

Artificial Intelligence meets Structural Design in Practice



EISFELDINGENIEURE

Prof. Dr.-Ing. Michael Eisfeld MSc

THINK VISIONARY - DESIGN PASSIONATELY



Structural engineers
since 1938 in third
generation

BIM & AI pioneers in
structural design in
Germany

Reliable partner from
the idea to the
implementation

CERTIFICATES AND MEMBERSHIPS:



6,5 Mio. Euro turnover

200+ projects per year

4 divisions

Over 85 employees



Employees over 70 engineers, modelers and draftsmen

Technology state-of-the-art BIM software / in-house developed AI tools / agile management

Network research partners, specialists in foundation engineering and construction

STRUCTURAL ENGINEERING



Erweiterung & Sanierung Rathaus Langenhagen

PRECAST PLANNING



SIEMENS Campus Erlangen

STRUCTURAL CHECKING



SMA Repair Center Niestetal

GENERAL PLANNING



Variowohnen Kassel

BUILDING TYPOLOGIES

ENGINEERING STRUCTURES

Bridge to the production module

Client SMA Solar Technology AG

Architect HHS Planer und Architekten AG



INDUSTRIAL BUILDINGS

Conversion and refurbishment of CMS calcination plant

Client K+S Kali GmbH

General planning Eisfeld Ingenieure AG



RESIDENTIAL CONSTRUCTION

Salamanca site, Kornwestheim

Client Immobilien Projektgesellschaft Salamanca GmbH

Architect Global Concept GmbH



COMMERCIAL BUILDINGS

Goldbeck Campus Fasanenhof Stuttgart

Client Objekt Fasanenhof B. V. & Co. KG

Architect Goldbeck Süd GmbH



EDUCATION

Heinrich Schütz School Kassel

Client City of Kassel

Architect Schultze + Schulze Architects BDA

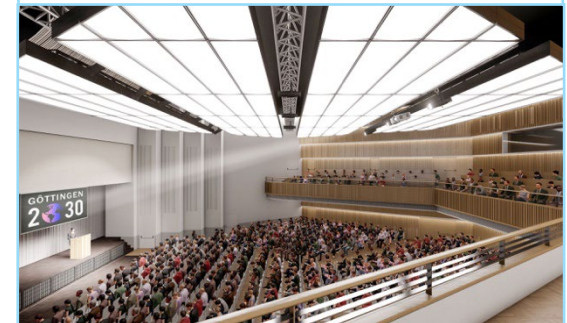


EXHIBITION / MEETING

Refurbishment and extension of Göttingen City Hall

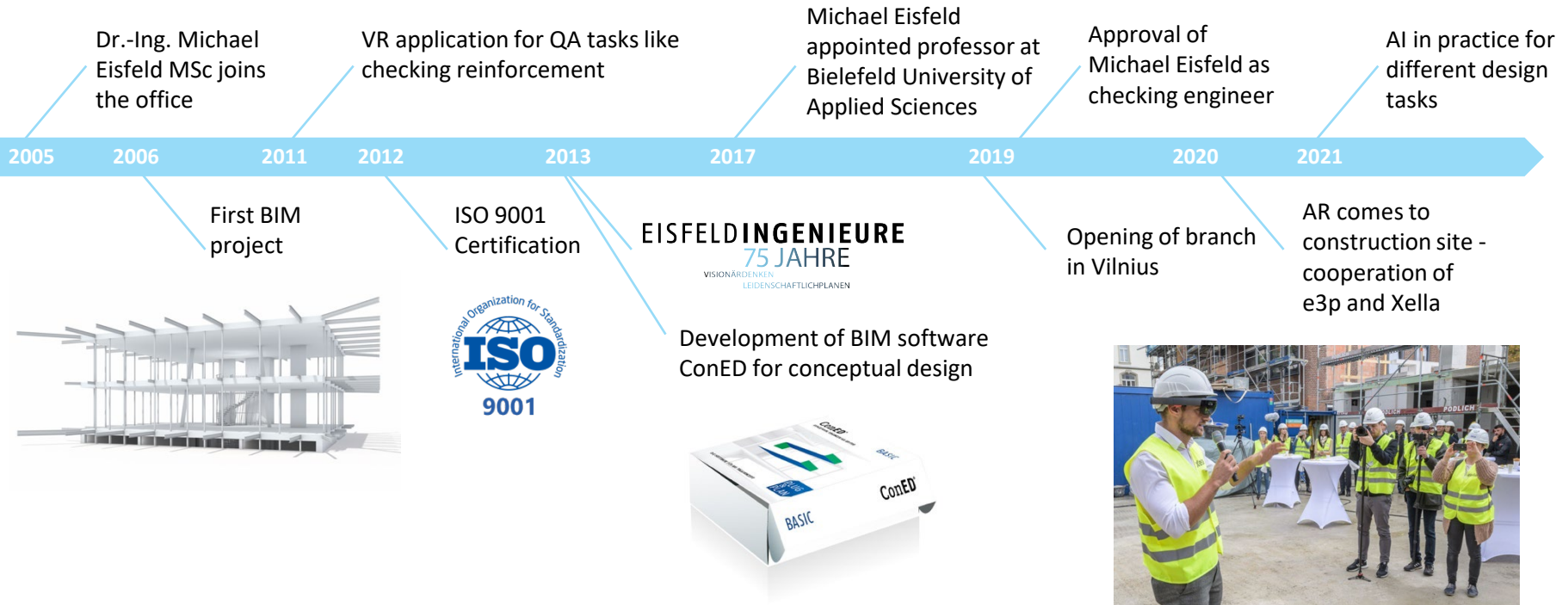
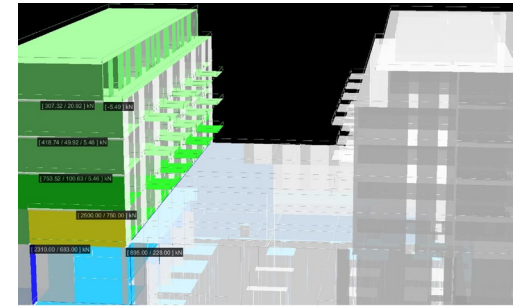
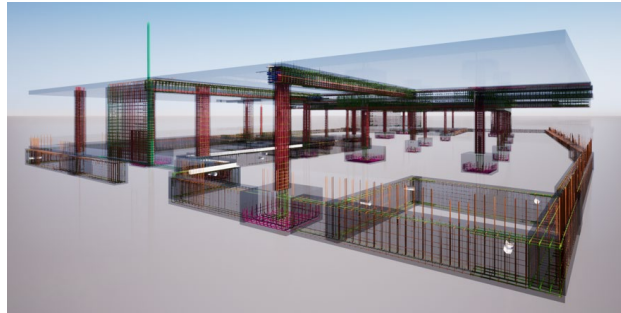
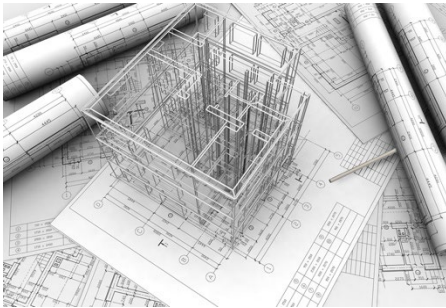
Client City of Göttingen

