

Visualization for Public Participation Procedures in Major Infrastructure and Industrial Projects

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Günter Wenzel
Peter Steinhagen
Lynn Hiel
Nikolas Früh



I. Visualization and
Communication
Management

II. BIM / 5D

Visualization for Public
Participation Procedures

III. Virtual Reality

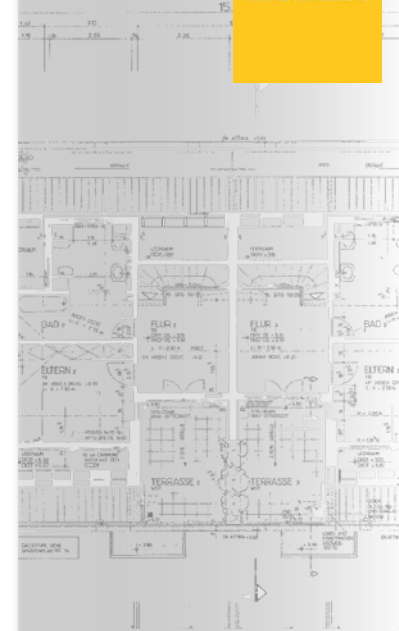
IV. VisB+



Fraunhofer
IAIO



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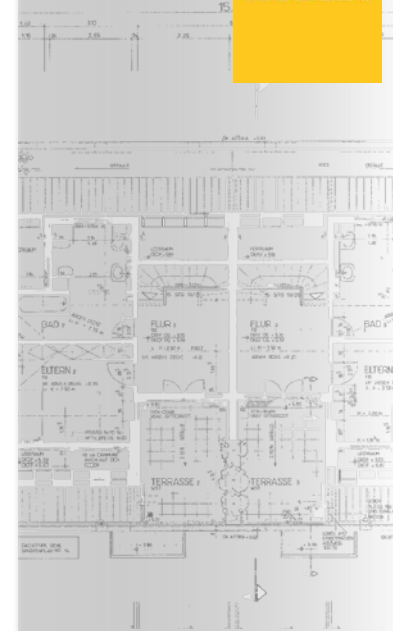
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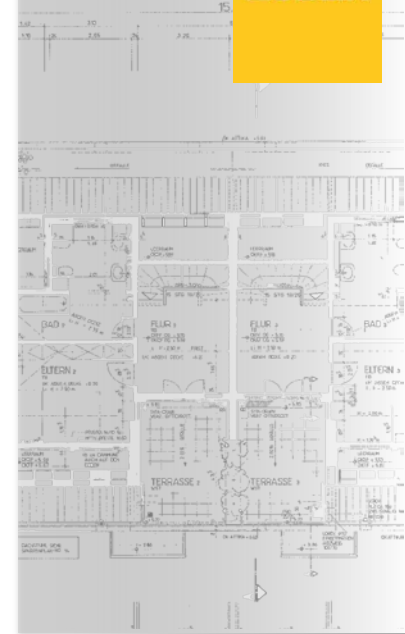
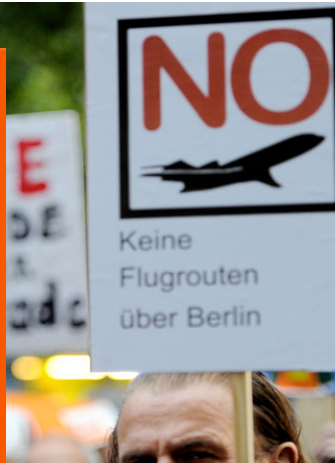
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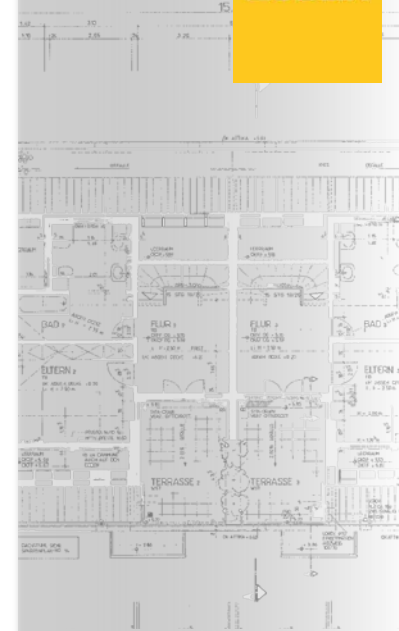


Lack of Acceptance for Building and Infrastructure Projects

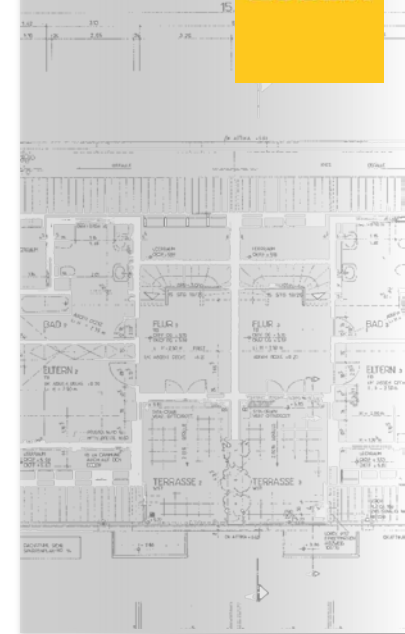
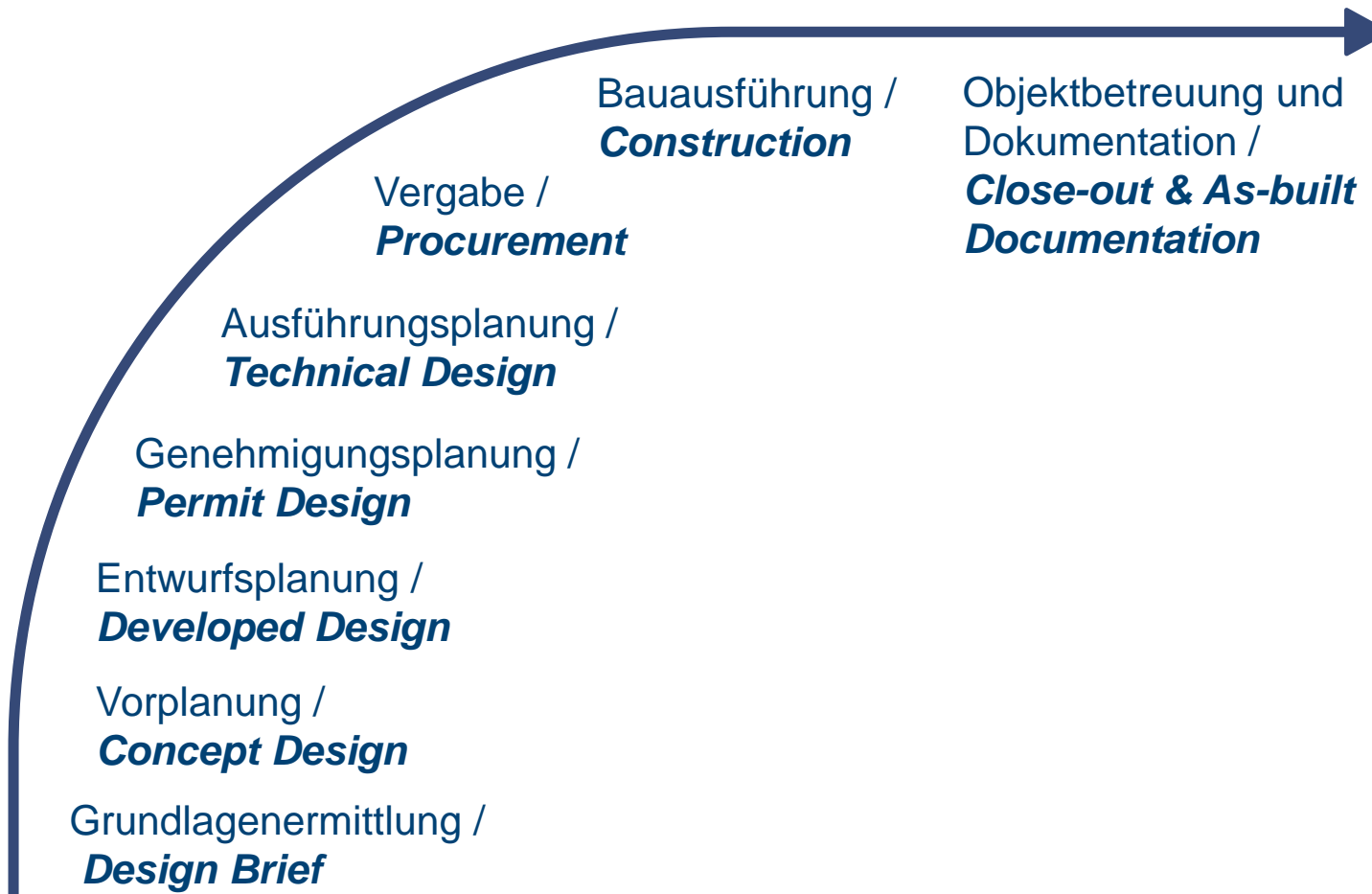


Consequences for Owners and Local Authorities

- Owners must adjust to a **different situation** in building projects.
- Design Quality: The **Sustainability** of construction projects is becoming more important in society.
- **Acceptance**: Acceptance through legal mandates no longer suffices -- this must also be realized through communication.
- The **systematic design of the Communication** must be an established part of Project Management: from conceptual design through hand-over.



VDI 7001: Communication Management in all Engineering Phases



VDI 7001: Communication Management in all Engineering Phases

Vergabe /
Procurement

Bauausführung /
Construction

Objektbetreuung und
Dokumentation /
**Close-out & As-built
Documentation**

Ausführungsplanung /
Technical Design

Genehmigungsplanung /
Permit Design

Entwurfsplanung /
Developed Design

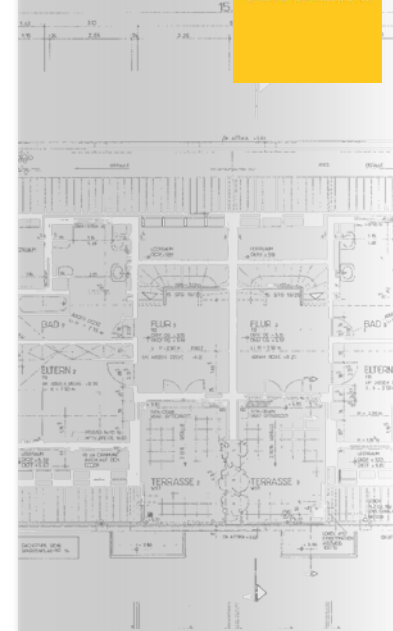
Vorplanung /
Concept Design

Grundlagenermittlung /
Design Brief

Clarity and Visualization in
different phases play an
important role.

Goal:

- Information for the citizen
- Interaction with the citizen



ICS 03.020, 91.010.01, 93.010

VDI-RICHTLINIEN

Februar 2015
February 2015

VEREIN DEUTSCHER INGENIEURE	Kommunikation und Öffentlichkeitsbeteiligung bei Planung und Bau von Infrastrukturprojekten Schulung für die Leistungsphasen der Ingenieure Communication and public participation in planning and building of infrastructure projects Training for work stages of engineers	VDI 7001 Blatt 1 / Part 1
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Ausg. deutsch/englisch
Issue German/English

Die deutsche Version dieser Richtlinie ist verbindlich.
The German version of this standard shall be taken as authoritative. No guarantee can be given with respect to the English translation.

