



# 5D @ STRABAG | ZÜBLIN

## 5D Initiative, BIM, 5D Design

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**ZÜBLIN**

# STRABAG SE GROUP



Operational

Building Construction  
and Civil Engineering

Transportation  
infrastructures

Special Divisions &  
Concessions

Chief brands

**STRABAG**



**DYWIDAG**

Central Staff Units

LEGAL  
AFFAIRS

CONTRACT  
MANAGEMENT

AUDIT  
DEPARTMENT

Central Service Companies



<sup>1)</sup>BRVZ Bau- Rechen- und Verwaltungszentrum <sup>2)</sup>BMTI Baumaschinentechnik International  
<sup>3)</sup>BLT Baulogistik und Transport <sup>4)</sup>TPA Gesellschaft für Qualitätssicherung und Innovation

# CENTRAL TECHNICAL DEPARTMENT

## TECHNICAL KNOW-HOW AT OUR FINGERTIPS

- technical support for all Group divisions in winning and executing contracts
- research, development and innovation
- training, transfer of know-how, creation of tools and materials
- public relations, talks and presentations, association and committee work
- 1 central department, 5 sub-divisions, 12 business units, 32 departments, 500 employees in 9 locations

### Central Technical Department (ZT)

#### Subdivisions

Turnkey  
Construction

Construction  
Engineering

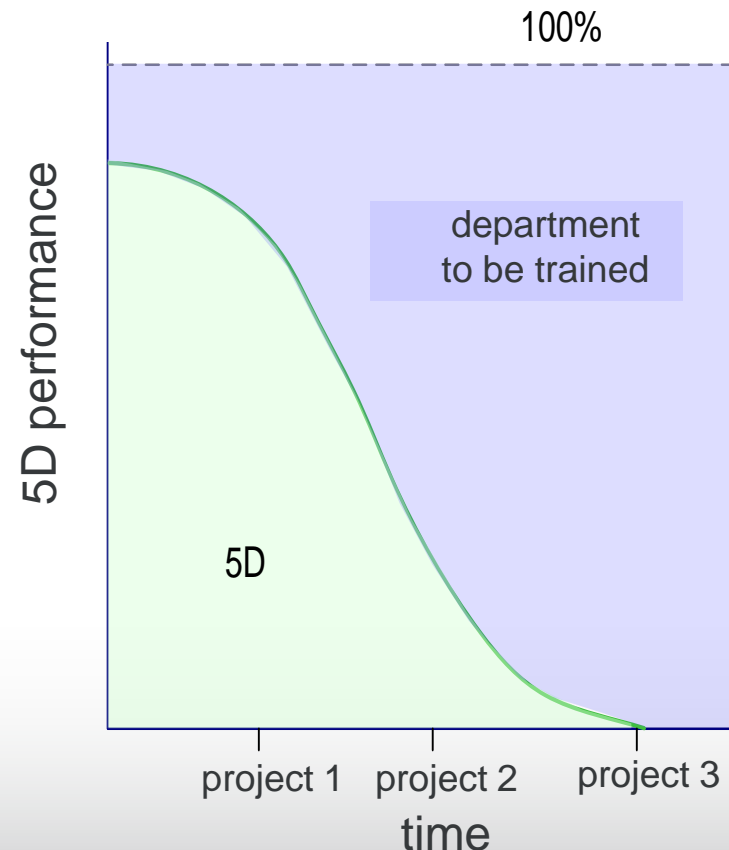
Ground  
Eng./Tunnelling

ZT Vienna

TGA Vienna

# 5D DEPARTMENT

- Definition of 5D
- Development of methods of operation for defined 5D work steps  
software, methods, tools
- Implementation of 5D work step in selected projects
- Definition of 5D work step as standard process
- Training of operational units in 5D methods
- Implementation phase: 5D department supervision to assure 100% performance even on the first project
- Hotline and backup for operational units



# OVERVIEW

MOTIVATION FOR 5D*i* COLLABORATION

IMPORTANCE OF ZÜBLIN'S 5D*i* USE CASE

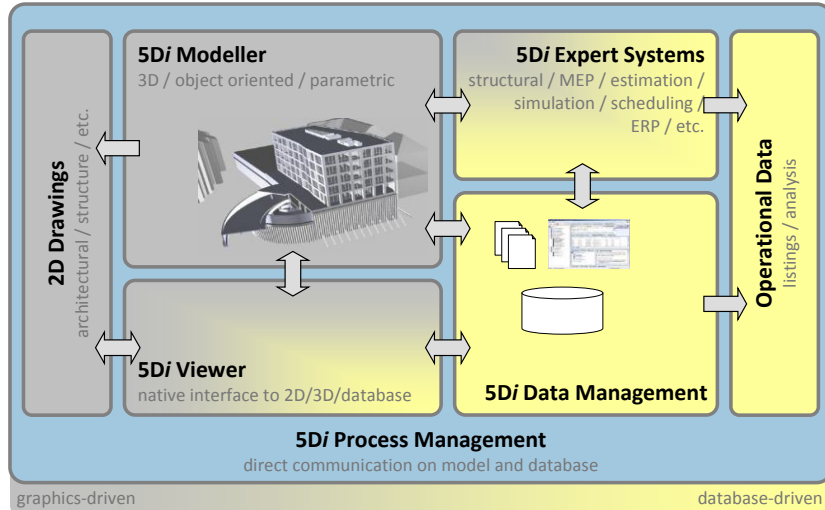
CURRENT SERVICES OF 5D

EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

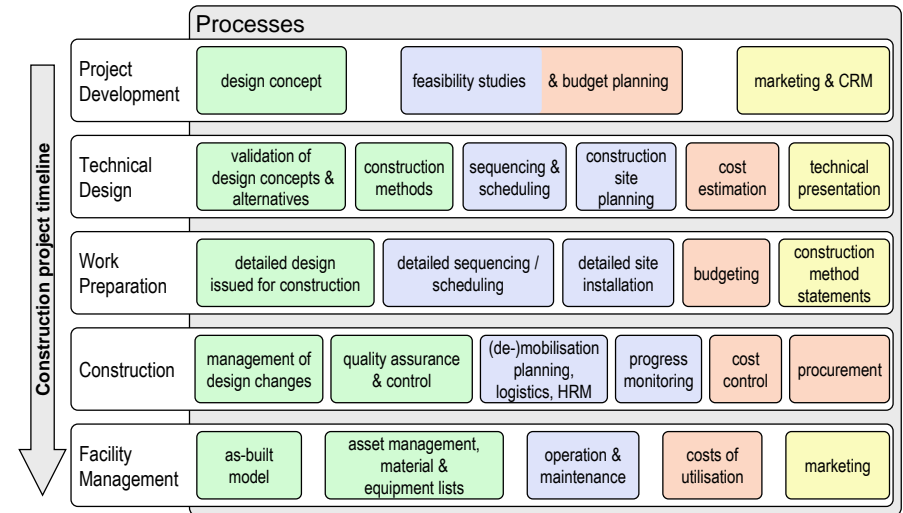
EXAMPLE 2: 5D "FROM SCRATCH"

# 5D*i* – COLLABORATION IN DEVELOPMENT AND IMPLEMENTATION

## IT-platform



## processes



quality control  
structure  
knowledge on hard- and software

guidelines  
training concept

knowledge on processes linkage  
templates

company implementation knowledge


# 5D*i* – COLLABORATION IN DEVELOPMENT AND IMPLEMENTATION

IT-platform

processes

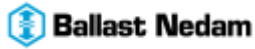
The **industry challenge for process integration**, is a challenge we share with other construction companies within 5D*i*