Architect SSP Architekten + Ingenieure AG

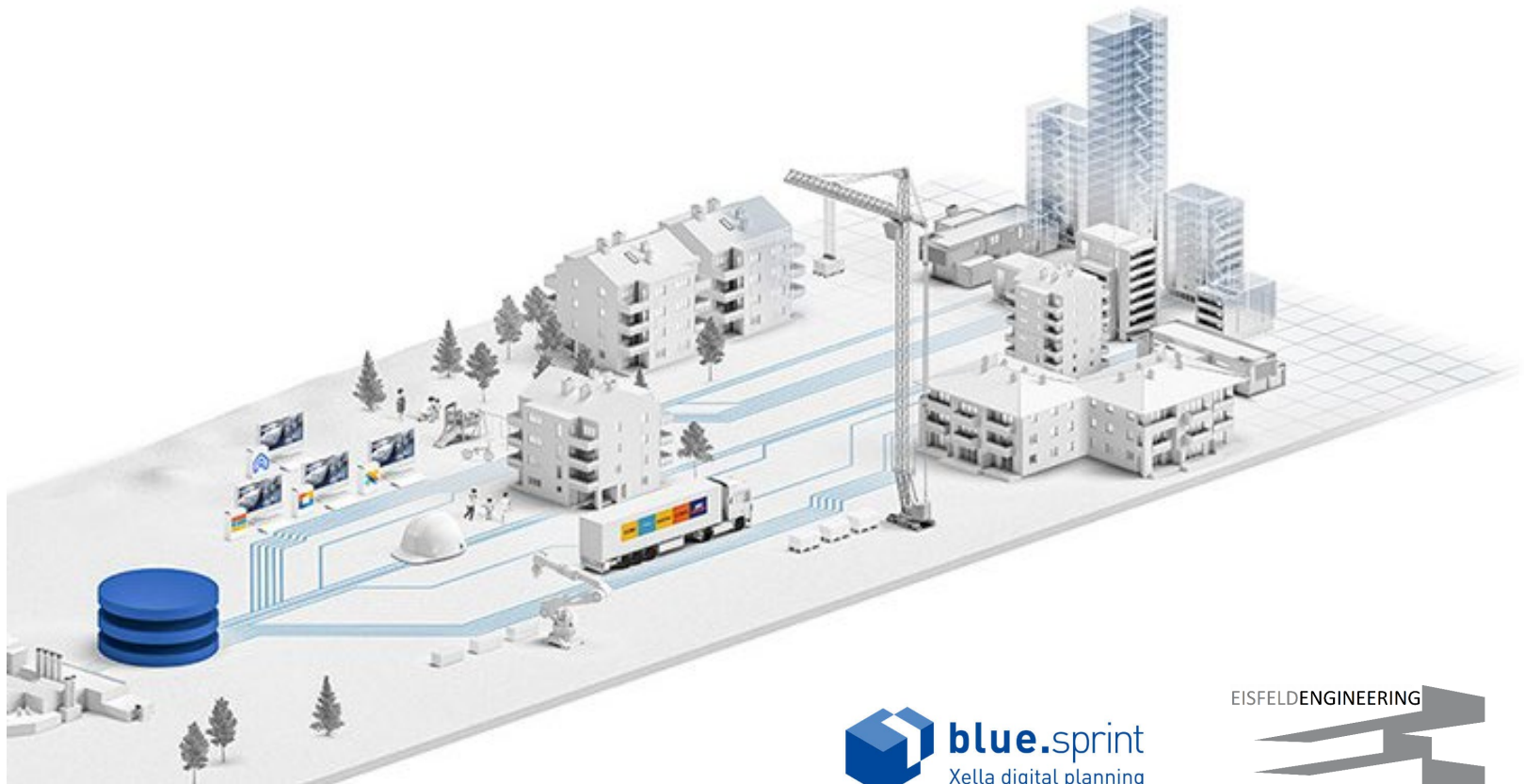


Why we are interested in Artificial Intelligence

BIM & AI IN EISFELD ENGINEERING



DIGITAL PLANNING & CONSTRUCTION OVER LIFECYCLE



Often symbolic information processing by engineers
→ planning, synthesis and learning