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Fachbereich Bautechnik

VDI-Handbuch Bautechnik
VDI-Handbuch Energietechnik
VDI-Handbuch Management und Sicherheit in der Umwelttechnik
VDI-Handbuch Produktionstechnik und Fertigungsverfahren, Band 1: Grundlagen und Planung
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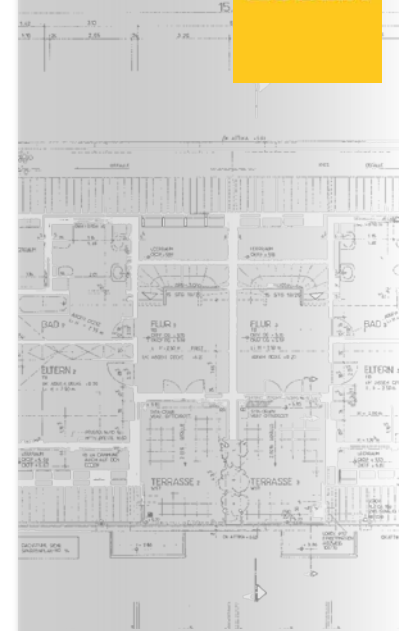
VDI Info-Stand
Mr. Frank Jansen

Language:
English & German

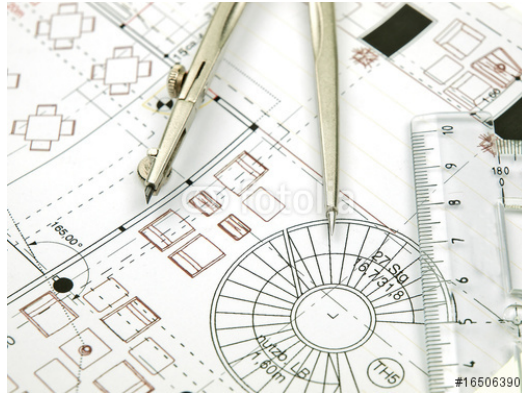


The potential of visualizations in Public Participation Procedures

- Cognitive Psychology: People **interpret** and **remember** visual information better – in particular this applies to limited involvement.
- Visualizations in Public Participation Procedures can **awaken peoples' interest / attention**.
- Visualizations can show building methods in a **graphical way** and clarify their **impacts on the surroundings** (with regard to sight lines, traffic flows or environmental impacts).
- Visualizations can **reduce speculative ideas** and false perceptions, thereby establishing the necessary **„common ground“** to begin a constructive discussion.



Breadth of Visualization Methods



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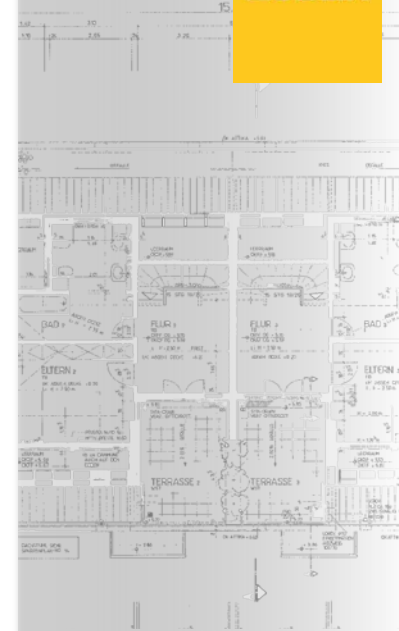
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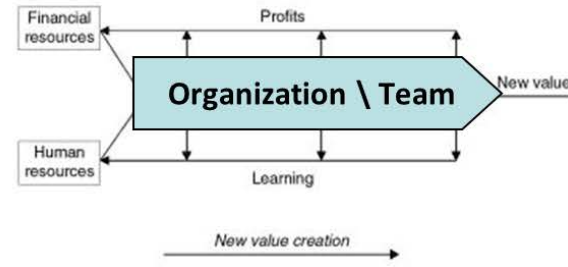
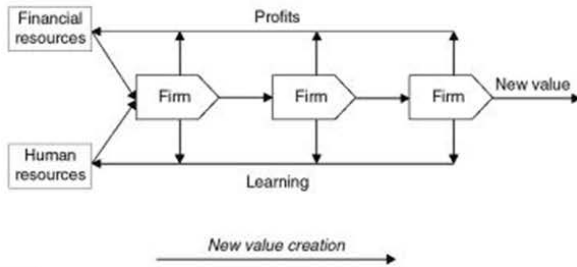
Fraunhofer
IAQ



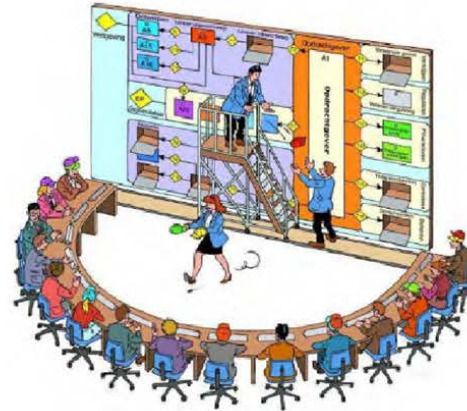
ZUBLIN



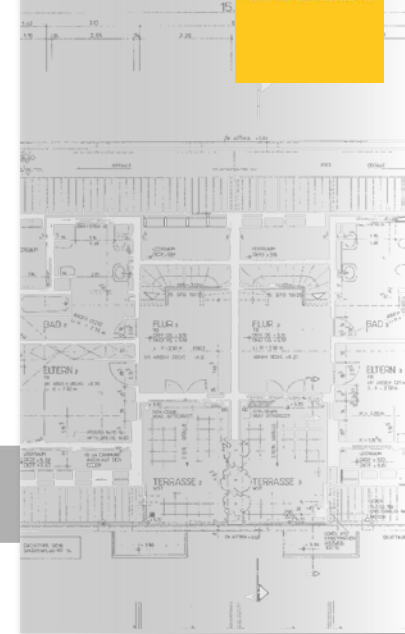
Impulse durch BIM / 5D



Conventional

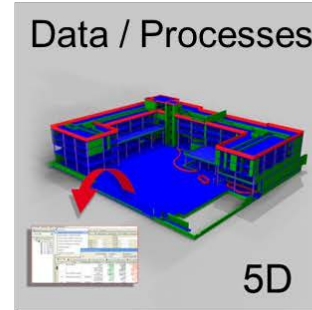
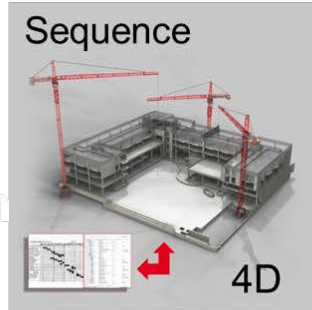
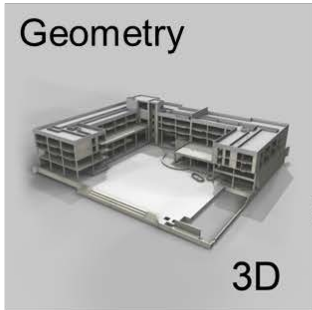


Integrated / Model-based



Impulse through BIM / 5D

5D – ZÜBLIN'S DEFINITION



What you see is what you build

Product information model

- Object-based 3D-model with user-defined attributes

What you see is when you build what

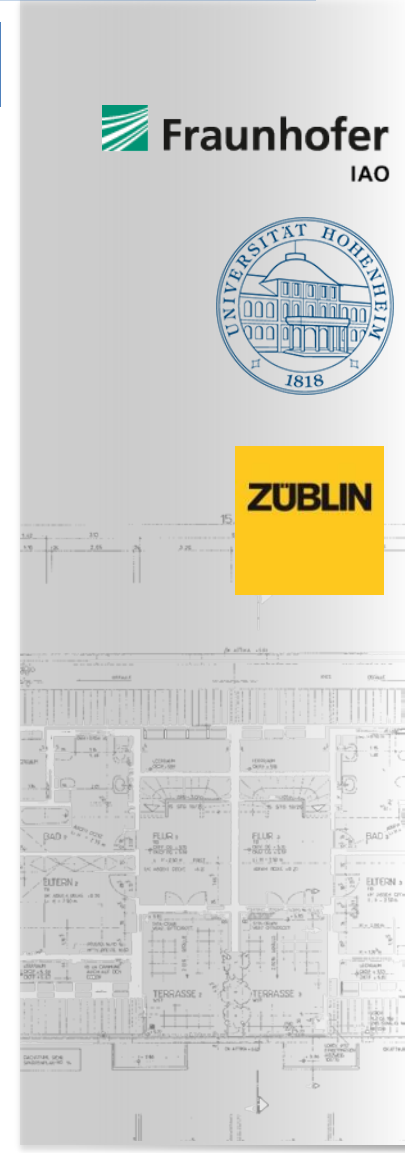
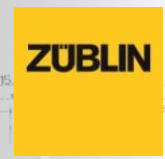
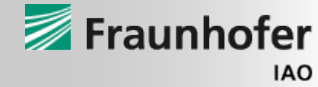
Virtual construction site

- Construction sequencing by linking the geometric model to a schedule
- Dynamic construction process
- „Virtual mock up“-simulations

What you see is how you build it

Data- & process management

- Quantity take-off from the 3D-model
- Company-wide logistics
- Connecting all business processes to the 3D-model and the workflow



Impulse through BIM / 5D

BRYGHUS PROJEKTET, COPENHAGEN DENMARK CONSTRUCTION: 2013 – END OF 2017



CLIENT: REALDANIA

ARCHITECT: OMA

MAIN CONTRACTOR: Züblin A/S (GE/DBC)

CONTRACT SUM: € 140 million

SIZE: 27.600 m²

BUILDING USE:

Multipurpose/Main tenant: Danish Architectural Center

OMA

COWI



CPH

Traffic

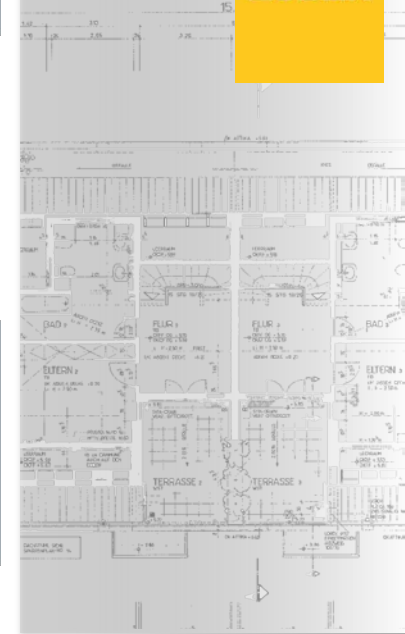
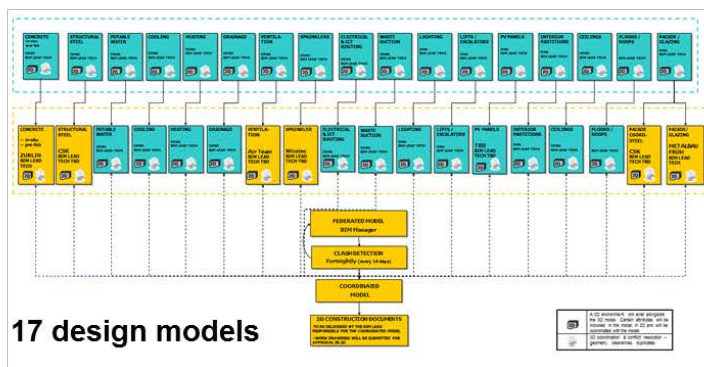
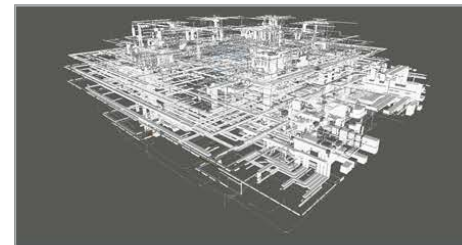
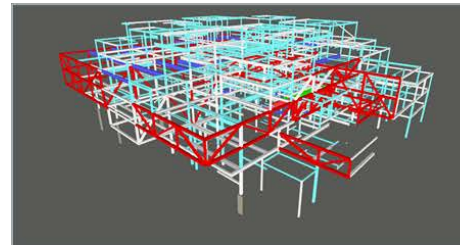
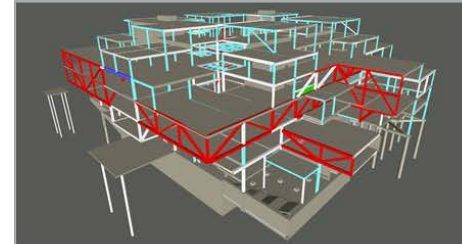
Fraunhofer
IAO



