SBE19 Graz
SUSTAINABLE BUILT ENVIRONMENT
D-A-CH CONFERENCE 2019

A holistic approach for industrializing timber construction

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13 Sept 2019

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A holistic approach for industrializing timber construction

1. Motivation and strategy
2. Background and foundations
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4. Case Studies
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1. Motivation and strategy

Environmental Assessment

33% global CO2 emissions

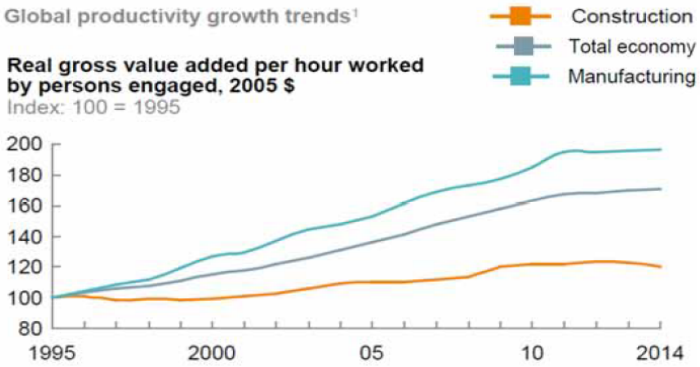
Resource Use

30% EU waste annually

40% Global resource use

Urbanization

40% global population will need new buildings



Source: Eurostat 2015b, McKinsey Global Institut analysis 2014

1. Motivation and strategy

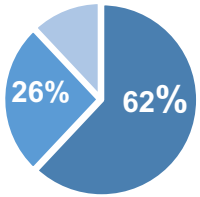
Environmental Assessment

GlueLam CLT Hybrid

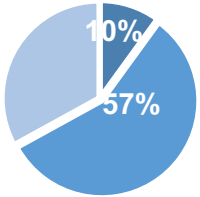
Urbanization

Columbia Via Cenni Puukuokka

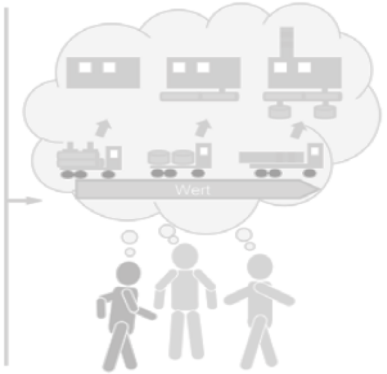
Resource Use



62% Value
26% Waste
12% Supporting activities



10% Value
57% Waste
33% Supporting activities



The chronic problems of construction are well known:

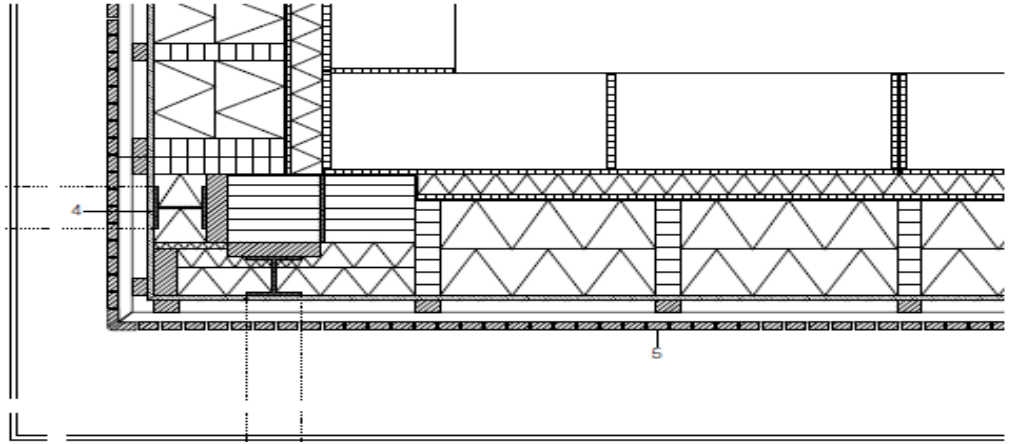
- Low productivity - Poor safety - Inferior working conditions - Insufficient quality

Source: Koskela, 1992, Construction Industry Institute 2004

2. Background and foundation

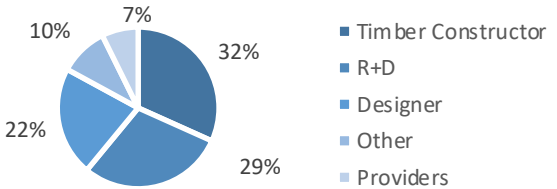
Why timber?

