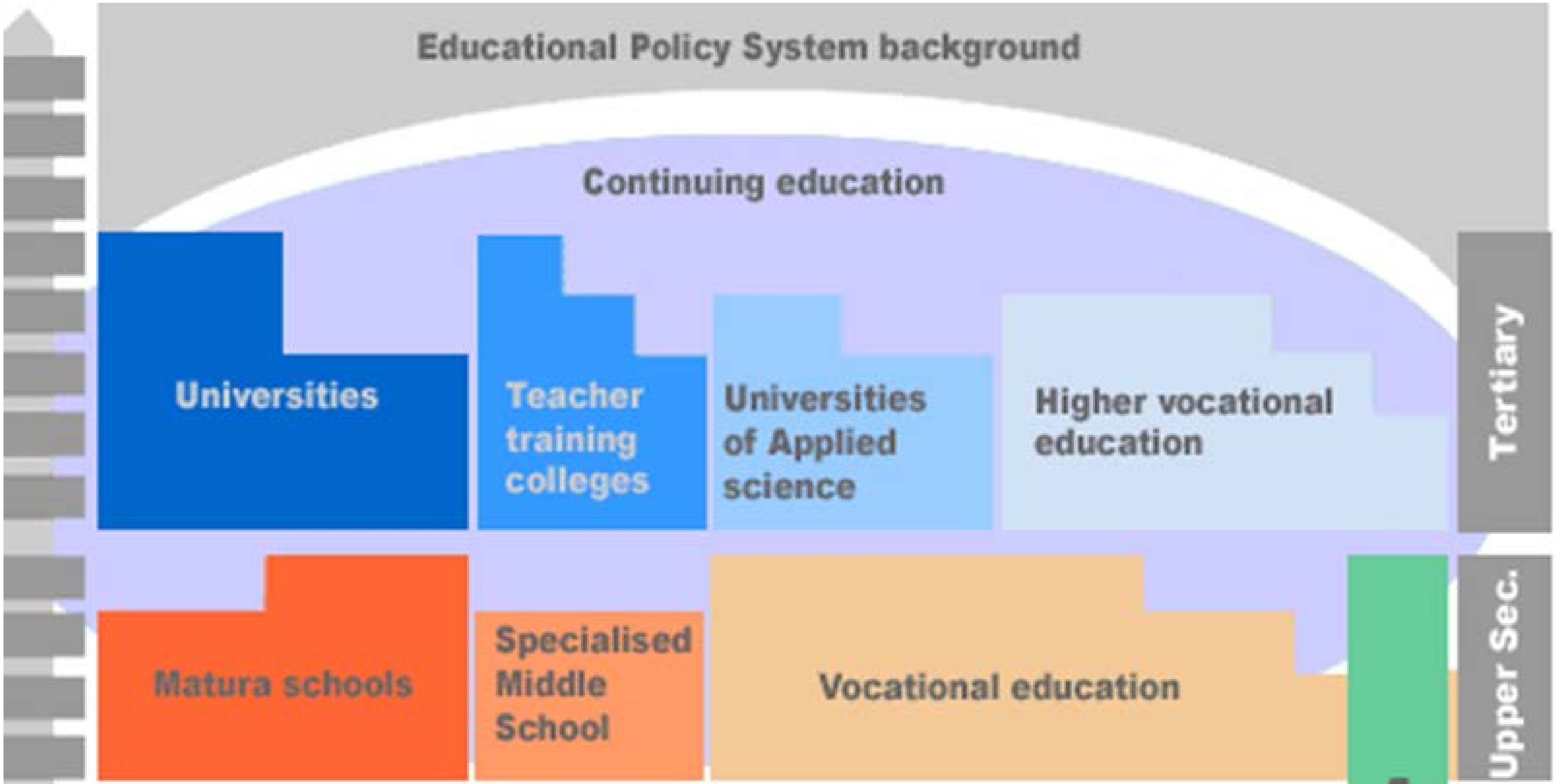
Science City
Bern University of Applied Sciences