ZÜBLIN

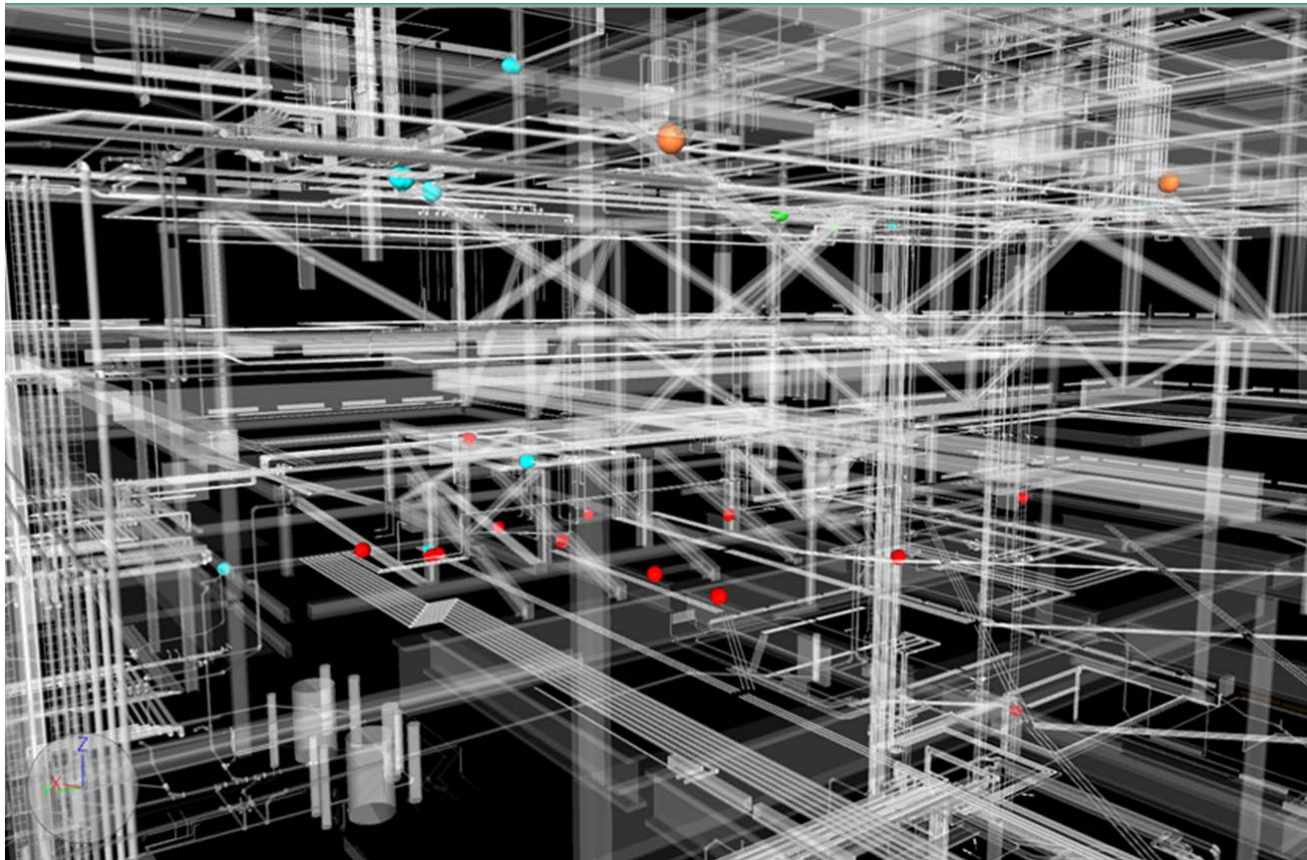
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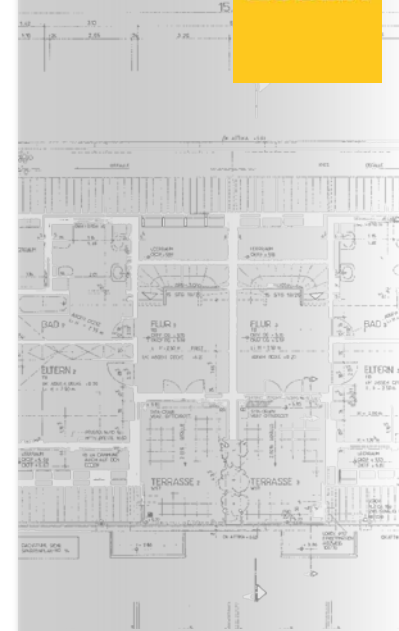


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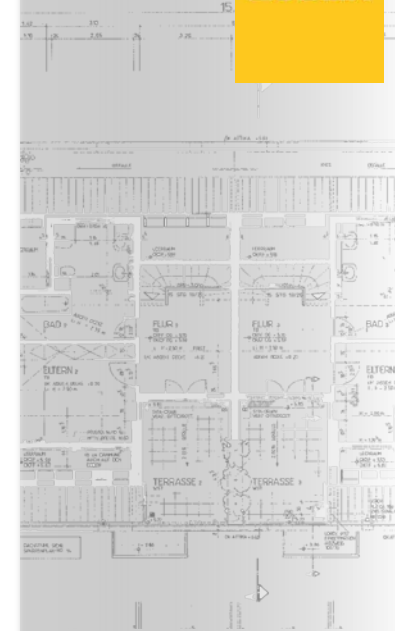
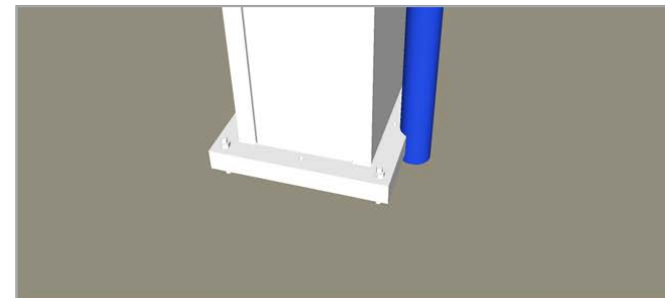
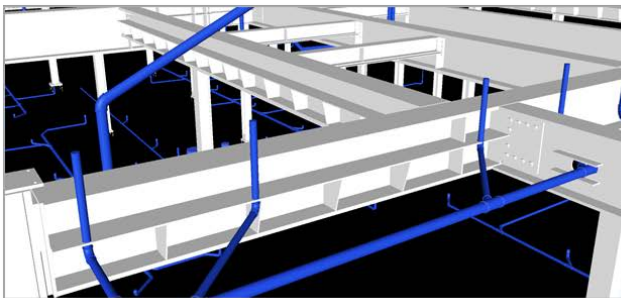
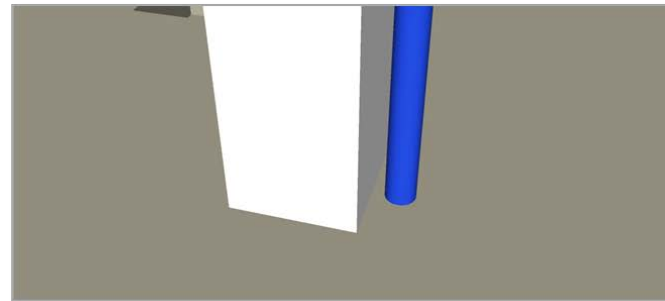
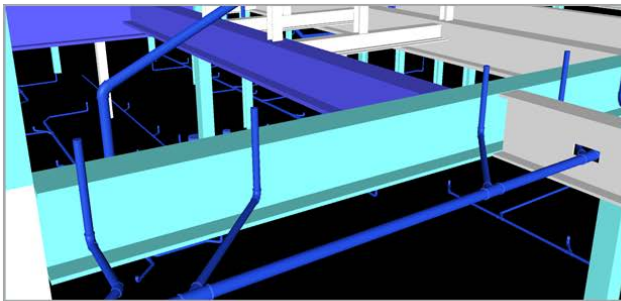


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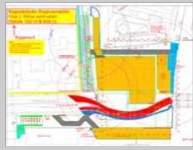
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Impulse through BIM / 5D

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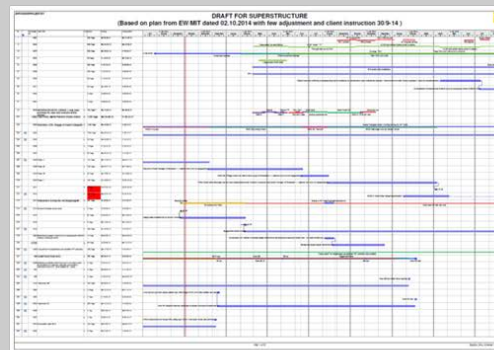
Site phases