Traditional number crunching does not work
→ searching, rules and pattern matching

Knowledge is required to solve a task
→ spatial, structural and procedural

Hybrid AI combines different approaches like logic, neural networks and graph reasoning



Federal Ministry
of Education
and Research

Can a machine learn to build a BIM model from 2D drawings?

AutoBuild3D

R&D project: 390 k€ budget, 2 years duration

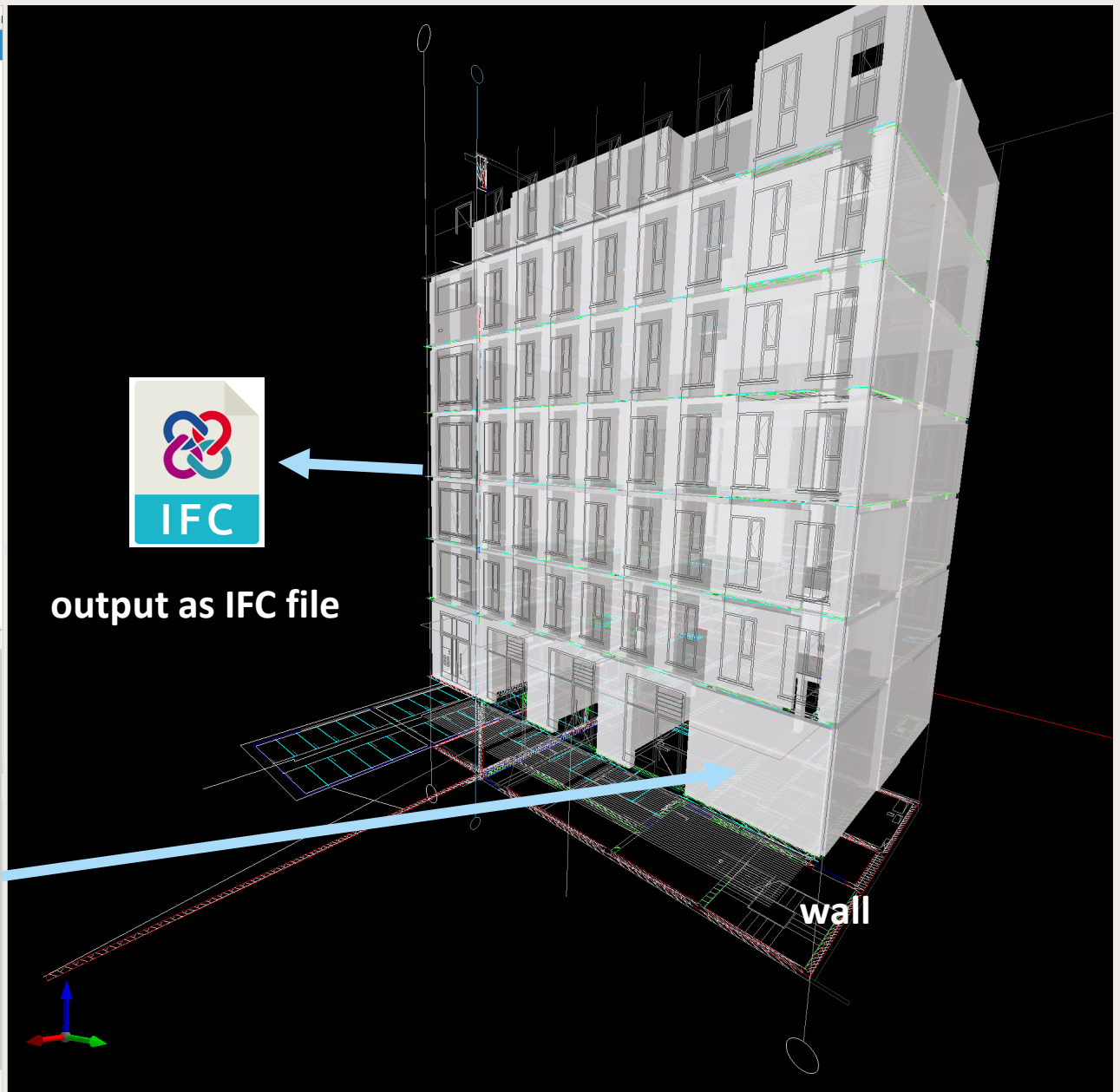


Optionen	Plan	Information
☒ ☑	Grundriss	
▸ ☒ ☑	Floor_06_(-6,7;-2,6;21,4).dwg	OG[6]
▸ ☒ ☑	Floor_05_(-6,7;-2,6;18,32).dwg	OG[5]
▸ ☒ ☑	Floor_04_(-6,7;-2,6;15,24).dwg	OG[4]
▸ ☒ ☑	Floor_03_(-6,7;-2,6;12,16).dwg	OG[3]
▸ ☒ ☑	Floor_02_(-6,7;-2,6;9,08).dwg	OG[2]
▸ ☒ ☑	Floor_01_(-6,7;-2,6;6,0).dwg	OG[1]
▸ ☒ ☑	Floor_00_(-6,7;-2,6;1,81).dwg	EG[0]