Bern University
of Applied Sciences


F
H
Bern University
of Applied Sciences
BFH

The Swiss educational system



New challenges


Methodology / Didactics / Agogics


Generation Z


Technology <-> Handcraft

Finances


Politics / Lobbying / Cooperations


Generation change

Bachelor degree courses

- Bachelor of Arts in Architecture
- Bachelor of Science in Wood Engineering
- Bachelor of Science in Civil Engineering

Bern University
of Applied Sciences

Masters degree courses

- Master of Arts in Architecture
  (in cooperation with the University of Applied Sciences Western Switzerland)
- Master of Science in Engineering
  (in cooperation with seven Swiss Universities of Applied Sciences)
- Master of Science in Wood Technology
  (in cooperation with the University of Applied Sciences Rosenheim, Germany)

FH B
Bern University
of Applied Sciences

Focal points

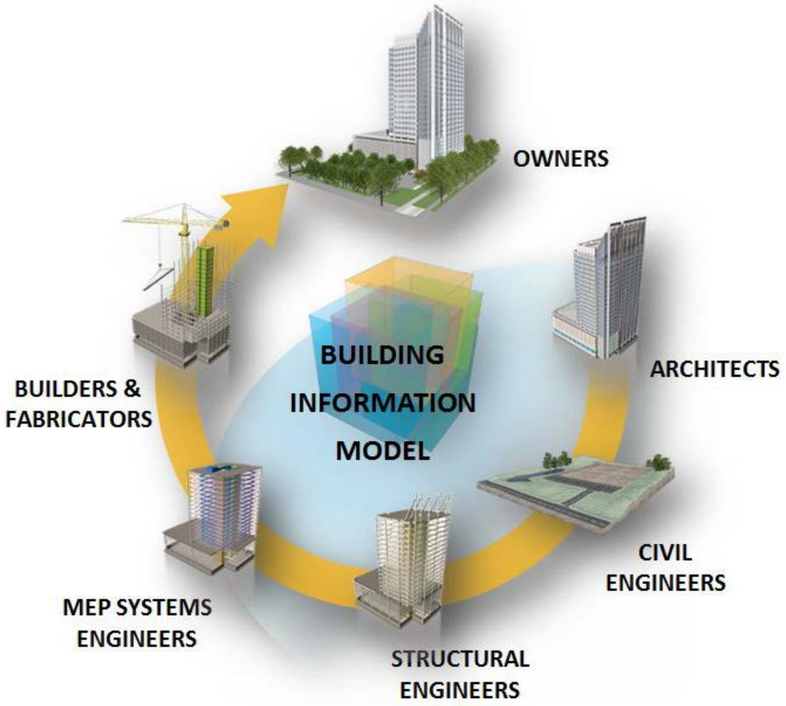
Specialisation Complex Timber Structures – CTS

Bern University
of Applied Sciences

1. **Multi-storey Timber and Hybrid Structures**

2. **Complex Timber structures**

3. **Building Information Modeling (BIM)**



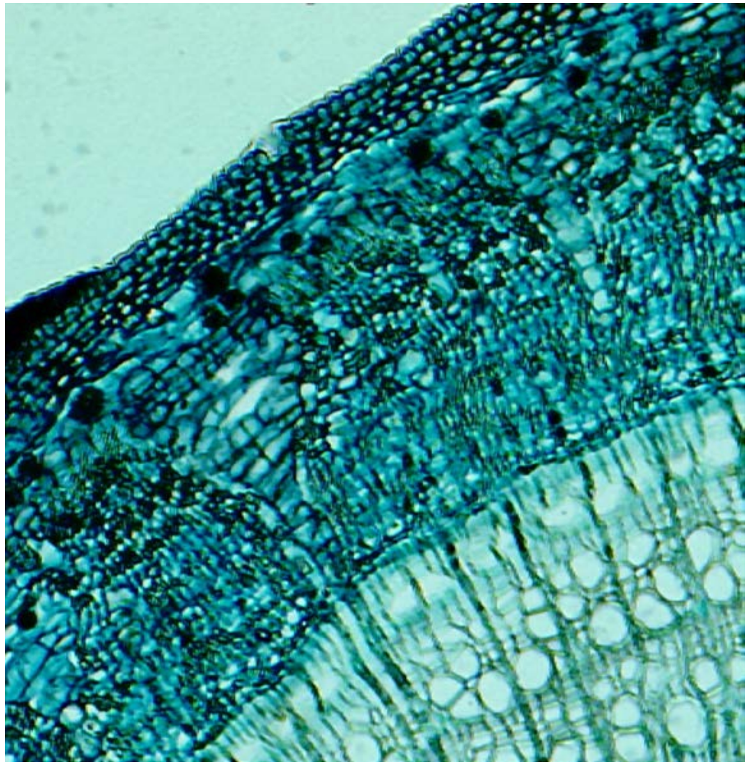
Left: *design of a 30 storey building by the kanadian Architect Michael Green*
Middle: *Shigeru Ban the new SWATCH Headquarter in Biel*
Right*: Source www.cooperindustries.com*