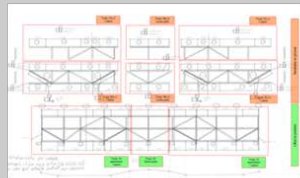
Structure



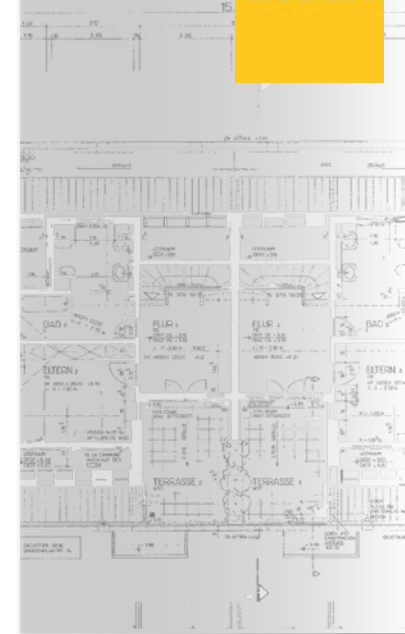
Project Schedule



Truss: pre-assembly & installation

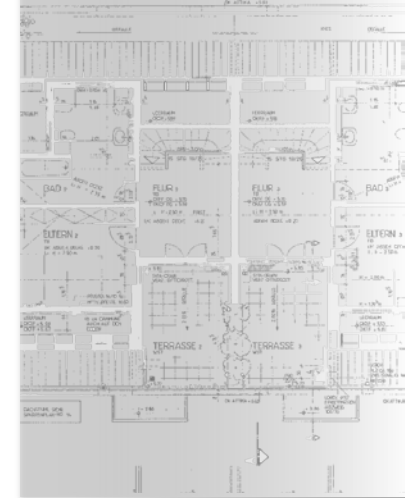
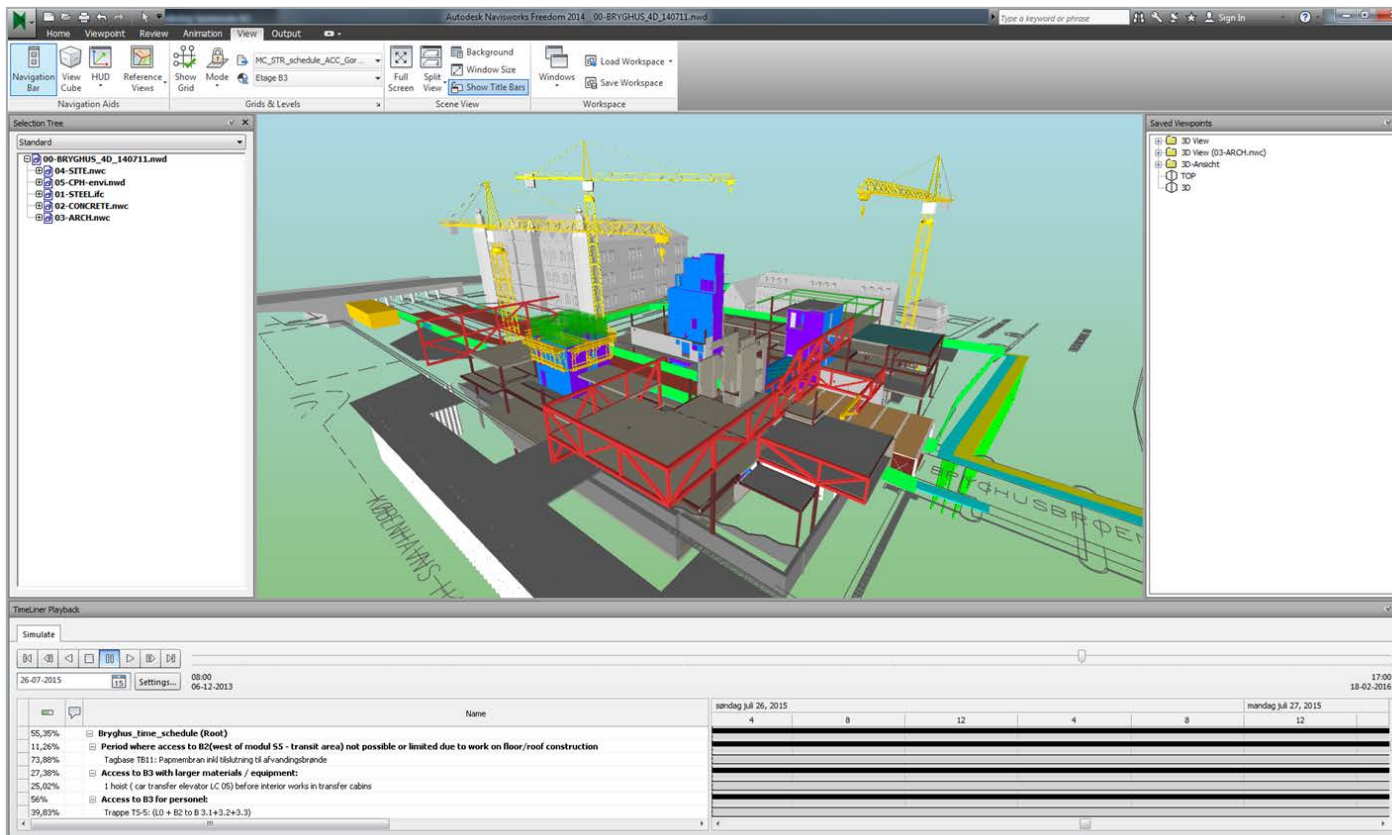


Temporary structures



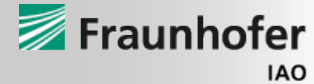
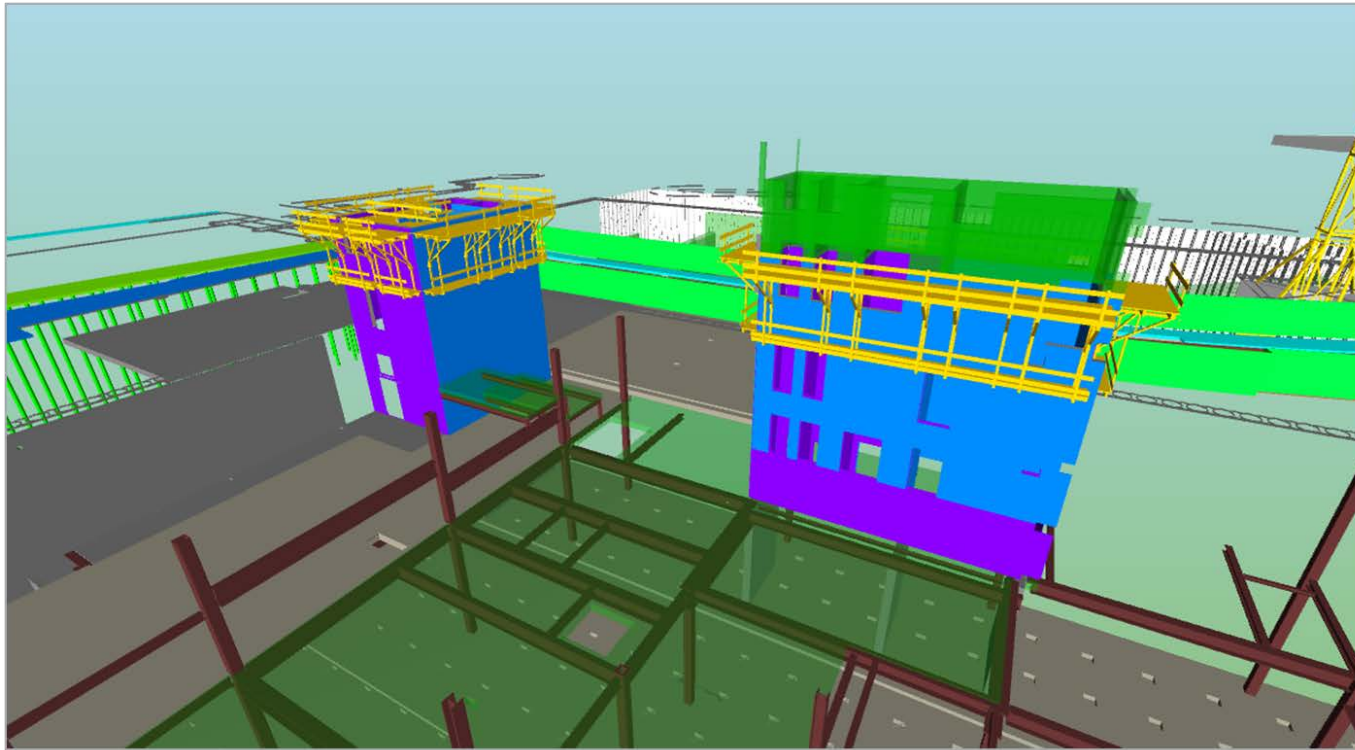
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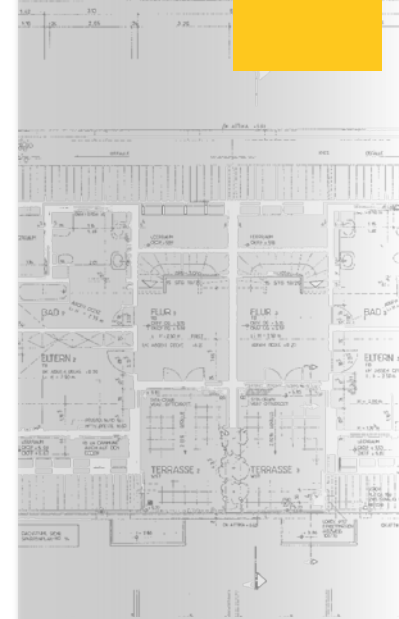


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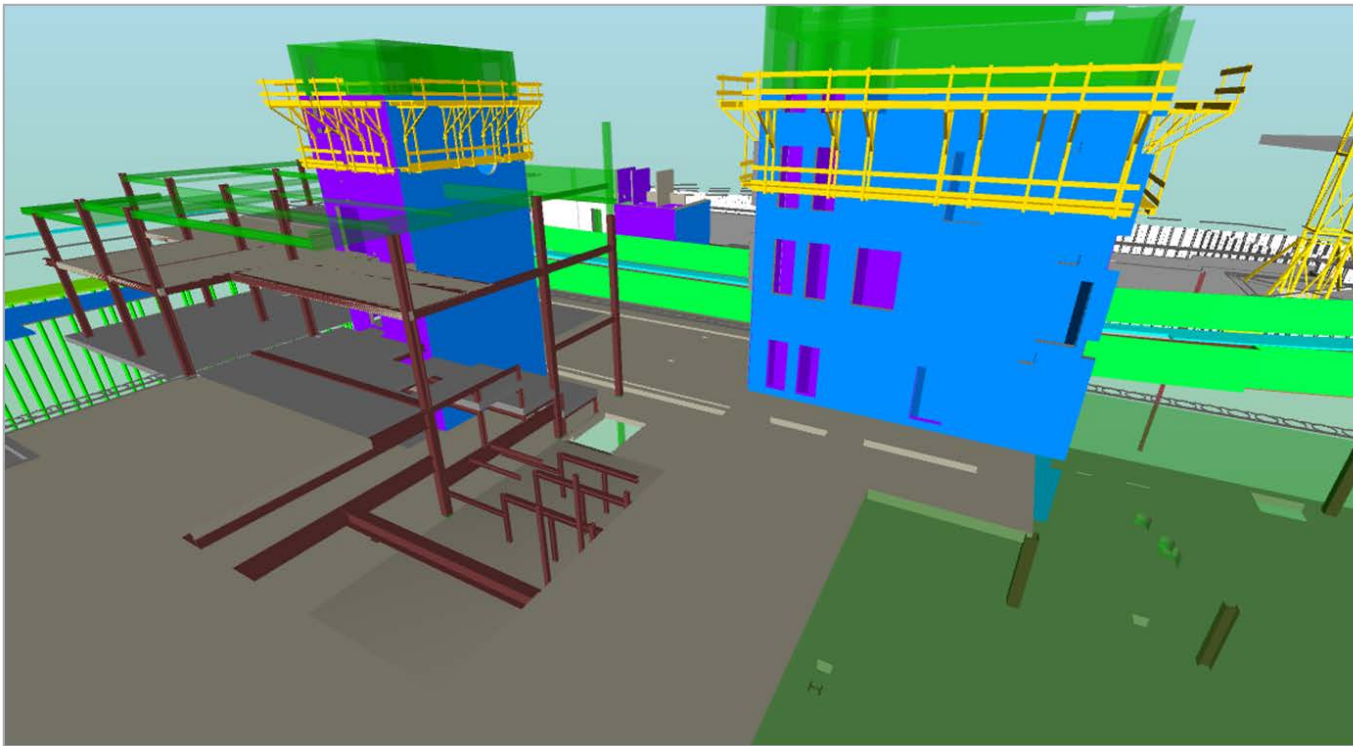