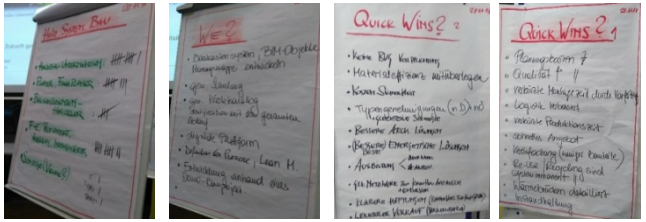
- ✓ Engineering performance
- ✓ Effective off-site construction (Local factories)
- ✓ Resources Management
- ✓ High Prefabrication Grade
- ✓ Dry Construction – Plug&Play
- ✓ Just in Time Delivery
- ✓ Expertise – Know-how
- ✓ Thermal Capabilities, Fire Resistance…



Source: Kaufmann 2018

3. Empirical study
Holz.System.Bau

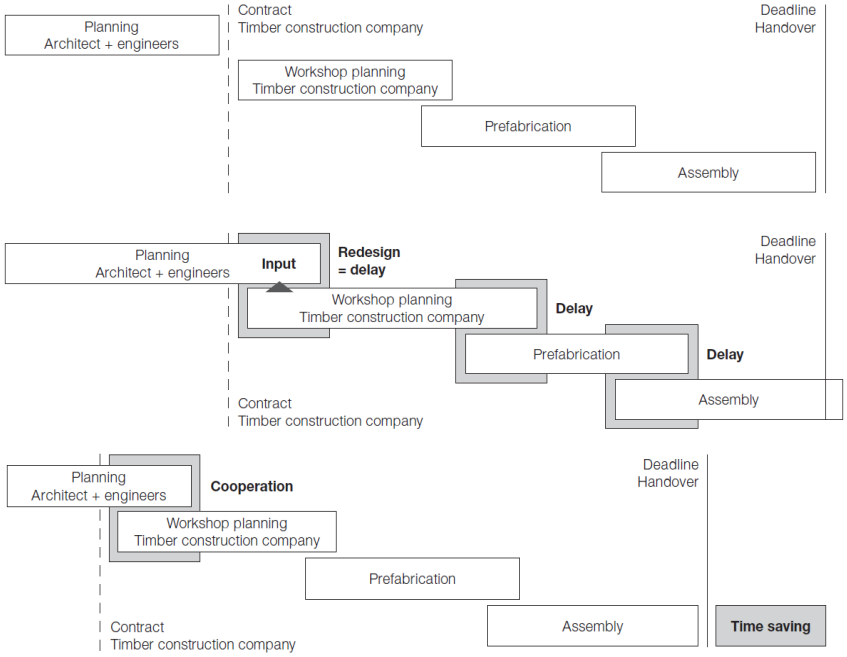


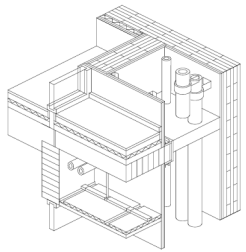


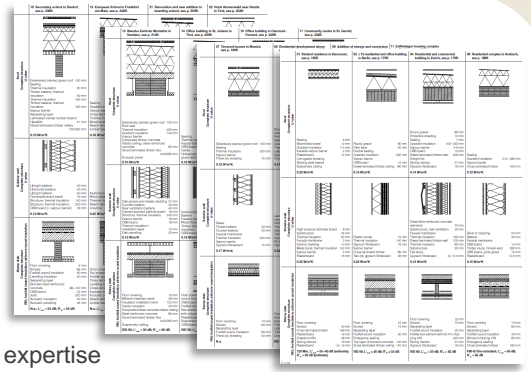
	Urgent value-adding goals	Strategies
DESIGN	• Extended knowledge in architectural design • Know-how exchange platform • Specific academic training • Energy and material efficient concepts • Less constructive elements, joints and details	• Define a reactive and adaptive modular system with standard assemblies from already existing components • Develop an integral catalog with all load-bearing and not load-bearing modular system elements • Use rainproof constructive elements • Spread the solutions through a BIM library as an open source • Advance a collective value-adding actions catalog throughout the whole process • Implement a crossed specific training • Improve efficiency through Lean Management • Promote reliable cost and time plans by implementing Lean Construction
PRODUCTION	• Optimized logistic and coordination • Competent handcraft • Shorter production time in factory	
ERECTION	• Faster assembly through higher prefabrication grade (plug-and-play) • Better performance on site against weather detriments • Optimized logistic and coordination • Null-error performance	
Cost-time	• Refinement of planning costs • Reliable cost and time plans • Faster offers and lighter comparability	
End-product	• Cradle-to-cradle • Improved end-product quality	

