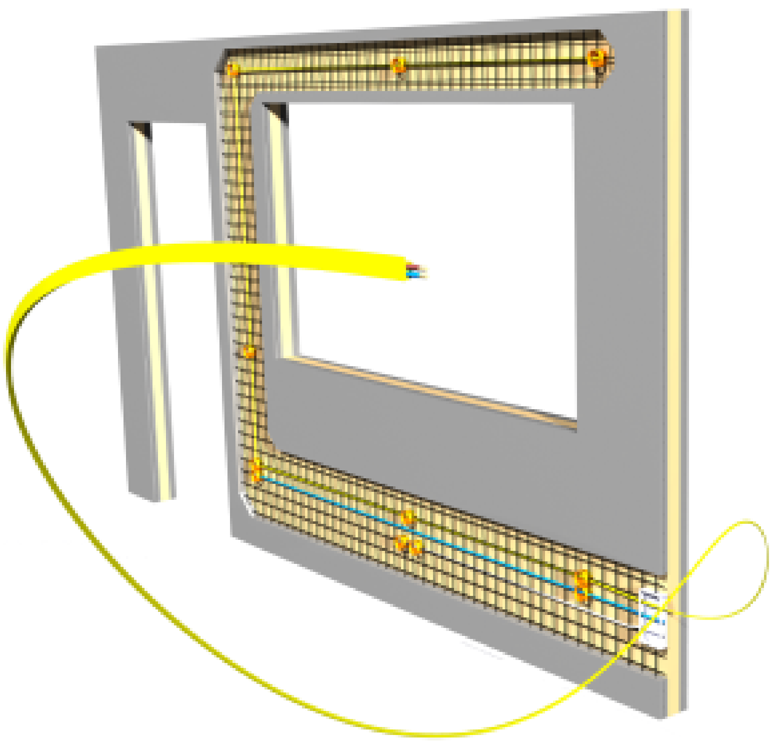
Sustainable construction: Carbon concrete walls with integrated electrical engineering

About this project



WallConnEct

Sustainable construction: Carbon concrete walls with integrated electrical engineering

Markets:

Material: Carbon fibres, Yarns, rovings, Others (Carbon concrete)

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

Technology Transfer Program Leichtbau

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Context

Electrical installations in buildings are often inefficient and consume large amounts of material. In office and commercial buildings in particular, complex cabling leads to high costs and unnecessary consumption of resources. At the same time, there is growing pressure to build more sustainably in order to reduce CO2 emissions and conserve raw materials.

One promising approach is carbon concrete - an innovative material that enables thinner and lighter wall elements. However, conventional electrical installations are unsuitable for this construction method: Laying cables in empty conduits or installation shafts is almost impossible to realise in slim components. This is where the WallConnEct research project comes in, developing a more efficient and sustainable solution for the automated production of carbon concrete walls with integrated electrical installations.

Purpose

The project team wants to develop an innovative wall construction in which the electrical infrastructure is already integrated into prefabricated carbon concrete elements ex works. In this way, the researchers want to reduce the amount of material used for cabling by up to 90 per cent and significantly shorten the construction time. The basis is the industrial communication standard AS-Interface (ASi-5), which enables data and energy transmission via a single cable.

The researchers are developing fully automated modular production processes for precast concrete elements in order to integrate an intelligent and resource-minimised electrical installation directly into the wall elements. In the future, industrial robots and other automated systems will insert all installation parts and system components into the walls fully automatically - a process that has so far been manual and inefficient.

Another focus is the digital pre-planning of the wall elements. Cable routes, built-in parts and reinforcements are to be precisely defined during the planning stage. The researchers are also driving forward the adaptation of existing installation and cabling standards.

The new technologies make it possible to save on materials, reduce energy consumption and make construction processes more efficient overall. The result is a construction method that conserves resources, is economical and also reduces CO2 emissions.

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Procedure

The project team is initially investigating how AS-Interface technology can be integrated directly into thin-walled wall elements. To this end, the researchers are developing new installation components that are optimised for the thin wall thickness and the special requirements of carbon concrete. In laboratory trials, they are testing how cables and sensors can be automatically inserted into the formwork without compromising the stability of the component.

At the same time, they are developing robot-assisted production systems that enable fully automated integration of the electrical installation in the production process. The researchers are optimising these systems step by step to ensure the precise placement and safe embedding of the electrical components. They then test the developed processes on exemplary components before producing prototypes and carrying out extensive practical tests.

The result is an industrially applicable solution that precast concrete plants can use to integrate electrical installations directly into carbon concrete components in a resource-saving and efficient manner.

Funding duration:

Funding sign:	03LB2037	**Funding amount:**	EUR 976 thousand

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2037A - WallConnEct in the federal funding catalogue

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Project coordination

Contact:

Mr Dipl.-Ing. Bernhard Wiedemann

+49 0621 33996-13

bwiedemann@bihl-wiedemann.de

Organisation:

English (EN){{ Projektpartner }}

SME Sondermaschinenbau Engelsdorf GmbH

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts, Machines and plants, Materials	✓
Services & consulting Testing and trials, Engineering, Standardisation, Prototyping	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing, Hybrid structures	✓
Functional integration Actuator technology, Sensor technology	✓
Measuring and testing technology Component and part analysis	✓
Modelling and simulation Optimisation, Processes, Materials, Reliability validation	✓
Plant construction & automation Automation technology, Robotics	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing 3D printing, Electron beam melting, Others (Carbon concrete construction)	✓
Coating (surface engineering)	
Fibre composite technology Casting (concrete)	✓
Forming	
Joining	
Material property alteration	
Primary forming Injection moulding	✓
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Others (Carbon concrete)	✓
Fibres Carbon fibres	✓
Functional materials	
Metals	
Plastics	
Structural ceramics	
(Technical) textiles Yarns, rovings	✓