- the overall goal is too big for one company to describe it for the software industry
- software industry needs to understand the “overall goal” and the variety of implementation strategies in construction to develop sustainable 5D solutions
- ➔ we participate within 5D*i* to define our most critical requirements to software partners
- ➔ we profit from partners covering other critical focus points

- 
- assurance of our investments in software, company methods and training
  - the company implementation is structurally compatible to other companies' solutions ➔ not developing an “5D-island”

company implementation knowledge

# 5D*i* USE CASE MODEL BASED ESTIMATION



Building Process Integration – Systems Engineering and BIM / Client Requirements Processing



Manage Change – Change  $\Delta$  Managed



Design to Fabrication



**Model-based Estimation – QTO Processes**



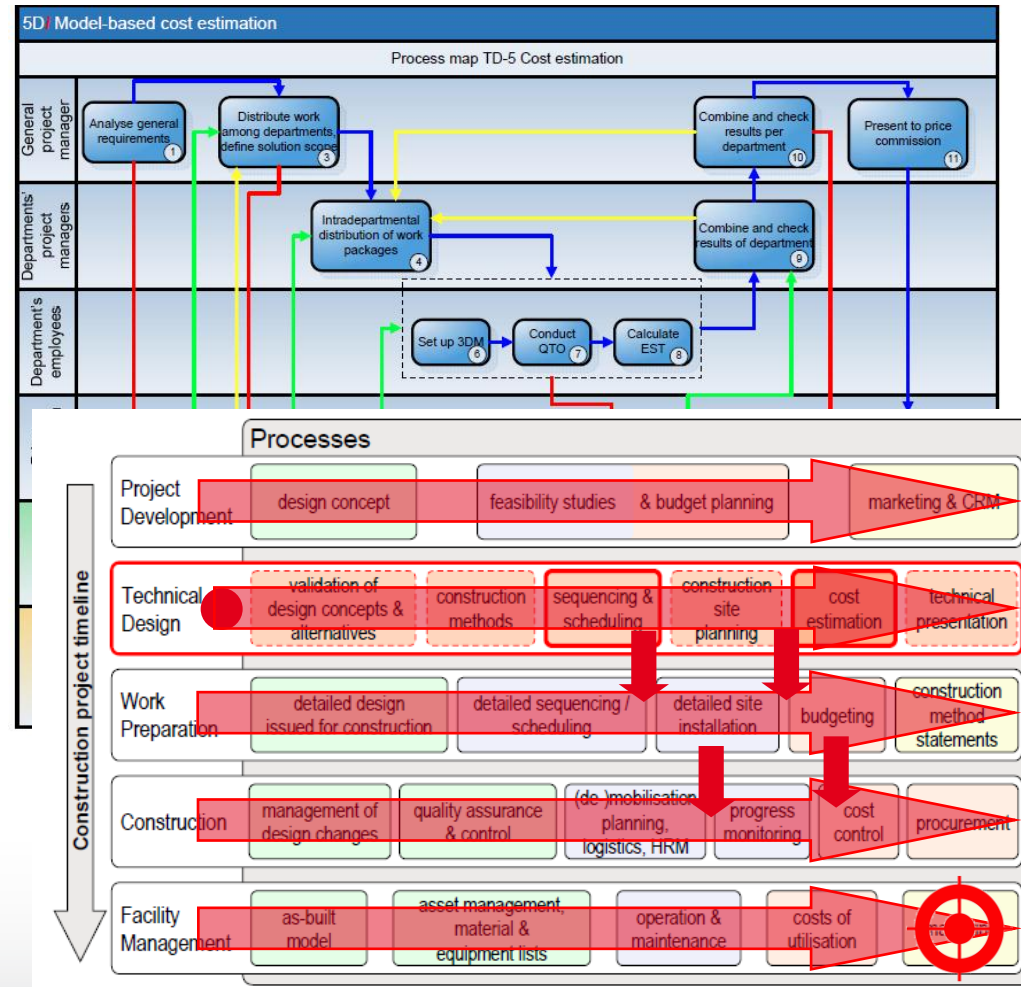
Progress Collection, Monitoring and Control



# 5D / USE CASE MODEL BASED ESTIMATION

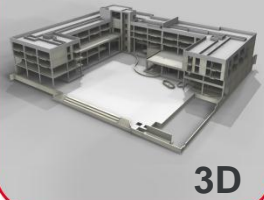
The use case is critical to us:

- our starting point for usage of 5D as a standard process: usually a construction company enters at the tender phase
- horizontal process integration, covering the whole tender phase
- this can only succeed if we transcend traditional tender processes. This assures:
  - model-based vertical integration
  - holistic process integration



# CURRENT SERVICES OF ZÜBLIN – 5D DESIGN

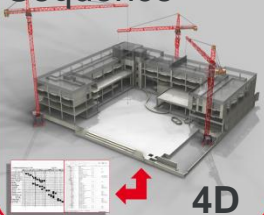
## Geometry



3D

- **presentation** of STRABAG|ZUEBLIN|DYWIDAG solutions in the tender phase
- **creating a BIM-model** on the basis of 2D drawings and/or coordinating external planners to develop a high-end model suitable for further process integration and decision support
- a BIM-model to achieve proper **coordination of trades** in an early design phase
- **quality** checks and **augmentations** of **external models** for follow-up processes
- **clash detection** and the coordination of subsequent resultant amendments
- fast and reliable **design of complex structures**

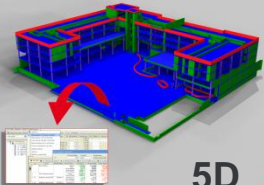
## Sequence



4D

- **depicting** the construction process by connecting the 3D-model and the schedule
- **clash detection** of moving parts (e.g. cranes)
- preparation of **site instructions** for various construction methods

## Data/Process



5D

- model-based **quantity take-off** and **cost estimation**
- model-based quantity take-off for **logistics**
- as-built model for **facility management**
- **design to production**: 3D-model for “computer-aided manufacturing” (CAM)

We are continuously **expanding our services**, the following slides will provide some illustrative examples.

# EXAMPLES – 5D DESIGN

logistics planning

coordination of trades

model based estimation

visualizations of scheduling

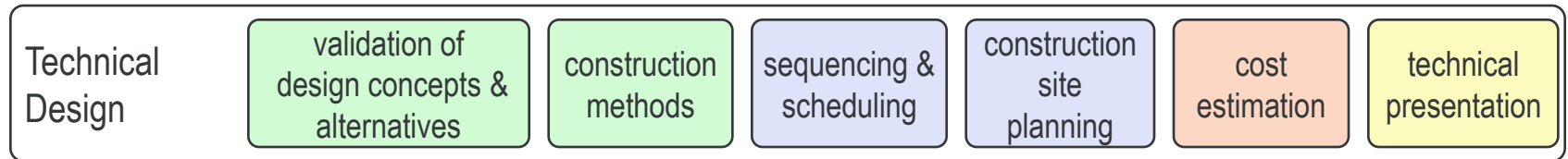
(3D) quantity take off

presentation

assistance for CAM

# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

- multi-storey office building: BIM model provided by client with the explicit request to use this model in the tender phase



