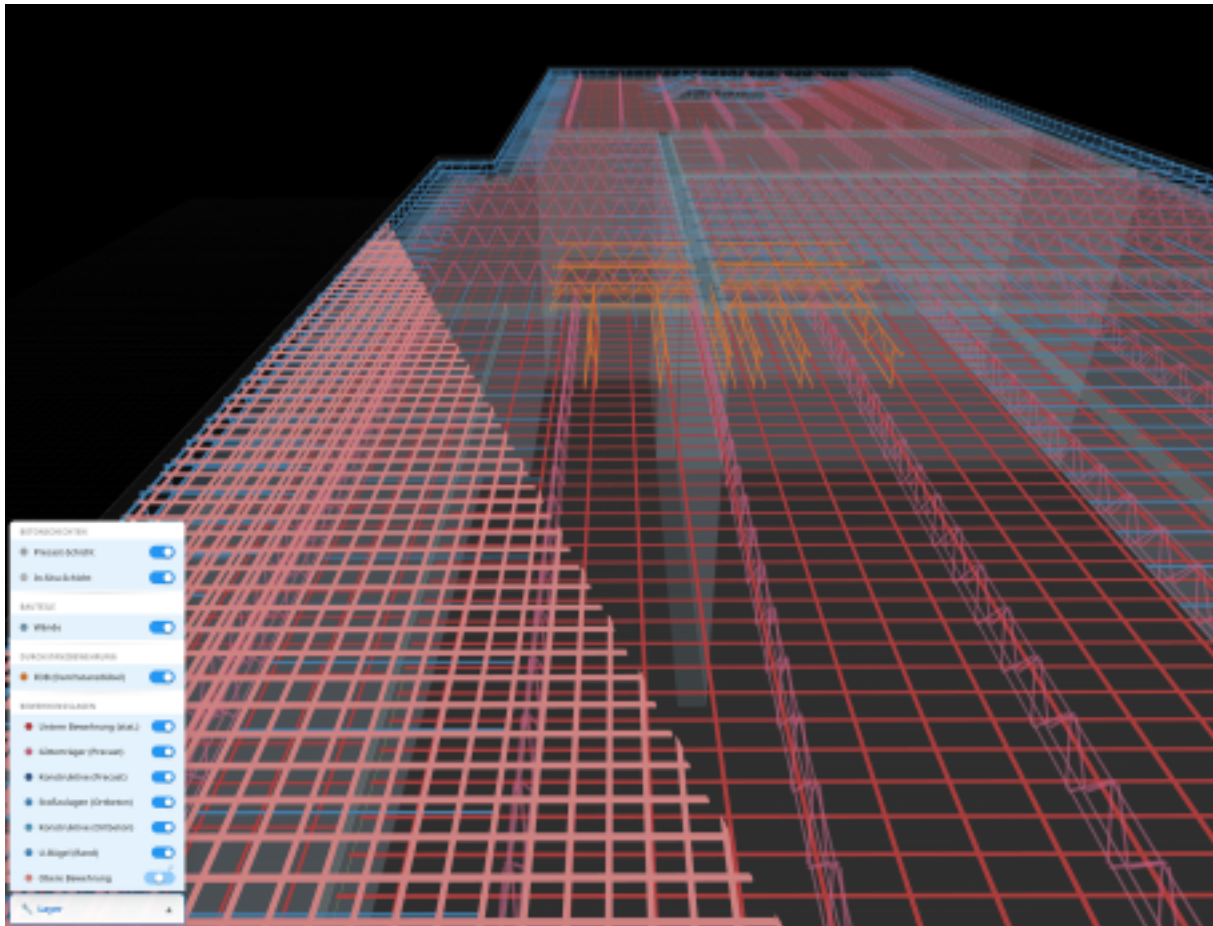


Carbon concrete construction: designing and manufacturing resource-efficient buildings

About this project



C-Tool

Carbon concrete construction: designing and manufacturing resource-efficient buildings

Markets:



Material:

Carbon fibres, Steel, Laid webs, Glass-fiber reinforced plastics (GFRP), Carbon-fiber reinforced plastics (CFRP), Short fibre-reinforced concrete, Others (Carbon concrete)

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About this project

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

[Technology Transfer Program Leichtbau](#)

Context

More and more people are living in cities. As urban density increases, so does the need for space- and resource-efficient buildings. At the same time, the construction industry faces the challenge of designing and constructing buildings in a climate-friendly manner throughout their entire life cycle.