▸ ☒ ☑	Floor_U1_(-6,7;-15,55;-2,23).dwg	UG[-1]
☒ ☑	Schnitte	
▸ ☒ ☑	Section_Y-pos_(-6,7;16,4;-12,97).dwg	yPositiv
☒ ☑	Ansichten	
▸ ☒ ☑	Elevation_X-neg_(21,6;-2,6;-12,97).dwg	xNegativ
▸ ☒ ☑	Elevation_X-pos_(8,5;47,4;-11,77).dwg	xPositiv

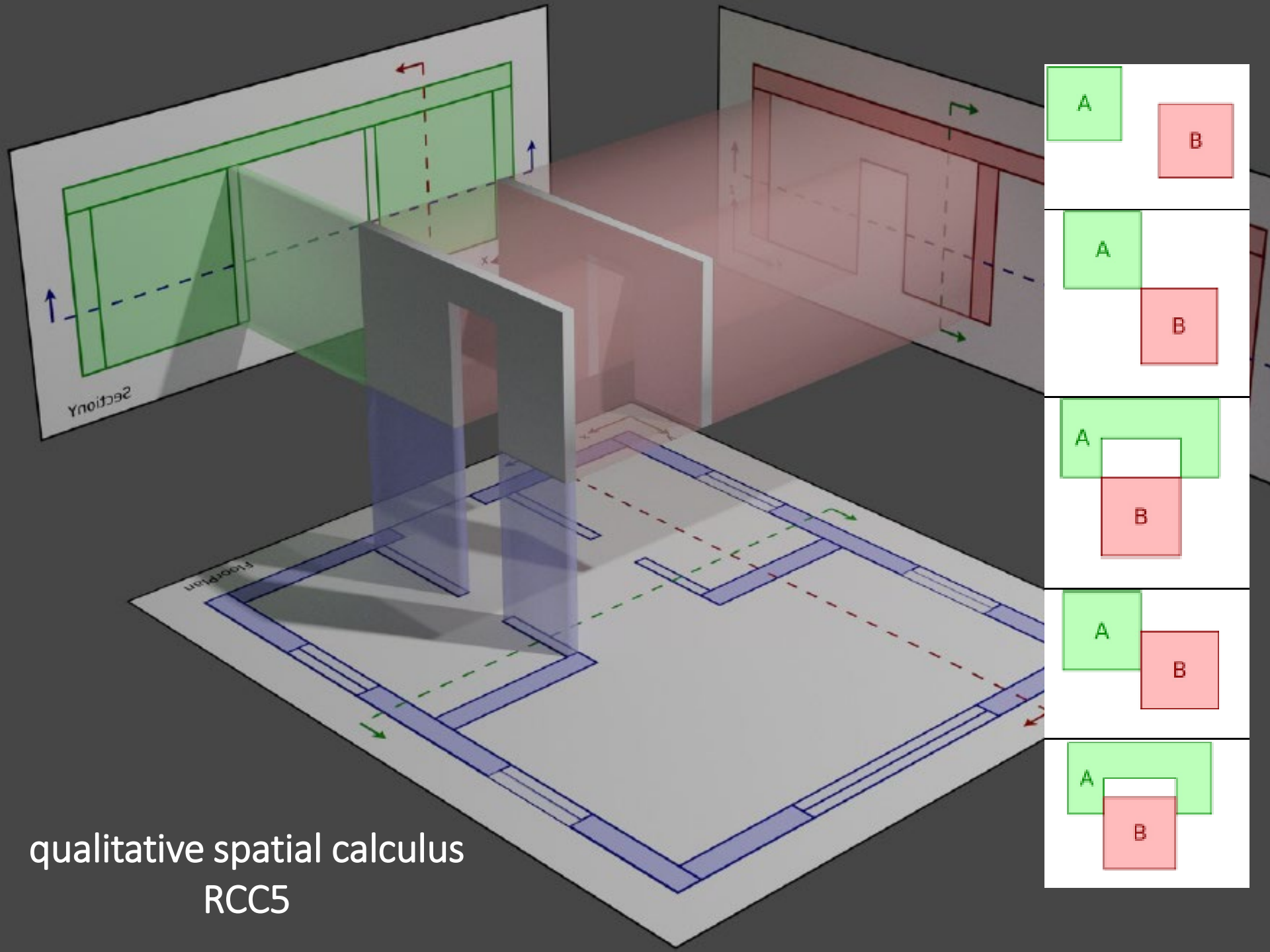


output as IFC file

Allgemein		
Position	W1	
Art	Normal	
Material	Stahlbeton	
Gruppe		
Geschoss	KG	
Haltung	1-seitig	
Knicklänge [m]	nicht berechenbar	
Flächenlast [kN/m²]	0.00	
Bewehrung		
Bewehrungsanteil (kg/m²)	120.000	
Volumen (m³)	3.478	
Geschätzter	417.420	
Material		
Betongüte	C20/25	
Stahlsorte	BSt 500 S(B)	
Geometrie		
XY-Koordinate-1 [m]	10.626	6.745
XY-Koordinate-2	6.287	2.900
Z-Koordinate [m]	0.000	
ZZ-Koordinate [m]	3.000	
Querschnitt		
Dicke [cm]	20.00	
Länge [m]	5.797	
Eigengewicht [kN/m²]	5.00	
Lastabtrag		
Belastet durch		
Liegt auf		