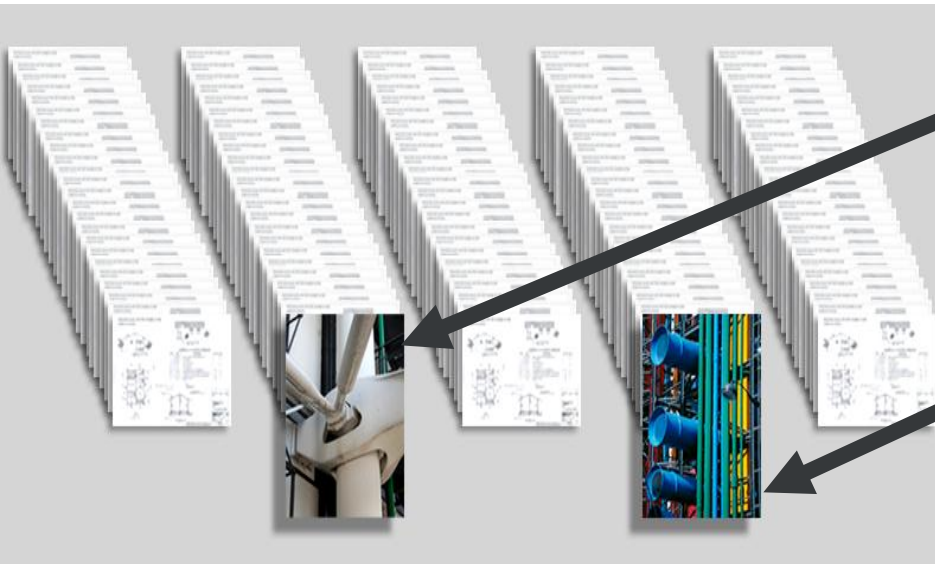
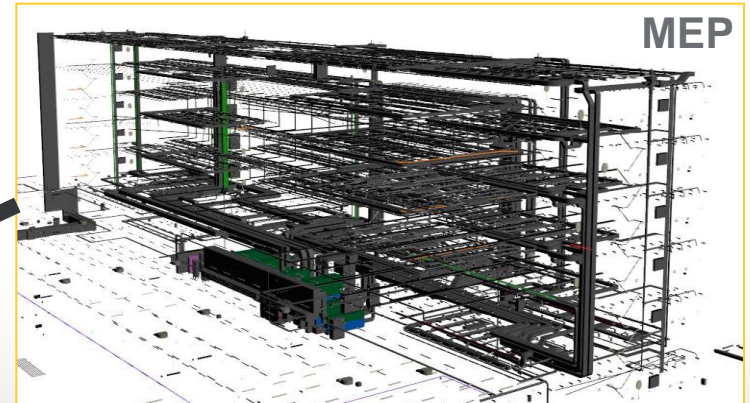
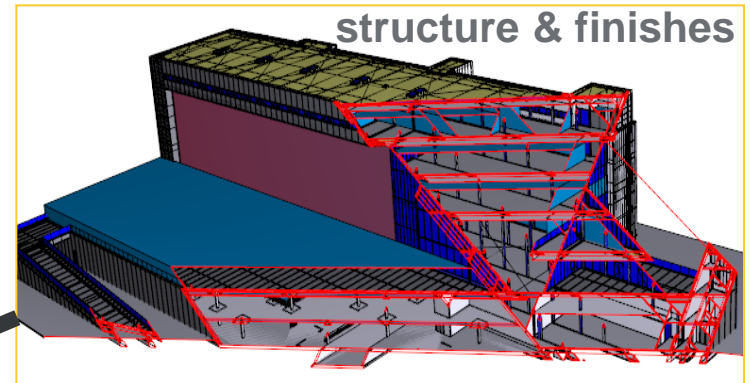


# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

## tender documents:

- structure
  - finishes
  - MEP
- 173 A0 plans
- 63 A0 plans

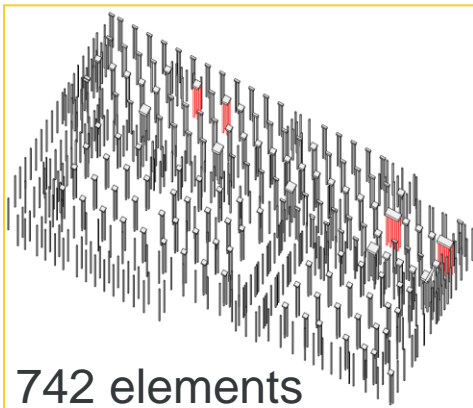
- also including two BIM models



all drawings derived from BIM model

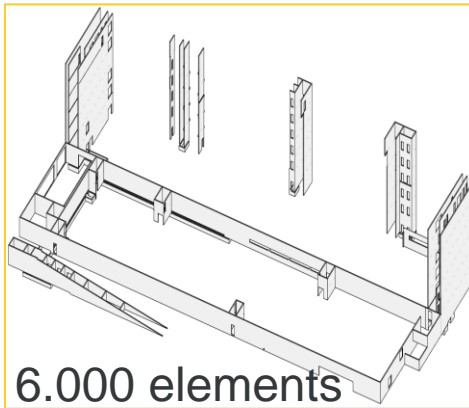
# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

- **model-based QTO.** Since all drawings were derived from the model, a model-based QTO was valid by consequence and thus conducted.



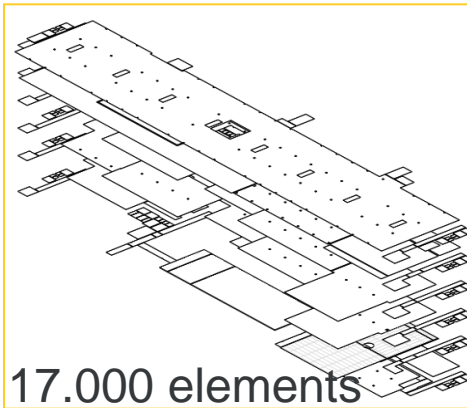
742 elements

foundation:  
columns...



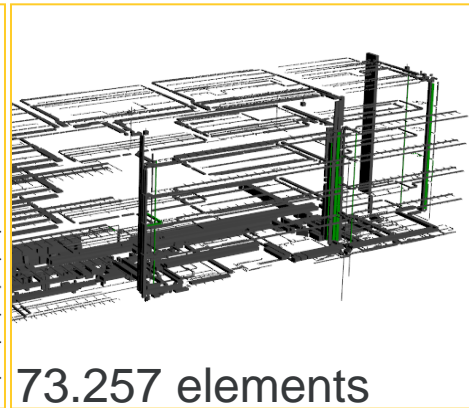
6.000 elements

structure:  
walls, columns...



17.000 elements

finishes, façade:  
suspended ceilings...