Research and Development

3 Institutes of Bern University of applied sciences

Bern University
of Applied Sciences

Institute 1: Materials and Wood Technology

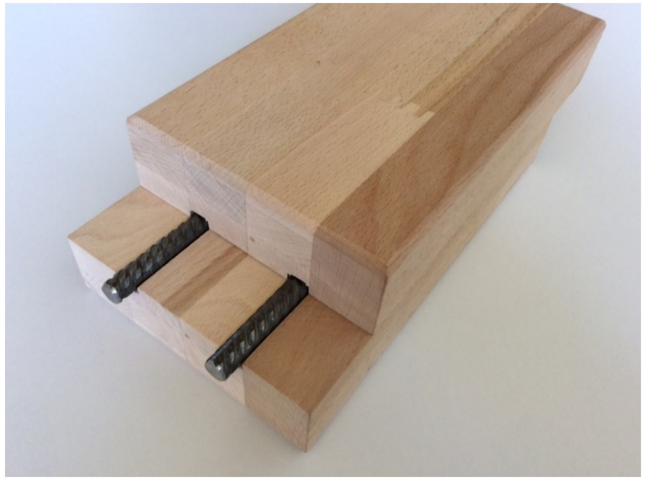


Institute 2: Timber Construction, Structures and Architecture

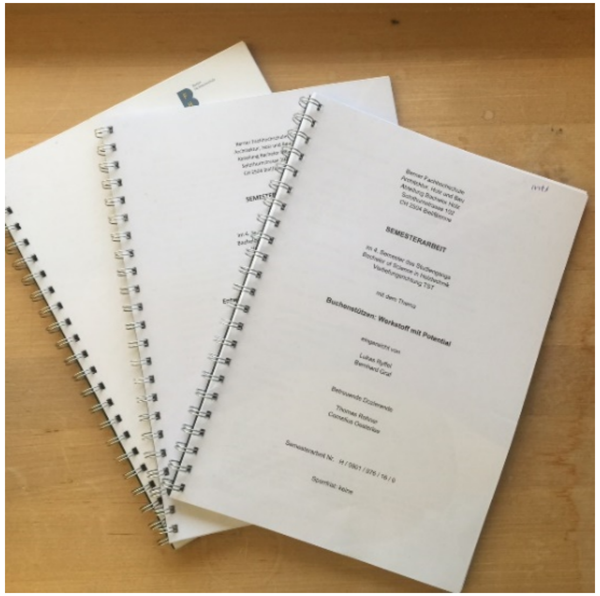
Institute 3: Urban Development and Infrastructure

teaching Researchers – researching Teachers

Applied sciences



Idea: reinforced high performance posts (beech instead of concrete)