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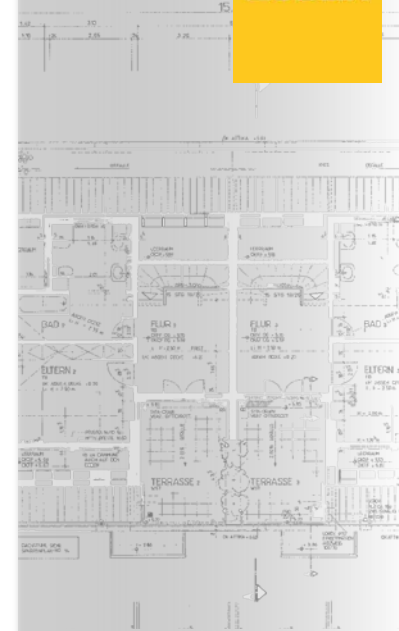


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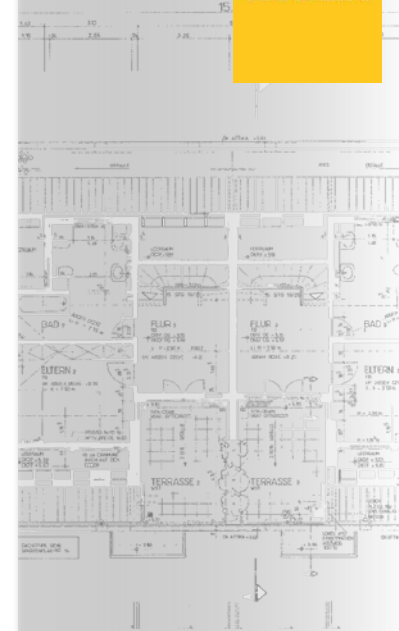
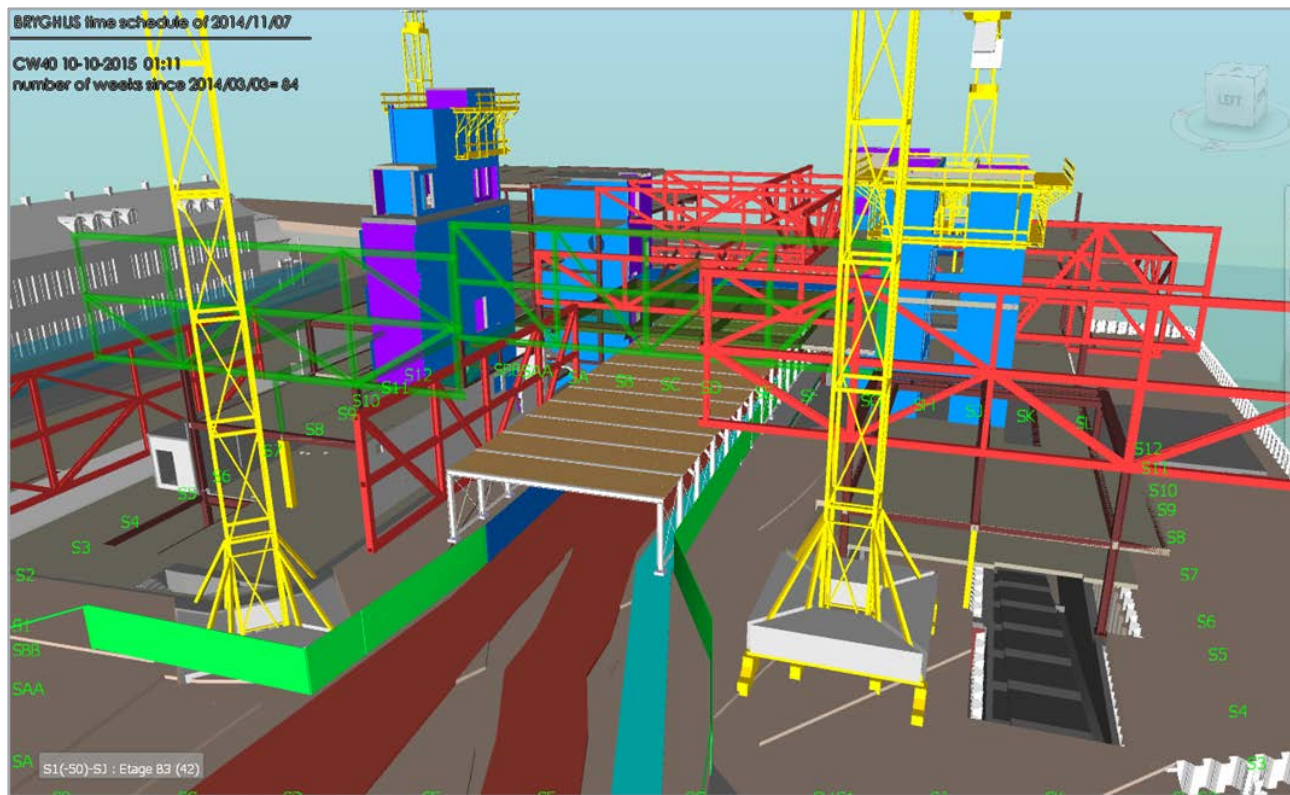


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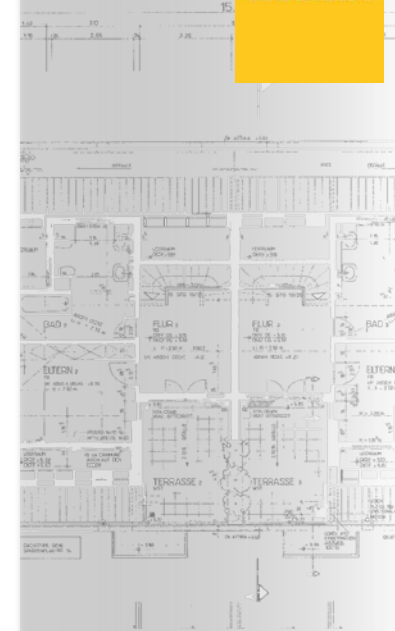
“

I am proud of **our 4D model result**, which I believe will make a big difference for the whole project, but especially for the understanding of the complexity of the erection of the structural work, under various site- and different traffic conditions. Many things will in my opinion be easier probably reduce the risk of crucial mistakes such as quality, health, time, and economic. So all our work will in my opinion be paid back 1000 times.

Following is only a part of which activities I believe will benefit from the 4D Model

- Visual tool to make right decisions for installation sequence
 - calculation of intermediate stages
 - to use for presentation (e.g. for traffic situations, installation sequences)
 - make detail plans for installation of superstructure (how do we tackle each critical installation, method statement including health & safety)
 - to find where special design for connection steel-steel and steel-concrete are needed to make installation possible or easier
 - to find out where it is possible to make [position] intermediate supports of trusses
 - tool to find out condition for site installation in phases well ahead time-wise
- ”
- to instruct before installation

--- **Michael Schmidt**, Pre-construction Planning Manager Bryghus
over 25 years of experience in the construction industry, 15 in capacity as time-scheduler
in a letter to Lynn Hiel -- 25.11.2014



Impulse through BIM / 5D

DEVELOPMENTS IN STUTTGART



Einladung zur
Mitwirkung beim

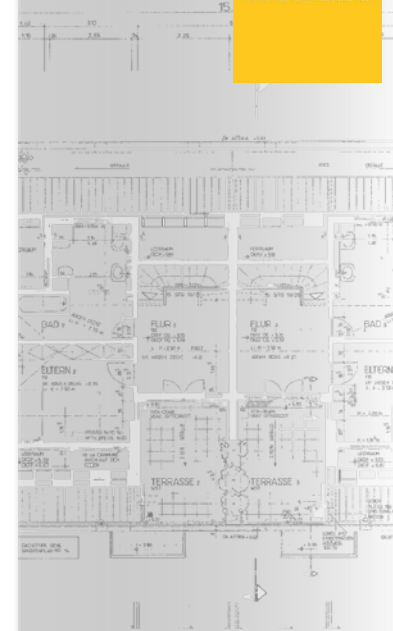
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Ideelle Unterstützer:

 Architektenkammer Baden-Württemberg	 VIRTUAL DIMENSION CENTER	 vpi	 TEKLA A TRIMBLE COMPANY
 Breitlinger Ingenieure	 HOCHSCHULE KONSTANZ TECHNISCHE WIRTSCHAFT UND GESTALTUNG	 Hochschule für Technik Stuttgart	 Trimble
 Universität Stuttgart Institut für Baubetriebslehre	 WABE-PLAN ARCHITEKTUR	 GEZE	 BBB
 Boll und Partner. Beratende Ingenieure VBI Ingenieurgesellschaft mbH & Co KG	 Fritz Deufel Ingenieurgesellschaft mbH & Co KG	 DAI	 HWP
 WOLFF & MÜLLER	 INGEBW	 PERI	 Fraunhofer IAO
 VDI	 FICHTNER	 RIB	 DREES & SOMMER
 BYTES & BUILDING	 Leonhardt, André und Partner	 BFK	 BAUWIRTSCHAFT Baden-Württemberg e.V.
 WRÄNNER SOBMAL	 VERBAND BERATENDER INGENIEURE	 ZUBLIN	 ZACHMANN
 schlach bergemann und partner	 Porsche Consulting		

BIM CLUSTER STUTTGART

bimcluster@stuttgart.zueblin.de (vorläufige e-mail)



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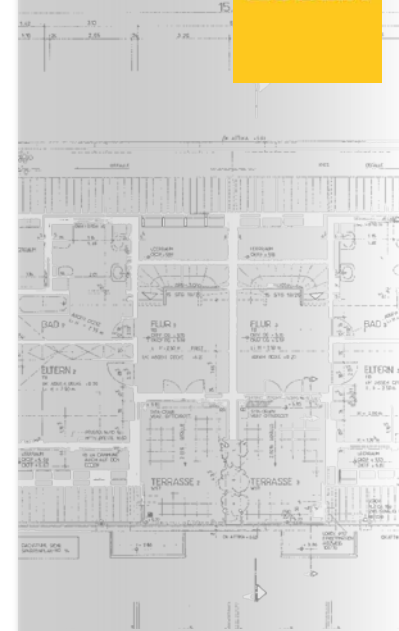
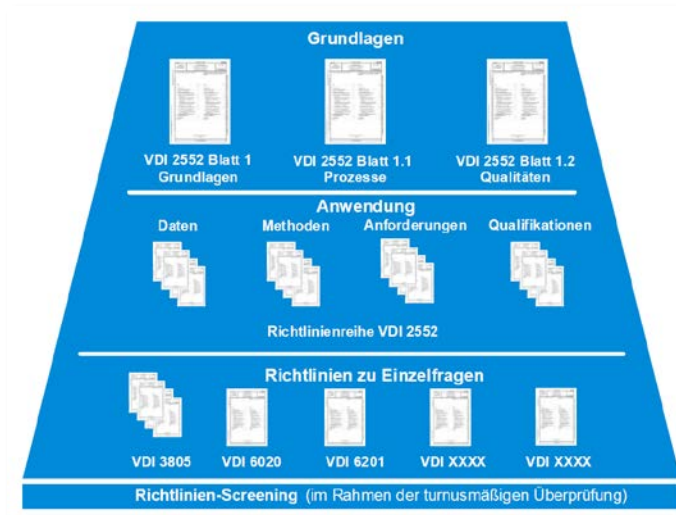
VDI STANDARD