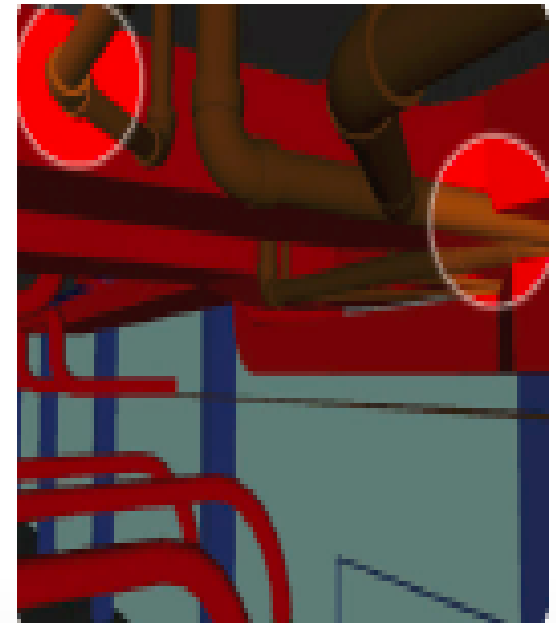
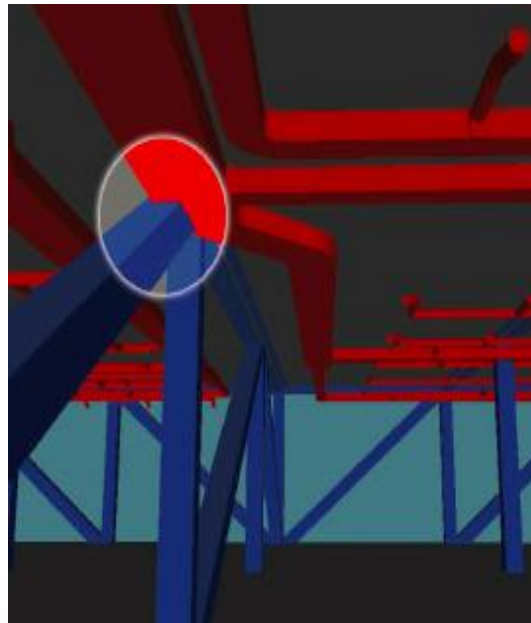
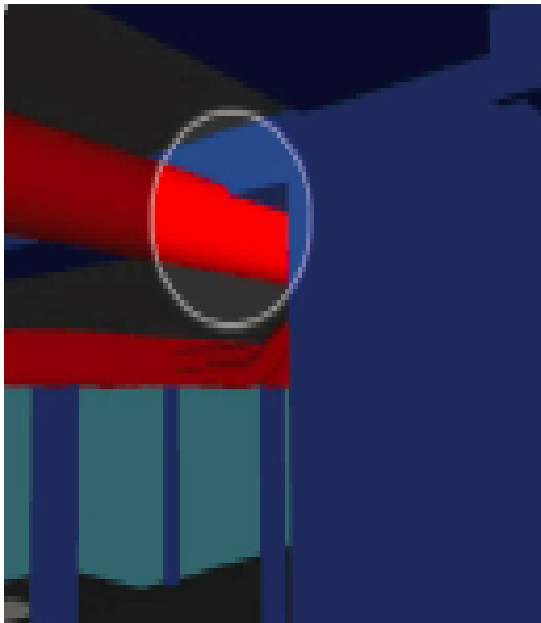


73.257 elements

MEP:  
ventilation,  
electrics...

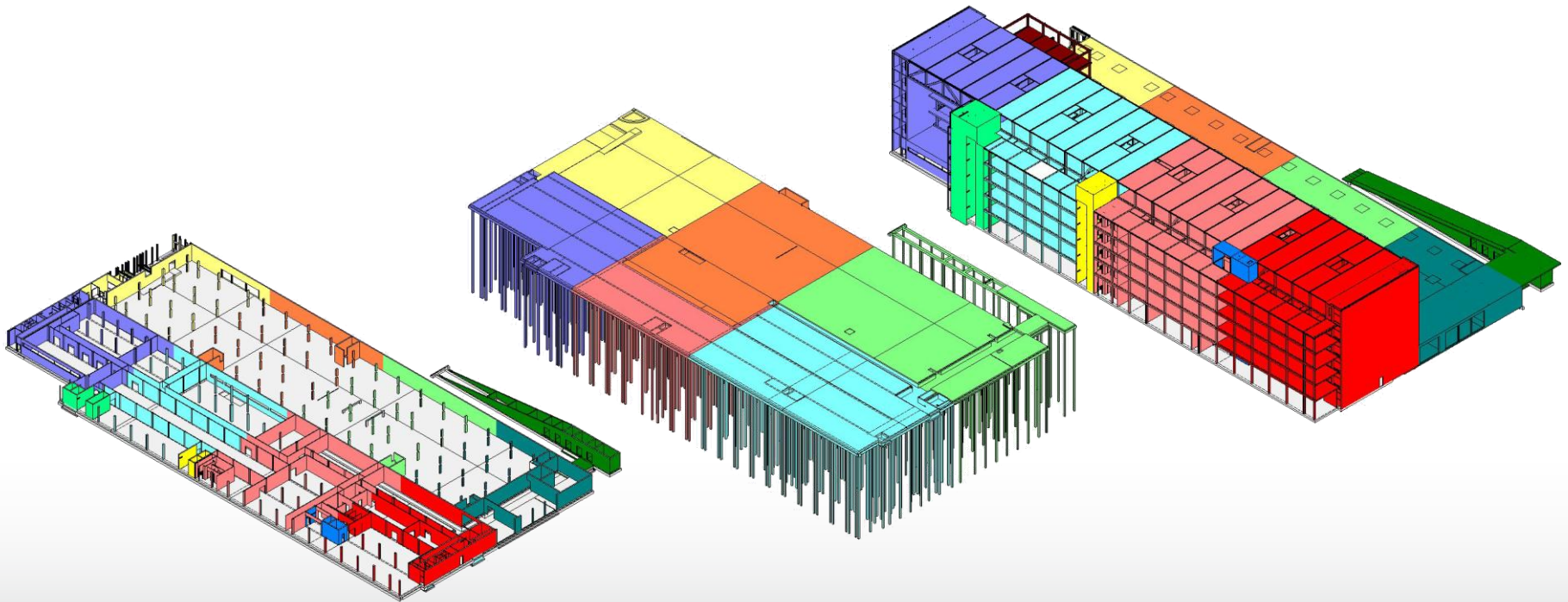
# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