3. Empirical study

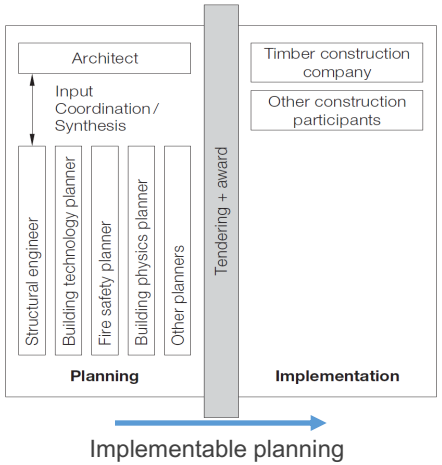
Lean Design







Specific timber construction expertise



Implementable planning

Open System

Erne
Cree
Kaufmann Bausysteme
Elk Fertighaus

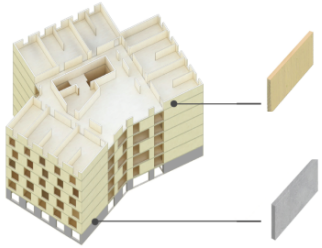
Binderholz
Storaenso

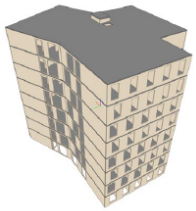
Dataholz
Baubook
Lignum Bauteil Katalog

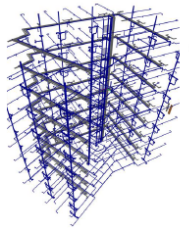
Source: LeanWOOD 2017 / Kaufmann 2018

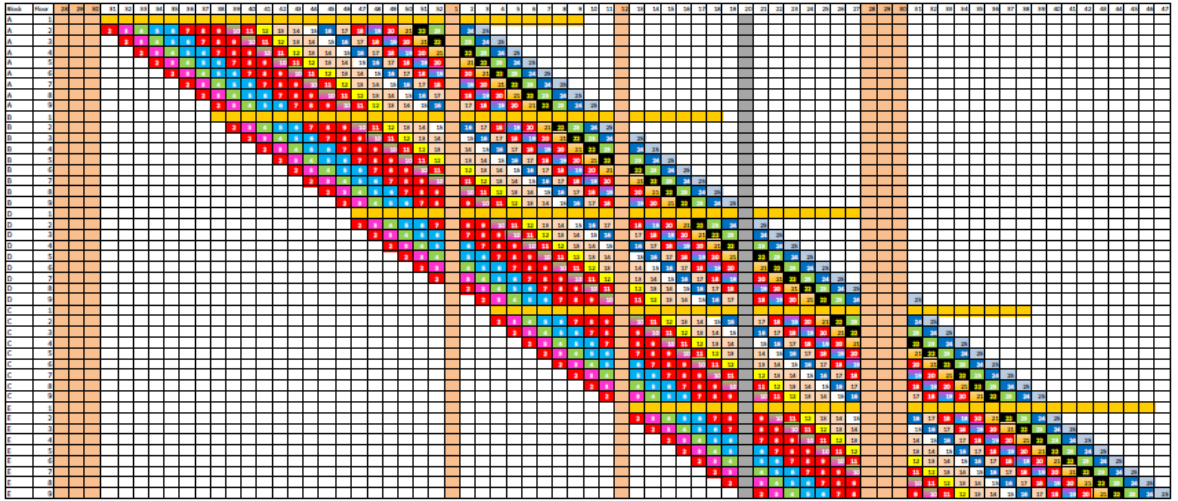
4. Case studies

Moholt 50|50, Norway







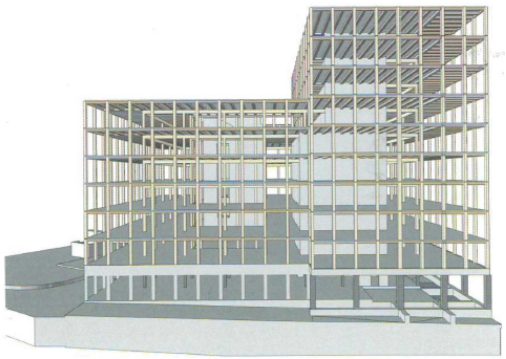


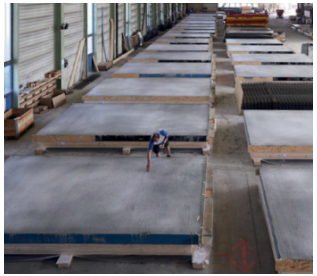
Source: Høyer Finseth/MDH Arkitekter / Veidekke