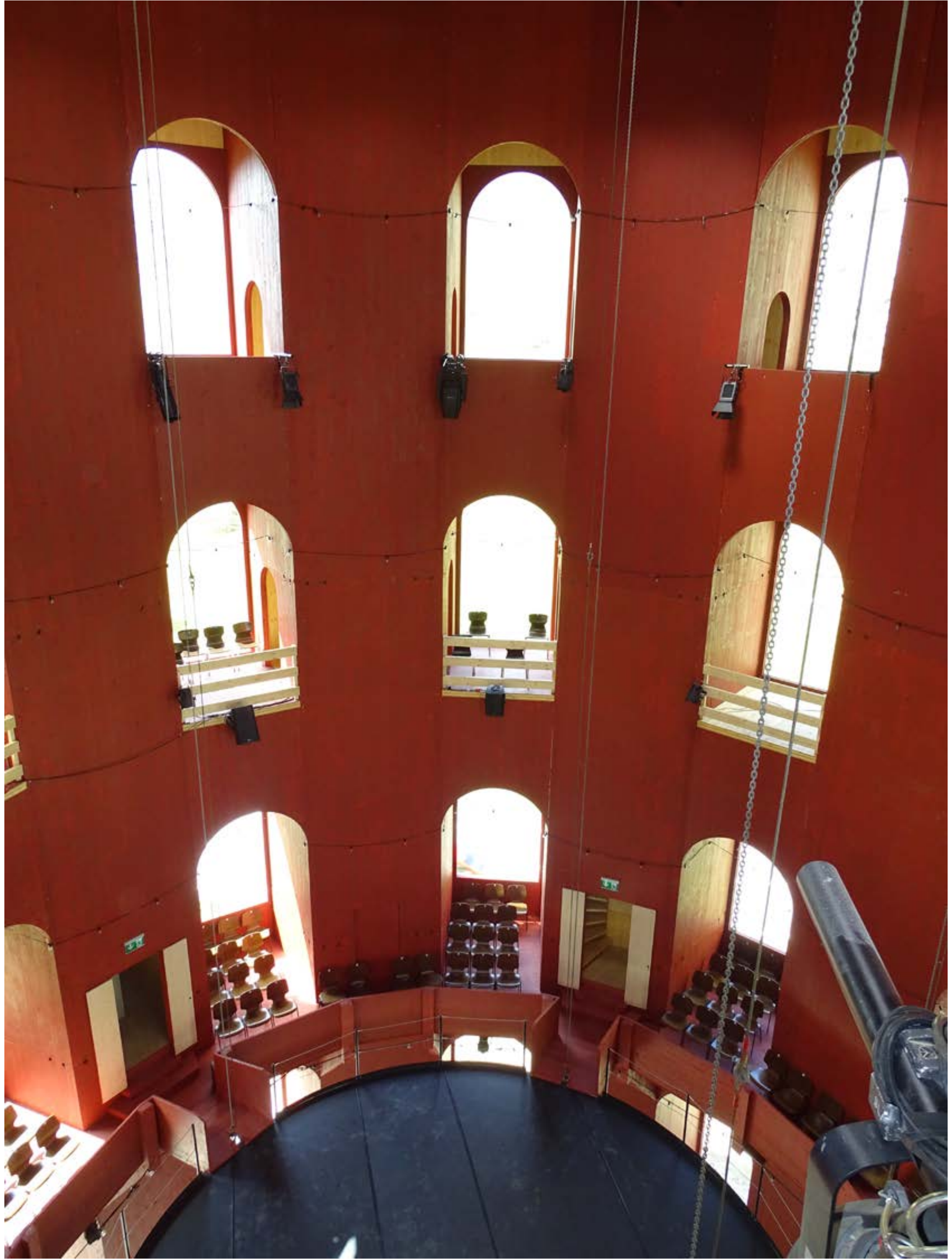



BLACK SABBATH

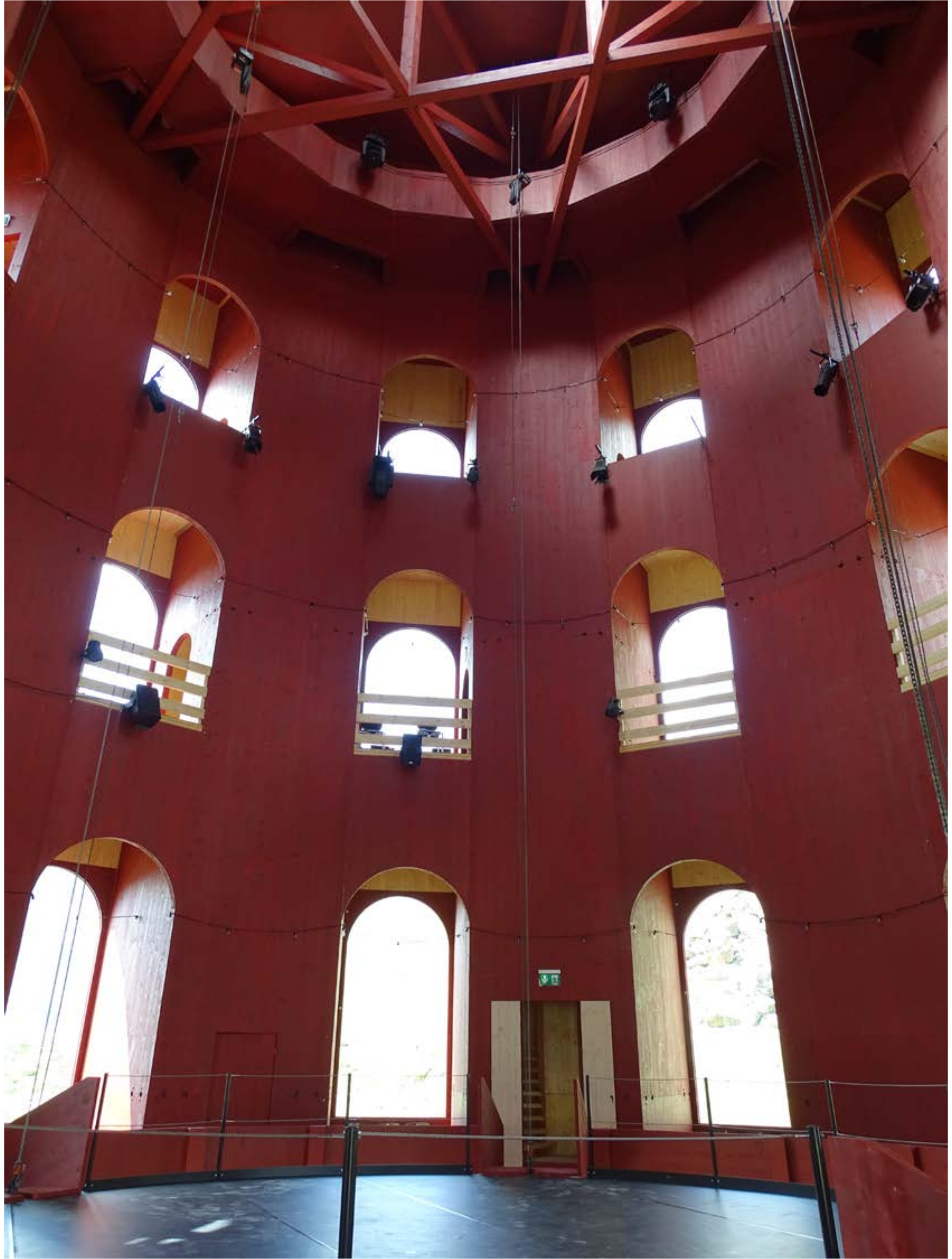
marti
roth gerüste
Häuselmann


FachWerk
76 Nord
ARNOLD
ENERGIE & TELECOM
Für dieses Plakat haben wir 449 Franken bezahlt. Um uns bekannter zu machen.
CLER
ARNOLD
Hochspannung HS
P


BEER HOLZBAU AG
GERSAG
INNOVATIVE KRANTECHNIK
Fabr.Nr. 161128/02
10 t
Baujahr 2016




ORIGEN
LA TORRE BABILONICA
MUSEUM ZUR BAUHÜTTE
OFFEN DI–SO VON 10–17H



Berner Fachhochschule
Haute école spécialisée bernoise
Bern University of Applied Sciences

Thank you very much for joining us

- Malmö, Swedish Wood