- **Clash detection.** For early coordination and estimation of required work



# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

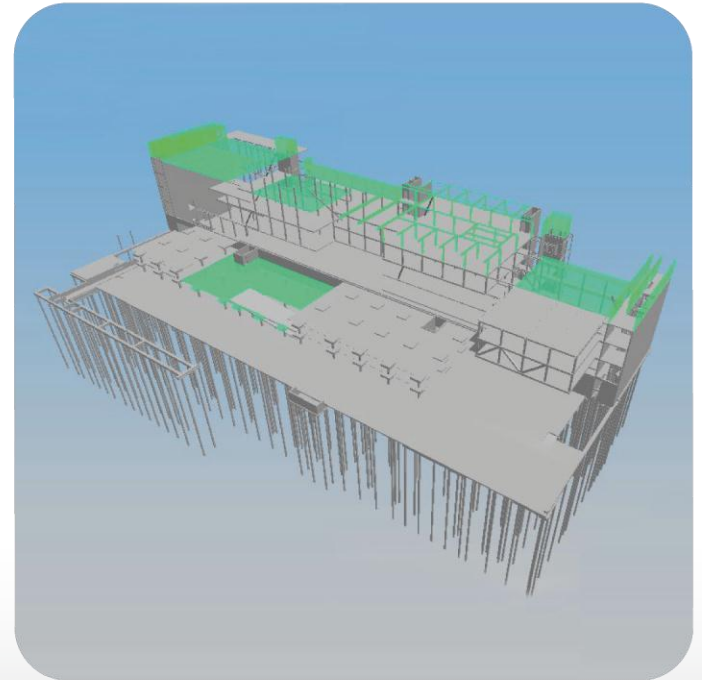
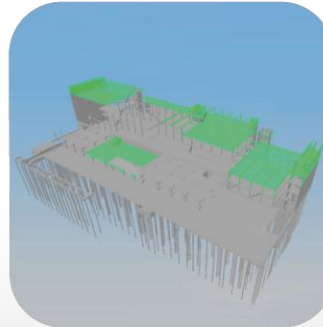
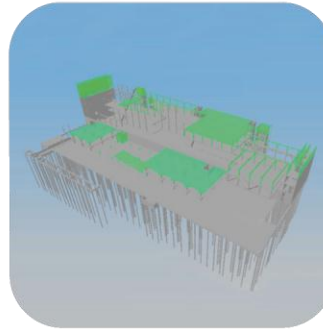
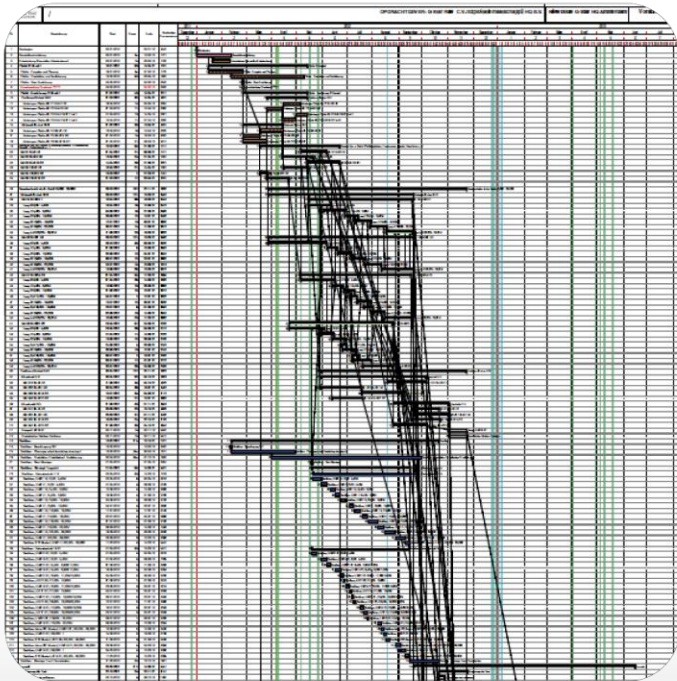
- **Scheduling.** Structural segmentation of work according to logical scheduling options. QTO per task





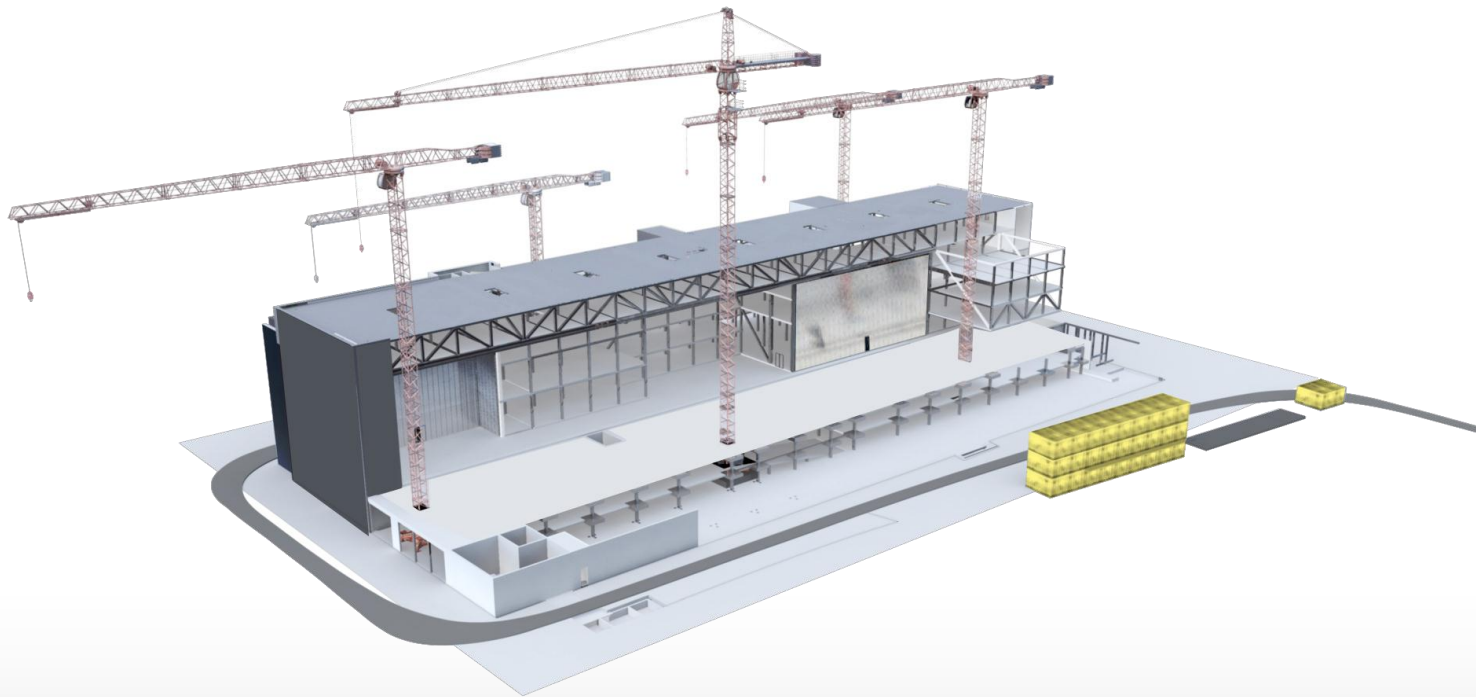
# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

- **Scheduling.** Linking the adapted model to proposed schedule for internal verification and presentation to the client



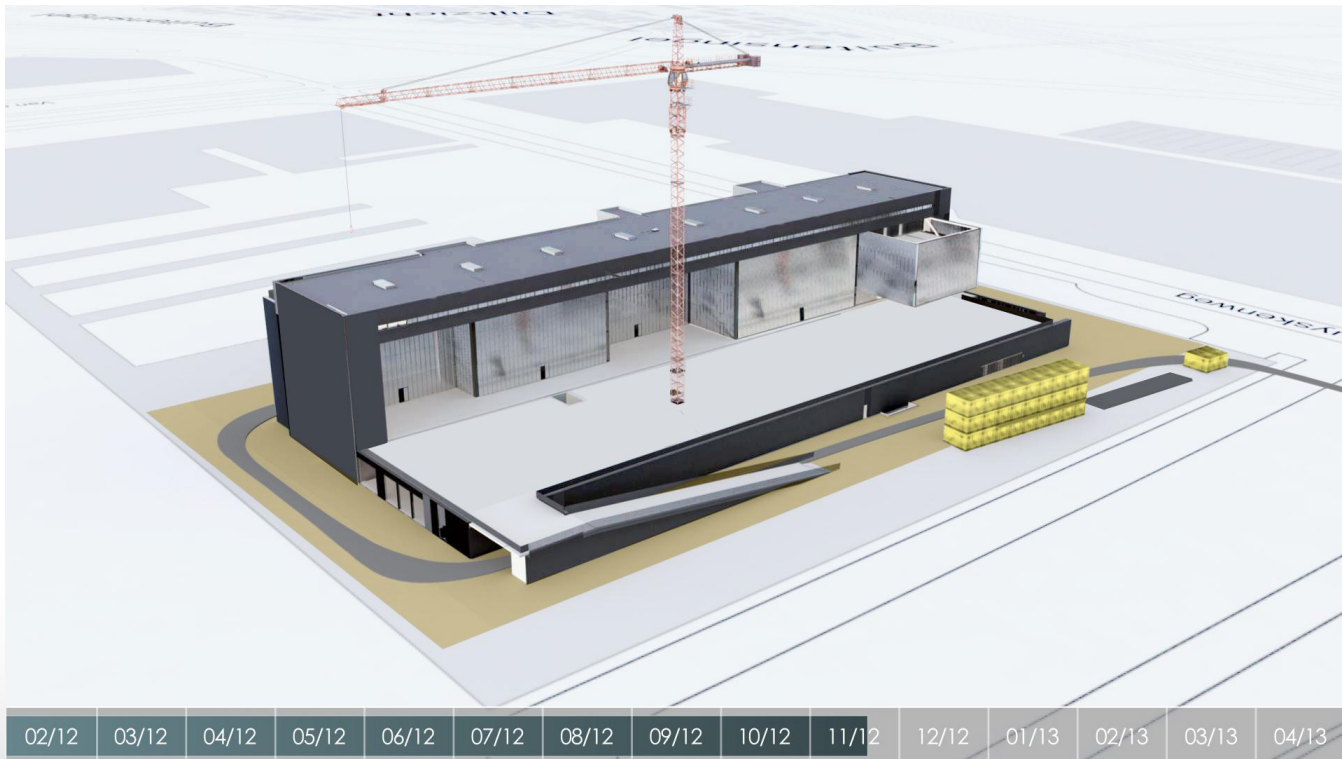
# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