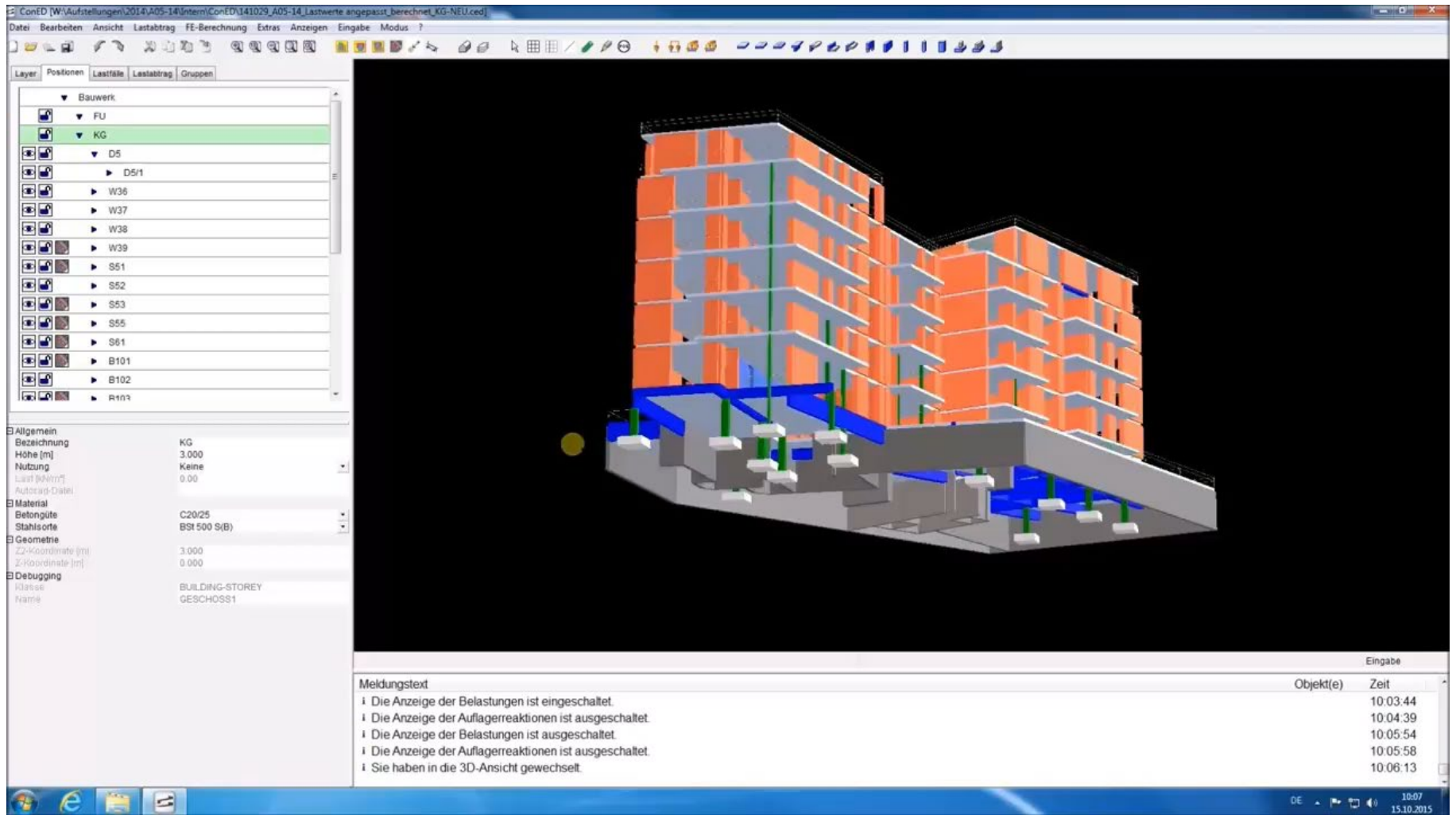


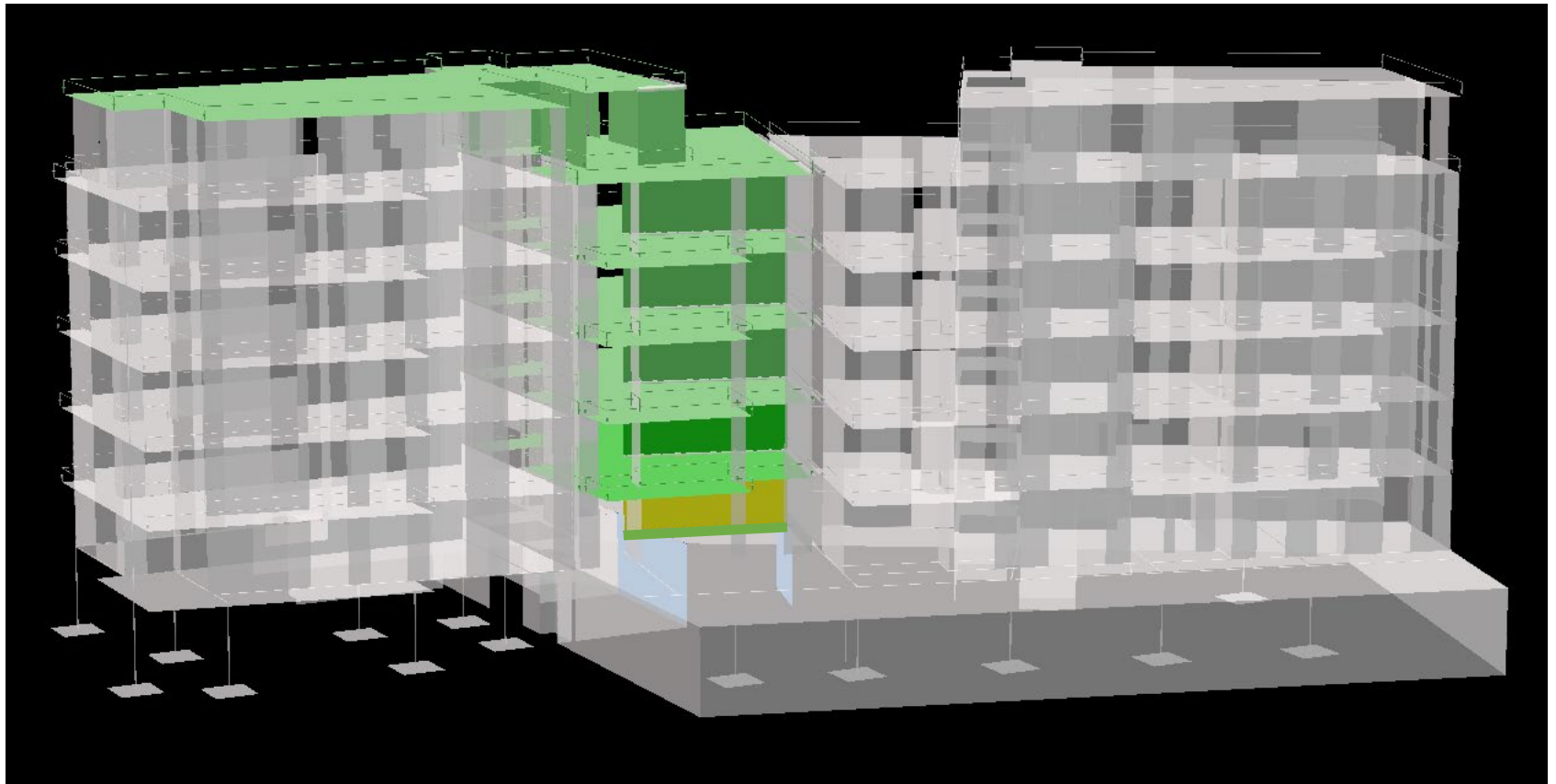
wall



qualitative spatial calculus
RCC5

CONED MOVIE