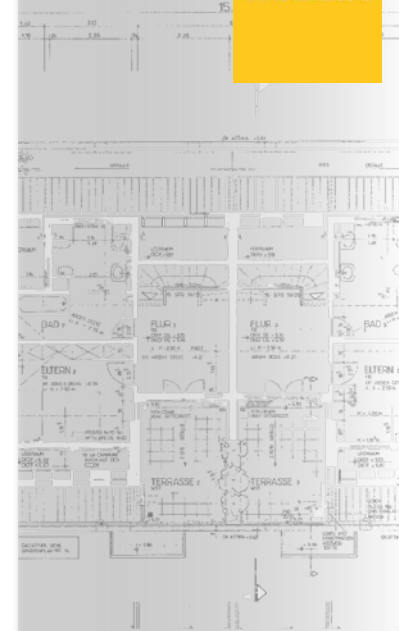
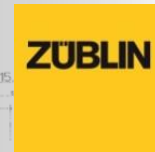
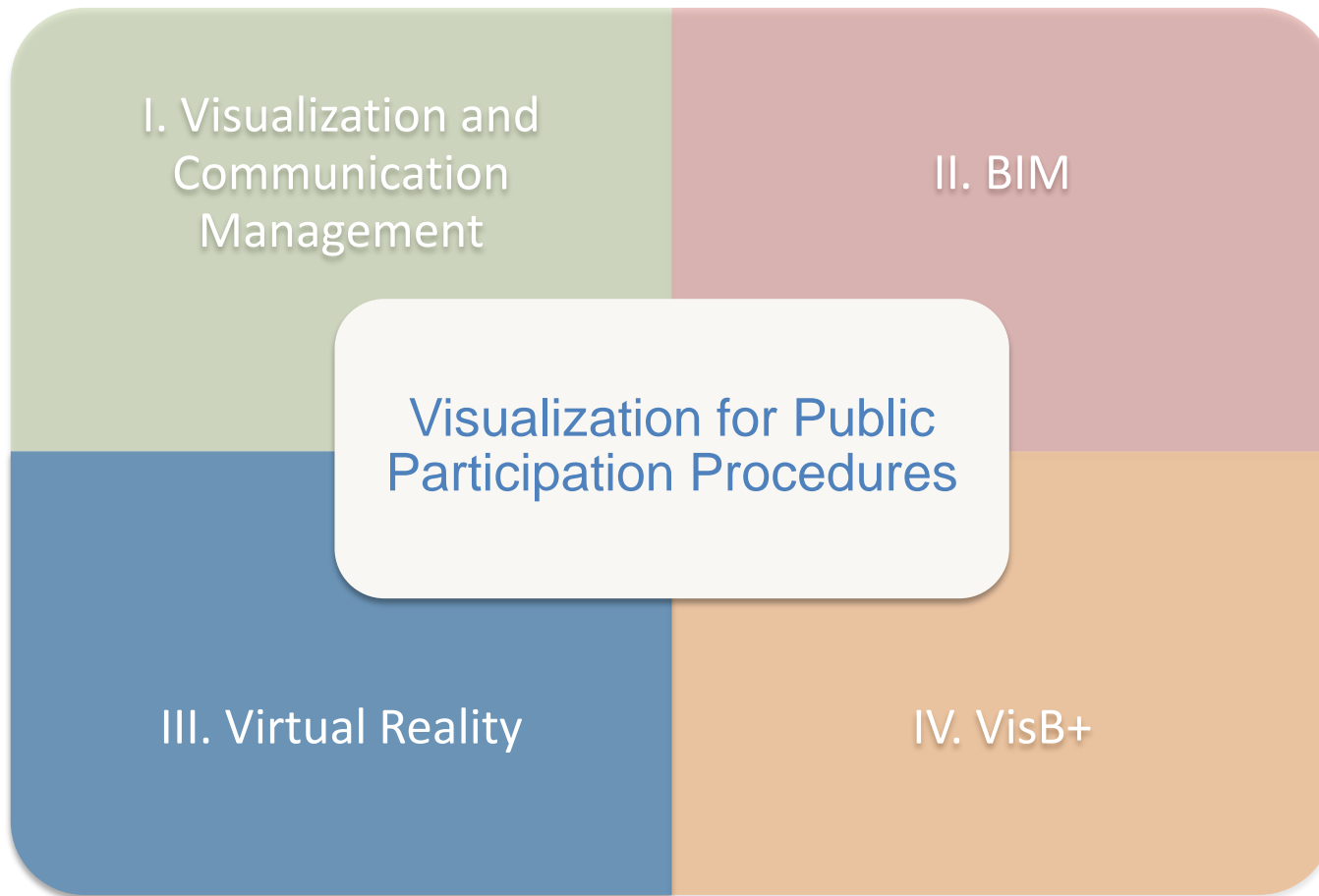
VDI

Agenda

Building Information Modeling
VDI-Richtlinien zur Zielerreichung

April 2015





Dialogue – on the same level

Requirements for Visualizations

- ✓ true
 - ✓ raw (not enhanced)
-
- ✓ dynamic
 - ✓ comparison of variants
-
- ✓ realistic impressions
 - ✓ independent experience

Challenges

Data Interface:
GIS (Existing) +
BIM (Design)
→ Simulation
→ Visualization

- Interactive Media

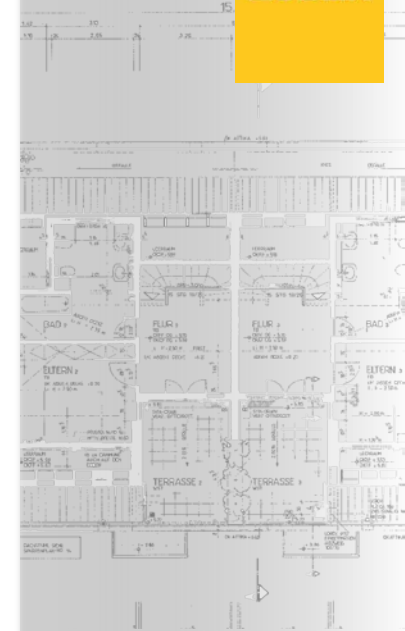
- Experience the spaces
- Intuitive approach

Solutions

Complemented by established Media (Text, Plan, Photo, Film) in:

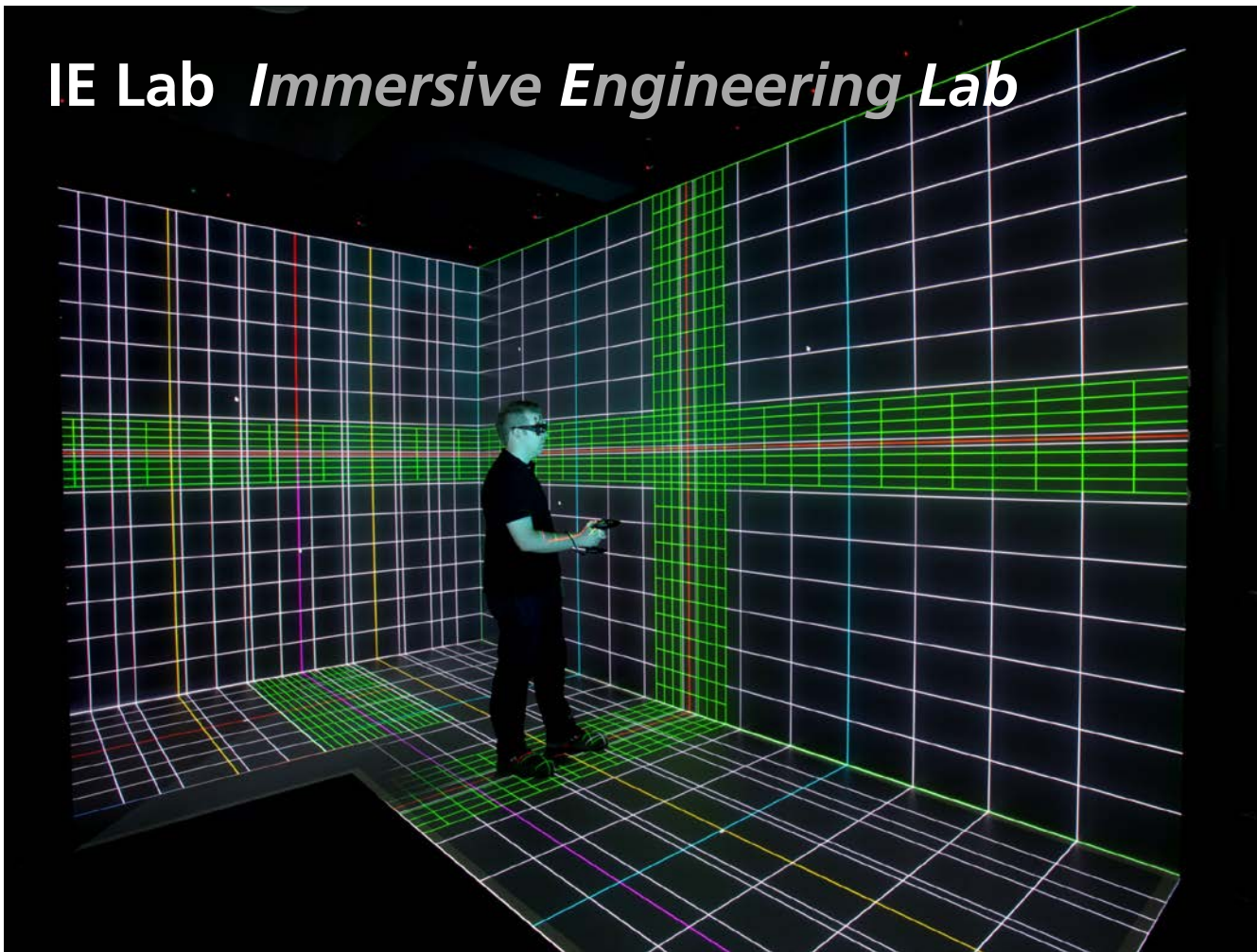
Virtual Reality Environments

(with direct connection to valid design and simulation data)





Virtual Reality Environments



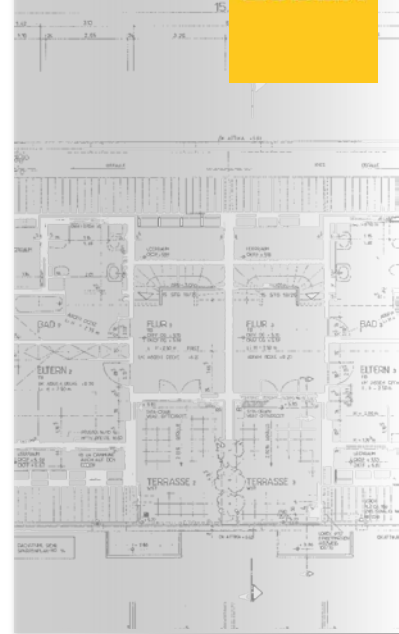
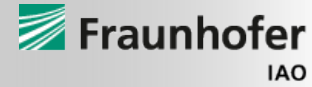