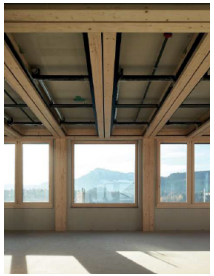
4. Case studies

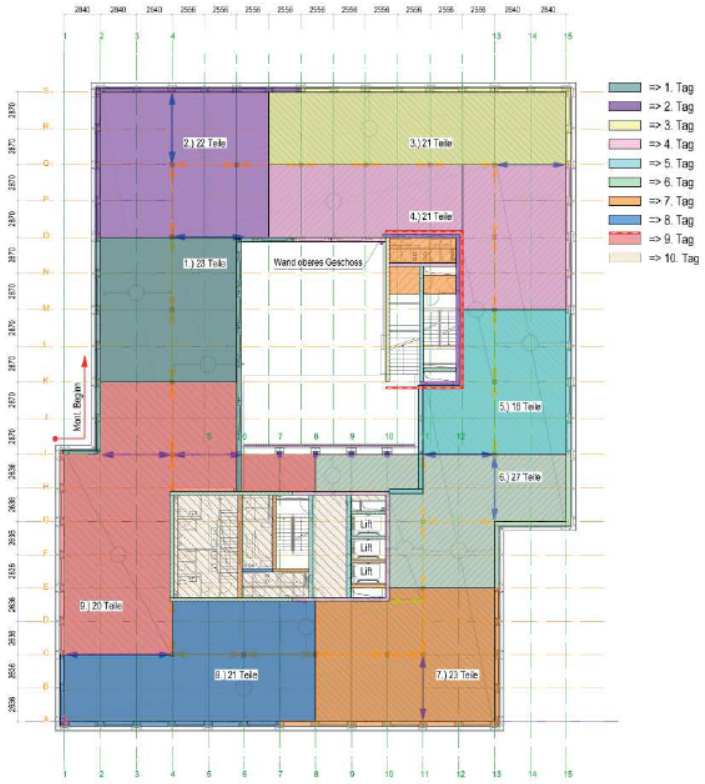
Risch Rotkreuz, Switzerland

Suurstoffi 22









Source: ERNE / Zuschnitt / Burkard Meyer

5. Conclusions

HSB-Urgent value-adding goals		HSB-Strategies	Take-home-Strategies	Moholt 50|50	S22 + Arbo
DESIGN	• Specific knowledge in design	• Adaptive modular system	• **Early key decisions**	x From brick to CLT	✓ERNE
	• Know-how exchange platform	• Open BIM	• **BIM**	✓ BIM model	✓BIM model
	• Less constructive elements and details	• Integral catalog with all standard elements and assemblies (BIM library)	• **Early involvement of the construction company**	✓Vaidekke	✓ERNE Building set libraries
PRODUCTION	• Optimized logistic and coordination	• Lean Management	• **Lean Production**	✓ Stora Enso	✓ ERNE
	• Shorter production time	• Competent handcraft	• **Kaizen. Jidoka**		
ERECTION	• Faster assembly on site	• Higher prefabrication grade	• **Higher prefab grade**	x CLT	✓ Building blocks
	• Independence of weather	• Use rainproof elements	• **Concrete or surface**	x JIT (4days/floor)	✓ Concrete layer
	• Optimized logistic and coordination	• Collective value-adding actions catalog	• **TTP**	✓ TTP for internal work	✓ TTP
	• Null-error performance	• Shared and crossed specific training	• **LPS**	✓ Involved Planning	✓ LPS
COST-TIME	• Reliable cost/time plans	• Lean Construction	• **Off-site+4D+Libraries**	✓ Preconstruction	✓ Preconstruction
	• Faster offers and comparability		• **Design-Bid-Build**	x Rework / Redesign	x No comparable offers

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