Conventional construction methods require large quantities of materials and often focus on the construction phase, whilst use, adaptation and demolition are given insufficient consideration. Low levels of prefabrication and complex processes also increase the likelihood of errors, drive up costs and delay construction times.

Current planning processes also fail to adequately reflect a holistic approach. Digital tools are often not seamlessly interconnected, meaning that data has to be processed multiple times and the planning workload increases. As a result, innovative, resource-efficient construction methods can only be integrated into existing processes to a limited extent.

Carbon concrete offers great potential for sustainable urban development, as this construction method enables the production of slim, lightweight and durable components using reduced amounts of material. However, standardised solutions and suitable planning tools are lacking for widespread application. This is where the C-Tool project comes in.

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Purpose

The project partners are developing a modular construction system made of carbon concrete for building envelopes and load-bearing components. In addition, they are developing a digital planning tool that models this system and makes it usable in practice.

The C-Tool configuration tool is designed to help companies create and compare different building variants right from the early stages of a project. The tool evaluates designs in terms of material usage, energy requirements, CO₂ emissions and floor plan flexibility. This enables users to identify sustainable solutions at an early stage of planning and to pursue them in a targeted manner.

Furthermore, the link between planning and manufacturing is being integrated much more closely. The project partners are developing an end-to-end digital value chain that transfers planning data directly into production. In this way, they enable cost-effective mass production and ensure consistently high component quality.

Procedure

The researchers are first analysing the requirements for climate-neutral buildings, as well as existing planning and manufacturing processes. On this basis, they are developing a modular carbon concrete building system featuring standardised components and recurring design details.

At the same time, the team is compiling data on materials, energy performance and life cycle in structured databases. On this basis, the project partners are developing the necessary data structures and calculation models for the digital configuration tool.

Building on this, they link planning and manufacturing processes to form an end-to-end digital process chain. For validation purposes, the project partners are applying the approach to a model building and transferring the generated data into production using both conventional and digital methods. Finally, they are manufacturing a component as a demonstrator and using it to test the feasibility and quality of the developed solutions.

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About this project



Funding duration:

Funding sign:

03LB3108

Funding amount:

EUR 1.3 million

Final report

leichtbauatlas.de
Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3108A - C-Tool in the federal funding catalogue

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Project coordination

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K&T

English (EN){ { Projektpartner } }



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Lightweighting classification	
	Realisation
Offer	
Products Parts and components, Semi-finished parts, Machines and plants, Software & databases, Systems and end products, Materials	✓
Services & consulting Consulting, Testing and trials, Engineering, Validation, Simulation, Technology transfer, Approval	✓
Field of technology	
Design & layout Lightweight manufacturing, Lightweight construction concepts	✓
Functional integration Media conductivity, Thermal activation	✓
Measuring and testing technology Component and part analysis, Materials analysis, Destructive analysis	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Optimisation, Processes, Materials	✓
Plant construction & automation Automation technology	✓
Recycling technologies Material separation, Recycling	✓

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Lightweighting classification	
	Realisation
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Glass-fiber reinforced plastics (GFRP), Carbon-fiber reinforced plastics (CFRP), Short fibre-reinforced concrete, Others (Carbon concrete)	✓
Fibres Carbon fibres	✓
Functional materials	
Metals Steel	✓
Plastics	
Structural ceramics	
(Technical) textiles Laid webs	✓