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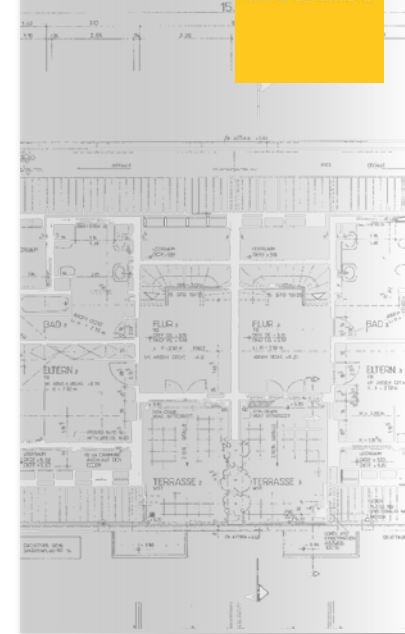


Working Effectively in Virtual Reality



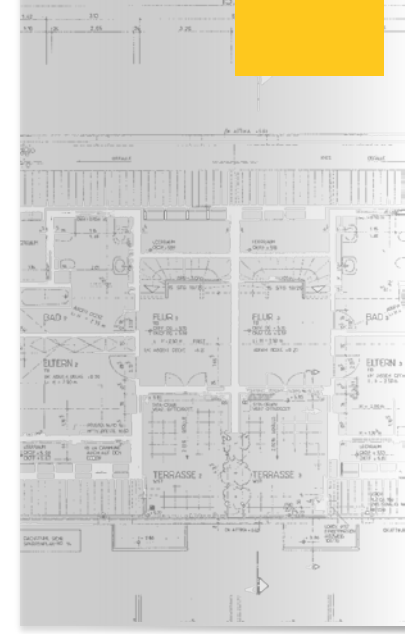
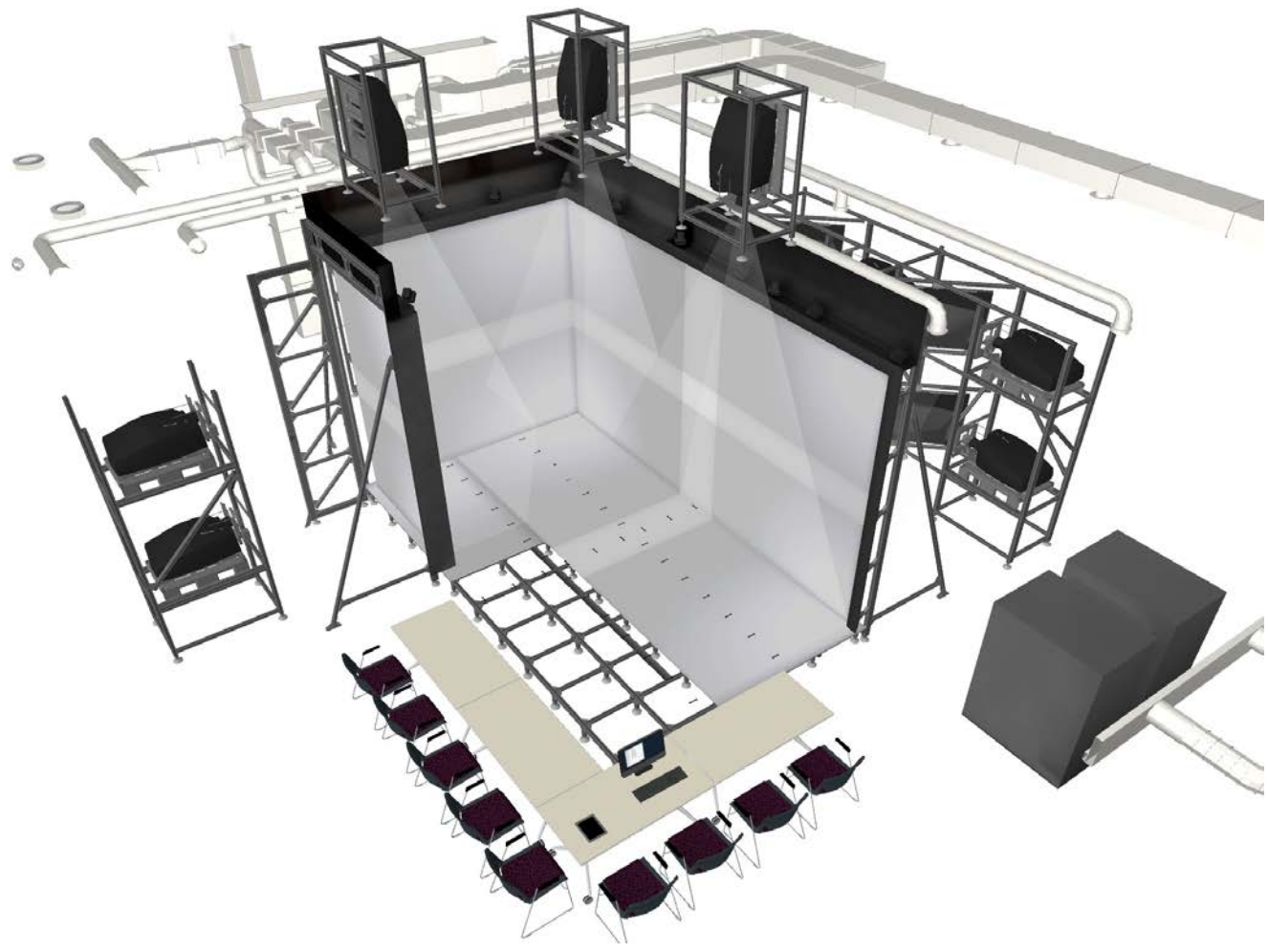


Efficient Communication & Decision-making in Groups





IE Lab: Layout



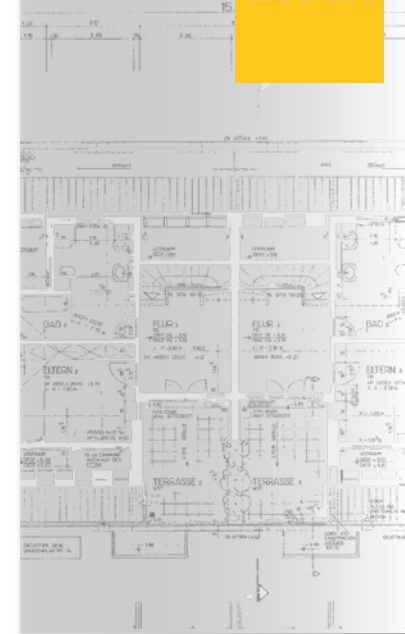
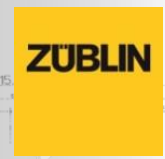


IE Lab as VIP Lab



IE Lab

Premium Visualization
Space and Meeting
Space for Decision-
makers



Virtual Reality Spaces Presentation Technologies for Virtual Reality



Mobile Powerwall / 3D-TV Equipment

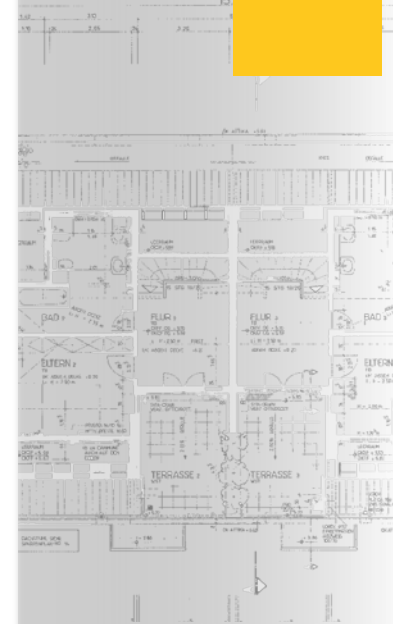
small, low-cost, robust system for sales offices and conference presentations



Powerwall

Low-cost media integration in meeting rooms

(Example Project Presentation at ThyssenKrupp Real Estate in Essen)





Construction Permit Procedure (1st Example)

Sitz der Schweizer Firmen der Würth Gruppe in Rorschach am Bodensee

- Owner: Adolf Würth GmbH & Co. KG
- Content: 3D-Data Model (Architects) + Variations
- Target Group: City Council Rorschach
- Presentation System: mobile display
- Use: City Council Meetings, trained presentation personnel

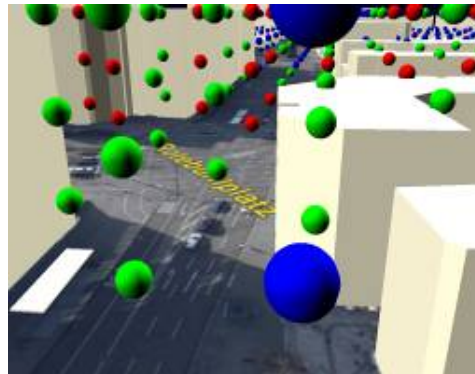
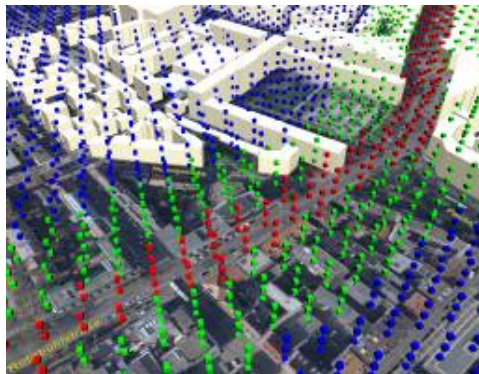




Virtual Reality used for urban areas (2nd Example)

IKONE

- Owner: Land Baden-Württemberg
- Content: CityGML City Planning Office Stuttgart + Noise Simulation
- Target Group: Public
- Presentation System: 3D-Display (3D-InfoPoint)
- Use: Research prototype for the visualization of acoustic impacts of E-cars on the environment




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Public Information / Employee Information (3rd Example)

BMBF Neubau, Berlin Spreebogen

- Owner: BMBF
- Content: 3D-Data Model (Architects)
- Target Groups: Public, Employees (Change Management)
- Presentation Systems: mobile Powerwall / 3D-TV (3D-InfoPoint) – without Tracking
- Use: Presentations for a period of 3 weeks in the Kronprinzenpalais Berlin, implementation for a period of 2 years at the locations in Berlin und Bonn (Security Personnel as Persons in Charge!)