- **Site planning.** Use of existing BIM model to efficiently plan and assure site-planning



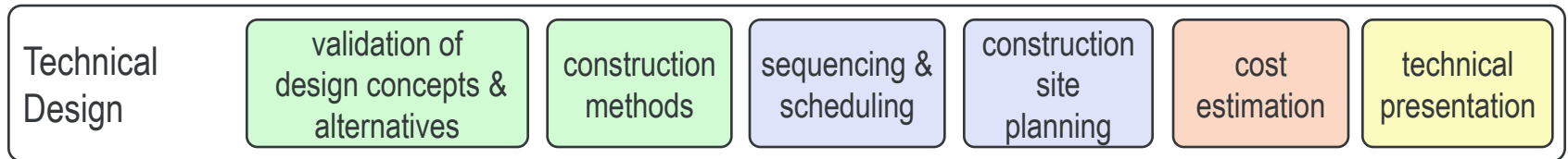
# EXAMPLE 1: 5D PROCESS USING CLIENT'S MODEL

- **Presentation for the client.** Using all preceding sub-deliverables to show the client the result of the tender.



# EXAMPLE 2: 5D "FROM SCRATCH"

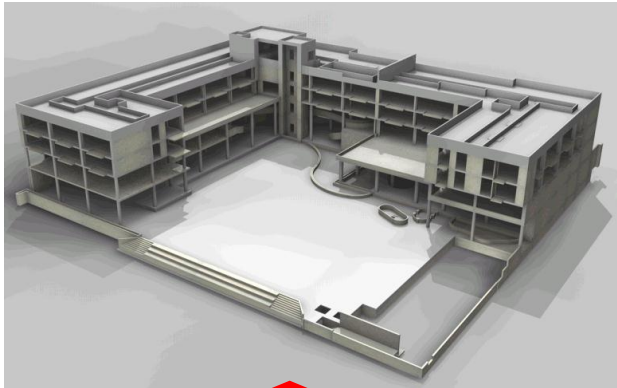
- multi-storey office building: in-house creation of tender model



# EXAMPLE 2: 5D "FROM SCRATCH"

- Quality, efficiency and thorough processes enabled by process integration

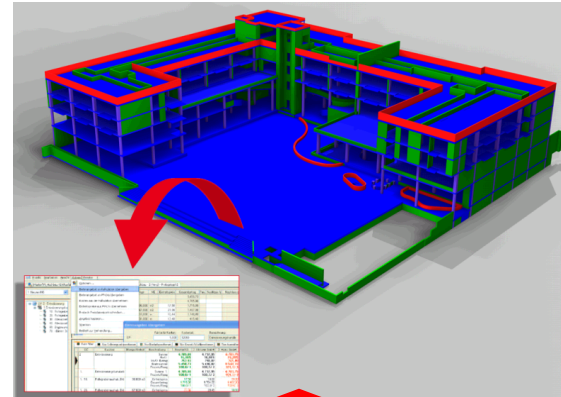
template-based 3D modeling



template library

**STRABAG**

model-based quantity take-off and estimation

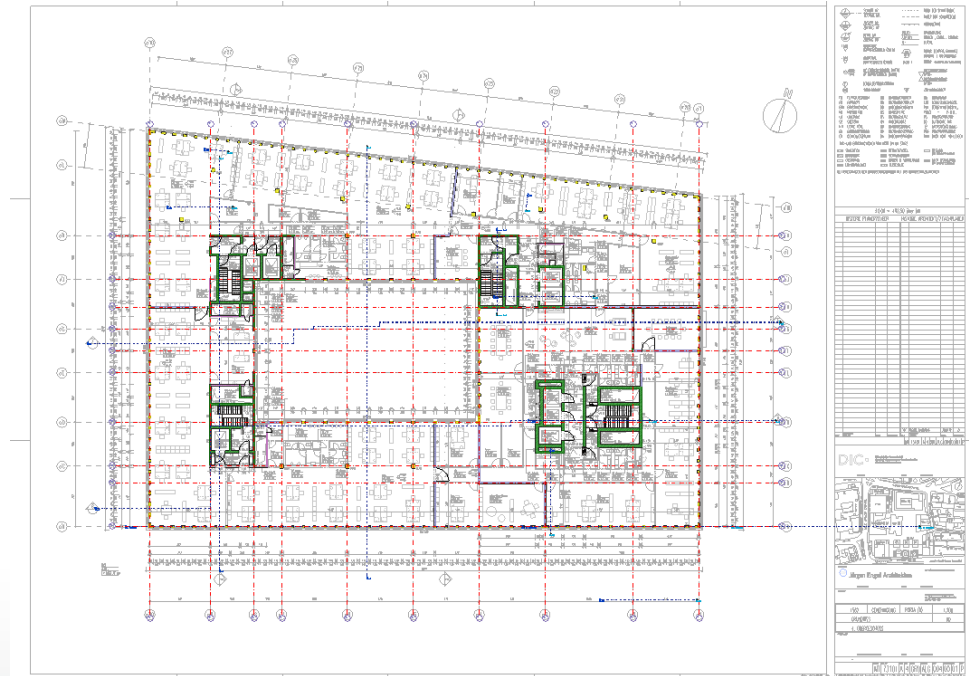
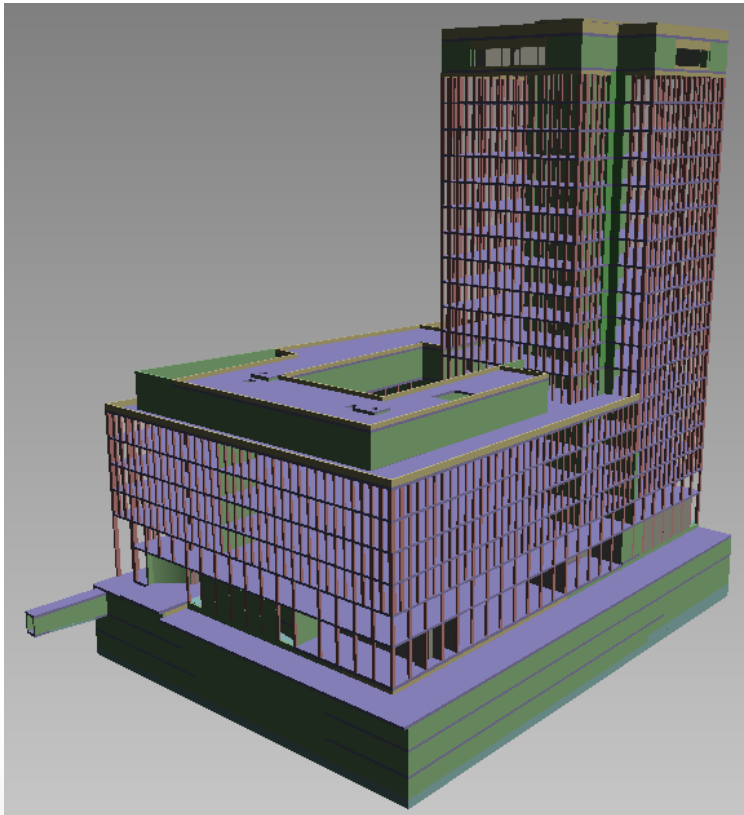