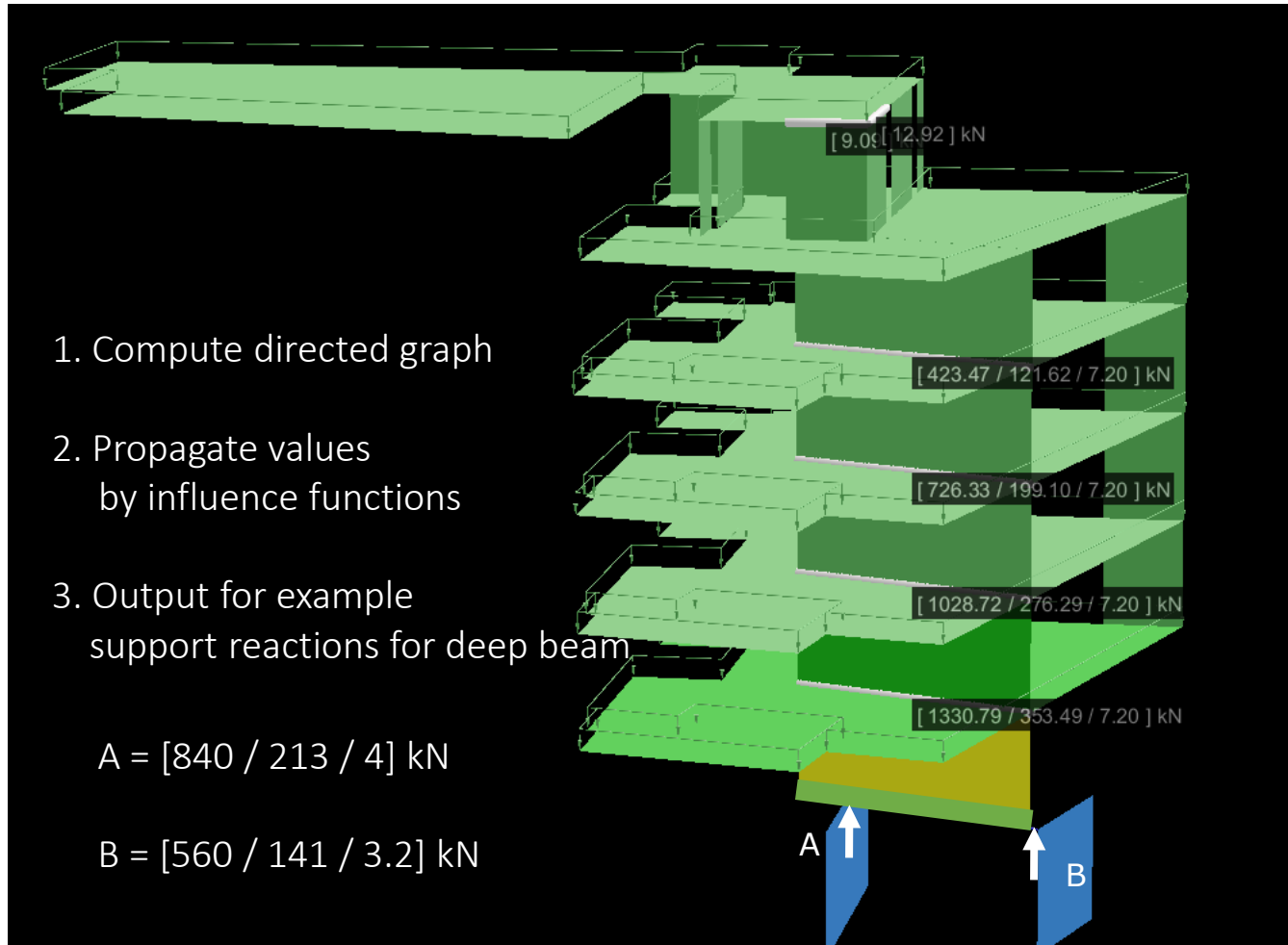




yellow = current deep beam in focus

green = loading elements \uparrow slab \uparrow wall $\uparrow \uparrow$ walls and so on