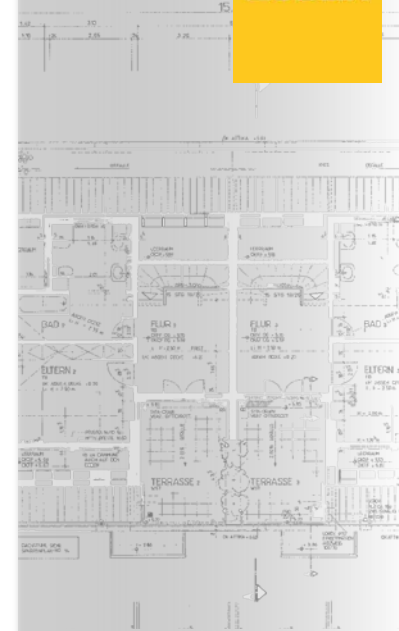
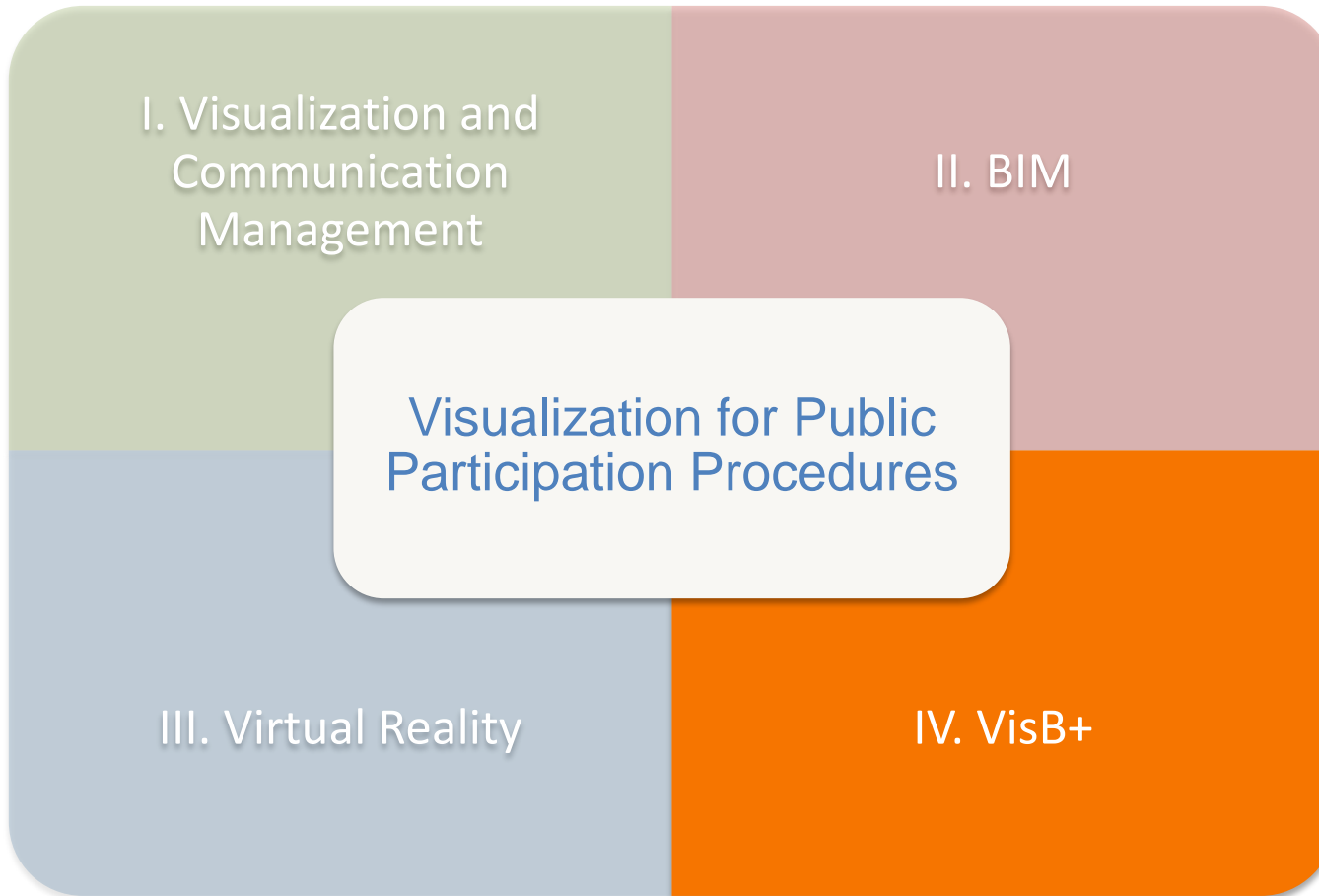


Project Development

Design

Realization

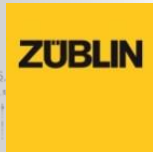
O&M





The Research project VisB+: Research Objectives

- What are the **expectations** of the relevant parties for visualizations in public participation methods?
- How do the different visualization methods **affect** public participation?
- In which **project phase** are which visualization methods most appropriate?
- Aim: **Visualization-Guidelines** for industry and public administration



The Research Project VisB+: Project-Design

Milestone 1
2. Q 2015

Milestone 2
4. Q 2015

Milestone 3
4. Q 2016

Milestone 4
4. Q 2017

Milestone 1

Requirements of the Parties
for Visualizations
(Expert-Workshops)

Milestone 2

Evaluation of the existing
Visualization Methods

Milestone 3

Empirical Analysis of the
effects of different
Visualization-Methods
(Focus-Groups)

Milestone 4

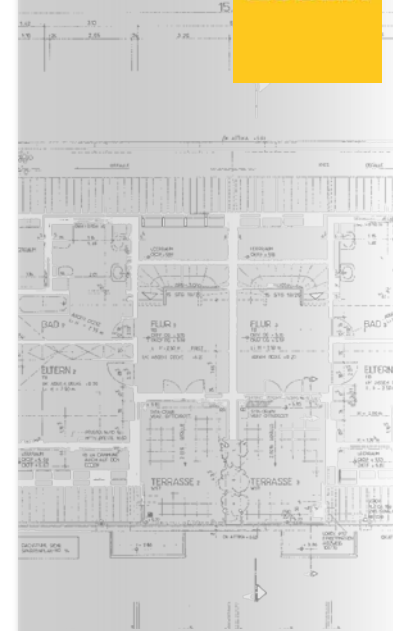
Final evaluation and
establishment of the
visualization guidelines



Sustained Guidance by the Project Advisory Council



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The Research Project VisB+: Project Advisory Council

- **Dr. Brigitte Dahlbender**, *Landesvorsitzende des BUND*
- **RA Dieter Diener**, *Hauptgeschäftsführer Bauwirtschaft Baden-Württemberg e. V.*
- **Claus-Dieter Hauck**, *Abteilungsleiter Stadtbahn, Brücken und Tunnelbau, Tiefbauamt Stadt Stuttgart*
- **Dipl.-Ing. Konstantinos Kessoudis**, *Abteilungsleiter 5D-Planung Ed. Züblin AG*
- **Markus Müller**, *Präsident Architektenkammer Baden-Württemberg*
- **Dipl.-Ing. Peter Steinhagen**, *Vorstand VDI-Gesellschaft Bauen und Gebäudetechnik*
- **N.N.**, *VBI Baden-Württemberg*





VisB+: Interdisciplinary and Practical Implementation

Public Participation

Design Phases

Acceptance

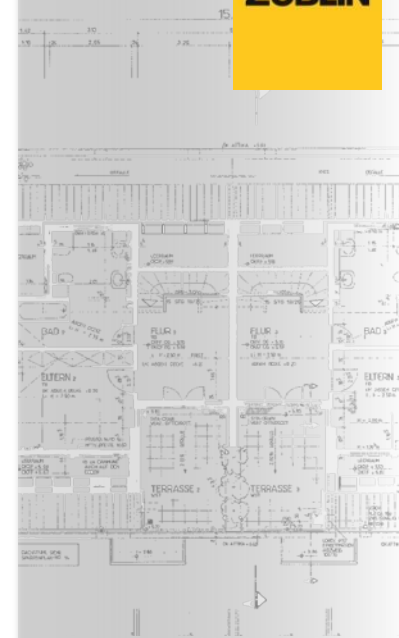
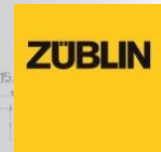
Design & Cost
Certainty

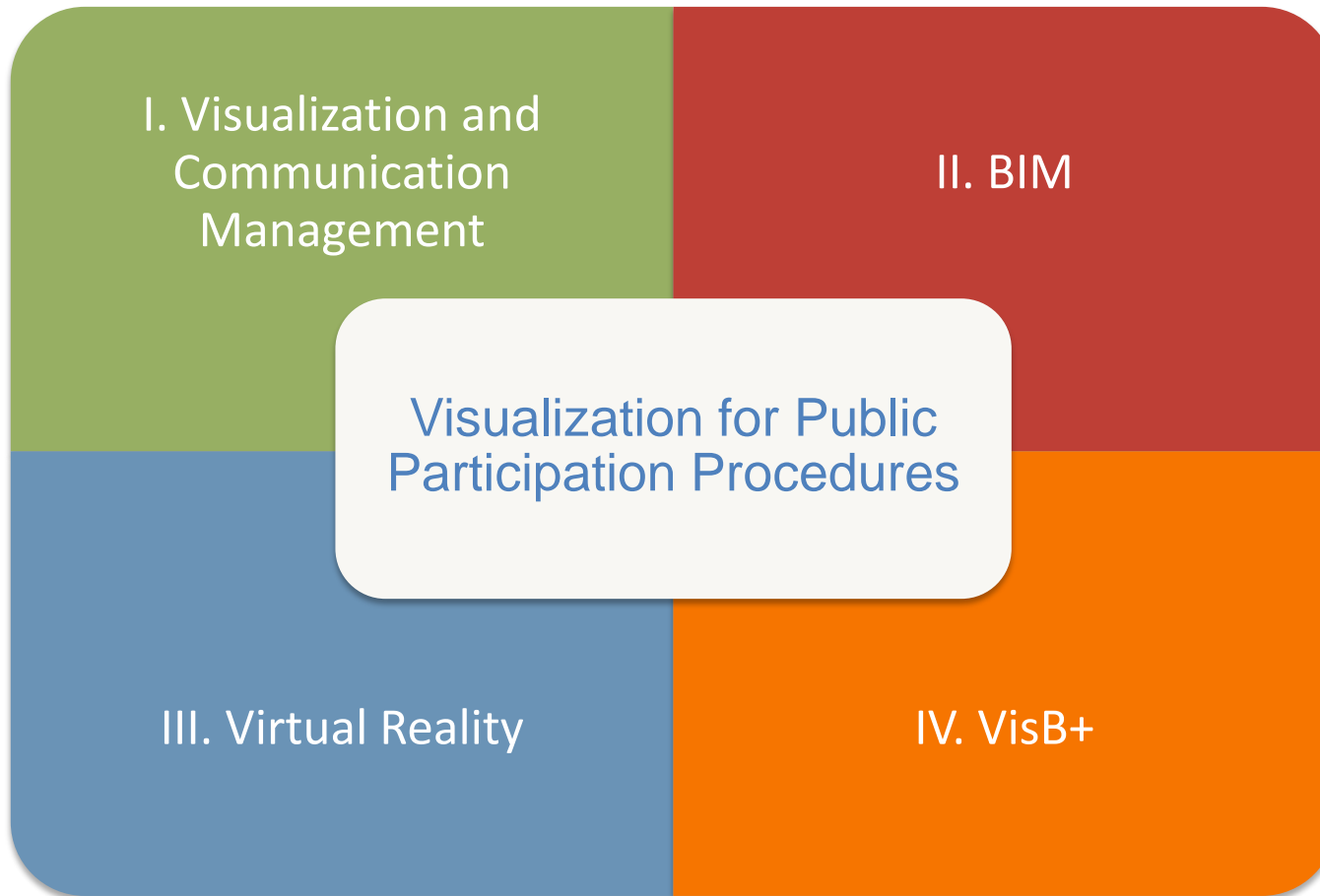


BIM / 5D /
Virtual Engineering

Extension:
user-oriented design

Functionality





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Züblin -- Zentrale Technik

Construction Process Management BIM/5D



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Time for a dialogue ...



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