standardized QTO recipes and estimation structure

**STRABAG**

# EXAMPLE 2: 5D "FROM SCRATCH"

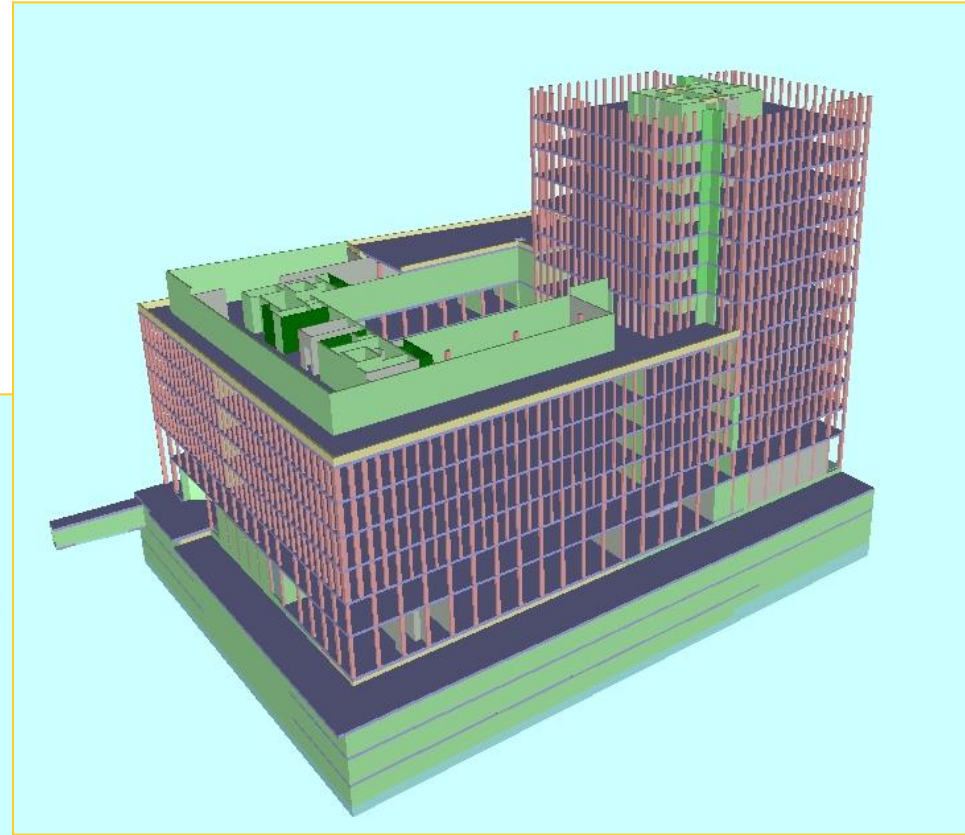
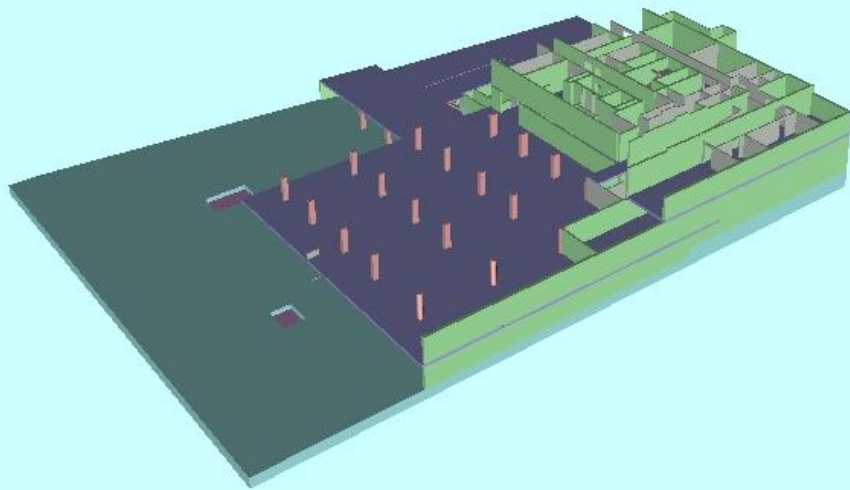
## ■ 3D modeling





# EXAMPLE 2: 5D "FROM SCRATCH"

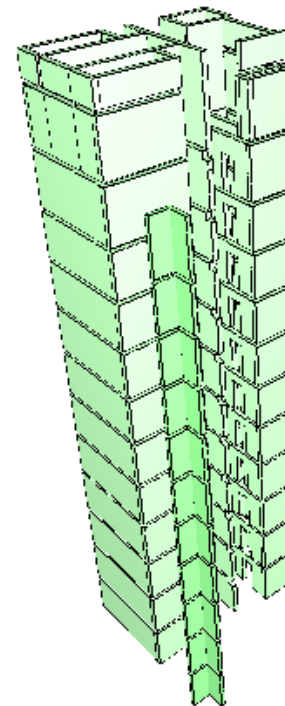
## ■ 3D scheduling



# EXAMPLE 2: 5D "FROM SCRATCH"

- Model-based quantity take-off according to STRABAG standards

Struktur	Schlüssel	Bezeichnung	Menge	ME
[-]	-	<b>Ausstattung</b>		
[-]	10	<b>Rohbau</b>		
[+]	10.30	Mauerwerk		
[-]	10.60	Stahlbetonwände		
[-]	10.60.10	Stahlbetonwand		
[+]	10.60.10.10	Ortbeton Wand d <= 20 cm, C30/37	30,434	CBM
[+]	10.60.10.20	Ortbeton Wand d <= 40 cm, C30/37	59,546	CBM
[+]	10.60.10.40	Schalung der Wand	787,134	QM
[+]	10.60.10.800	Plausibilität		
[+]	10.60.10.900	Konsistenzcheck		
[-]	10.60.30	Stahlbeton-Kernwand		
[+]	10.60.30.20	Ortbeton Wand d <= 40 cm, C30/37	1,044,241	CBM
[+]	10.60.30.40	Schalung Treppenhaus und Kernbereich	6,259,801	QM
[+]	10.60.30.60	Zulage für Wandschalung > 5,0 - 7,0 m	328,201	QM
[+]	10.60.30.800	Plausibilität		
[+]	10.60.30.900	Konsistenzcheck		
[-]	10.70	Stützen		
[-]	10.70.10	Stützen - rechteckig		
[+]	10.70.10.20	Ortbeton Stütze Querschnitt <= 1600 cm²	235,436	CBM
[+]	10.70.10.30	Ortbeton Stütze Querschnitt <= 3600 cm²	43,584	CBM
[+]	10.70.10.90	Schalung Stütze rechteckig, Querschnitt	3,028,790	QM
[+]	10.70.10.100	Schalung Stütze rechteckig, Querschnitt	451,374	QM
[+]	10.70.10.114	Zulage für Schalung der Stützen über 7,0 m	451,374	QM
[+]	10.70.10.800	Plausibilität		