blue = supporting elements \downarrow wall \downarrow wall





EUROPEAN UNION

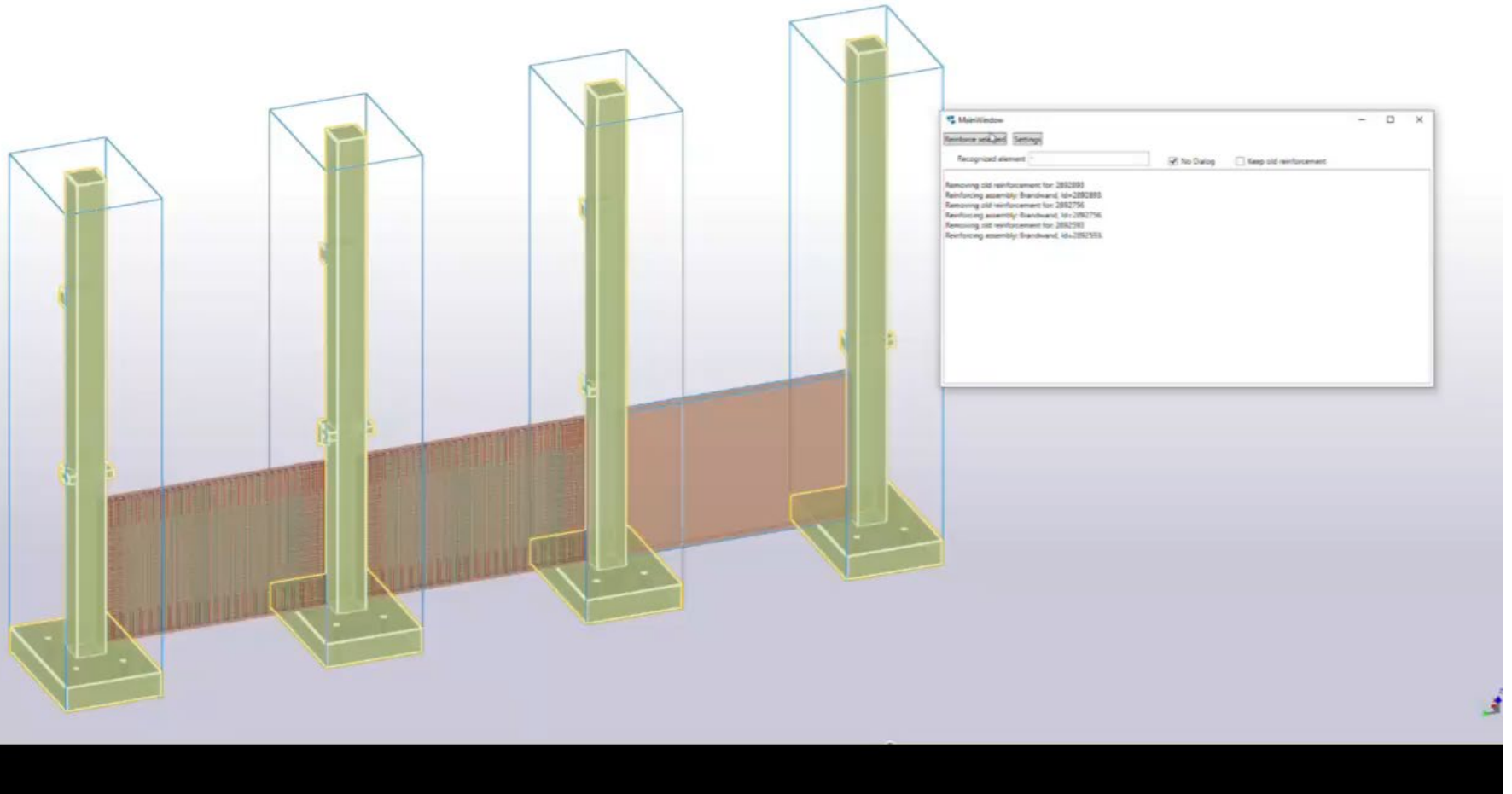
European Regional Development Fund

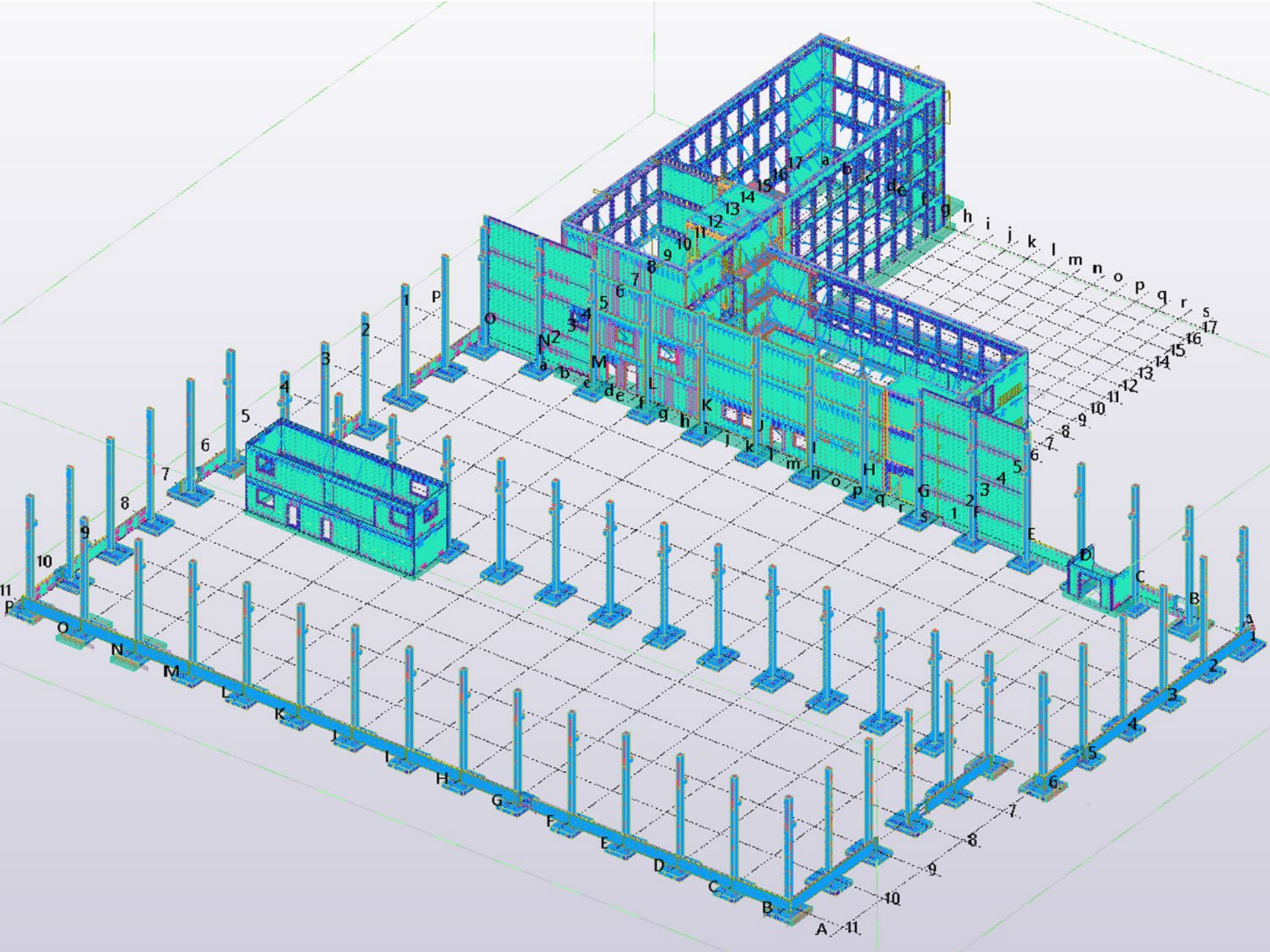
Can a machine learn to reinforce prefab elements?

3D-ARP

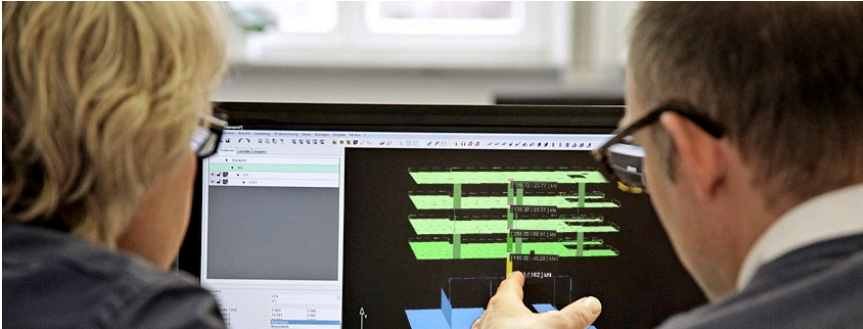
R&D project: 860 k€ budget, 2 years duration

3D-ARP MOVIE





**What benefit brings
AI into design practice**



Tedious and boring work can be done by computer
→ more fun and time for employees

Productivity increase up to 50%
→ less persons are needed for the job

More intellectual tasks can be carried out by computer
→ engineers have more time to think and check

LOOKING FOR NEW MOTIVATED TEAM MEMBERS IN VILNIUS!



structural engineers

young talents as BIM engineers

BIM modeler

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