# EXAMPLE 2: 5D "FROM SCRATCH"

## ■ Model-based estimation

**Positionsauswahl**

Angebotskalkulation

LV: 1 - MAINTOR PORTA - Mupro/STC 2011

- 5 Ingenieurbau / Rohbau
  - 40 Allgemeine Mauerarbeiten
  - 50 Beton- und Stahlbetonarbeiten
    - 13 STAHLBETONWÄNDE
      - 10. Ortbeton Wand d ≤ 20 cm, C30/37
      - 20. Ortbeton Wand d ≤ 40 cm, C30/37
      - 50. Zulage für Betongüte in ....
      - 100. Schalung der Wand
      - 110. Schalung Treppenhaus und Kernbereiche
      - 160. Zulage für Wandschalung > 4,0 - 5,0
      - 170. Zulage für Wandschalung > 5,0 - 7,0
      - 190. Zulage für Sichtbeton SB 3
      - 200. Zulage für Sichtbeton SB 4
      - 370. Betonstahl BST 500 S
      - 380. Lagermatten BST 500 M
      - 390. Listen- und Zeichnungsmatten, BST
    - 14 STÜTZEN
      - 20. Ortbeton Stütze Querschnitt ≤ 1600
      - 30. Ortbeton Stütze Querschnitt ≤ 3600

**Eigenschaften (Position)**

Grunddaten

5.50.13.110. QM EUR

Schalung Treppenhaus und Kernbereiche

☐ Schwerpunkt

Menge / Stunden / Kosten / Preis

LV-/VA-Menge: 6.259,801 6.259,80

	pro ME	Gesamt (LV)
Stunden:	0,900	5.633,82
EKT:	33,10	207.199,4
VwU:	0,00	0,00
BGK:		
EKZ:	0,00	0,00

UPos	K	KOA/BST	Bezeichnung	Me-A...	Menge	ME	Kosten/E	Wf
1			Schalung Treppenhaus und Kernbereich		1,000	QM	33,10	EUR
11			Schalung Treppenhaus und Kernbereich		1,000	QM	33,10	EUR
		S3	\$ 5.52.00 SCHALUNGSSTUNDEN		0,900	Std	29,00	EUR
		42101201	DOPP.HPT.WANDSCH		1,000	QM	6,00	EUR
		43100901	Hilfsstoffe Schalung		1,000	qm	1,00	EUR

**Angebot**

Projekt: TBK-12-003 MAINTOR PORTA  
LV: 1 MAINTOR PORTA - Mupro/STC 2011

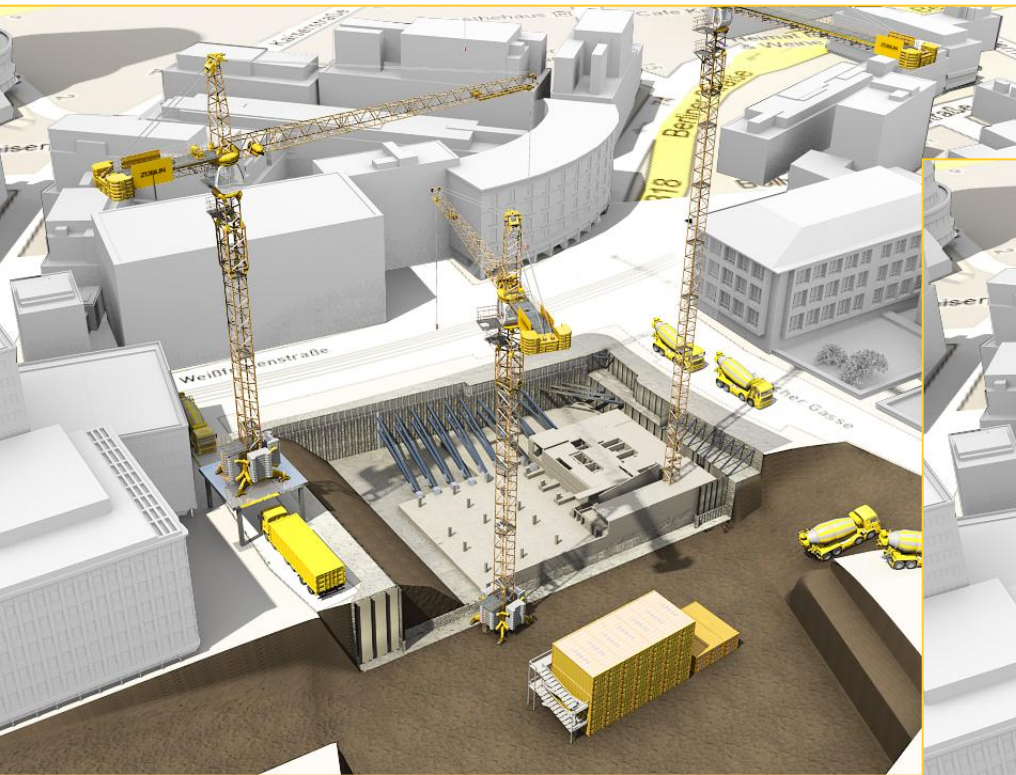
Währung: EUR

Summe	5.50.13.	STAHLBETONWÄNDE	338.224,42
5.50.14.		<b>STÜTZEN</b>	
5.50.14.20.		TLK-Name: Teilleistungskatalog/1, TLK-Nr.: 5.50.14. 20. Ortbeton Stütze Querschnitt ≤ 1600 cm², C30/37 Ortbeton der Stütze aus Stahlbeton C30/37 Querschnitt: bis 1600 cm².	235,436 CBM 97,00 22.837,29
5.50.14.30.		TLK-Name: Teilleistungskatalog/1, TLK-Nr.: 5.50.14. 30. Ortbeton Stütze Querschnitt ≤ 3600 cm², C30/37 Ortbeton der Stütze aus Stahlbeton C30/37 Querschnitt: bis 3600 cm².	43,584 cbm 94,10 4.101,25
5.50.14.100.		TLK-Name: Teilleistungskatalog/1, TLK-Nr.: 5.50.14.100. Schalung Stütze rechteckig, Querschnitt ≤ 1600 cm² Schalung der Stütze mit rechteckigem Querschnitt bis 1600 cm² als glatte Schalung.	3.028,790 QM 45,80 138.718,58
5.50.14.110.		TLK-Name: Teilleistungskatalog/1, TLK-Nr.: 5.50.14.110. Schalung Stütze rechteckig, Querschnitt ≤ 3600 cm² Schalung der Stütze mit rechteckigem Querschnitt bis 3600 cm² als glatte Schalung.	451,374 QM 42,90 19.363,94
5.50.14.150.		TLK-Name: Teilleistungskatalog/1, TLK-Nr.: 5.50.14.150. Zulage für Schalung der Stützen über Eck	451,374 QM 0,00 0,00

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# EXAMPLE 2: 5D "FROM SCRATCH"

- presentation to the client – on base on „work“ model







THANK YOU.

ZUBLIN

# closing



closing



**πάντα ῥεῖ (panta rhei)**  
**- all flowes (Heraklit)**

