Cross laminated timber with bamboo core: lightweight, resource-saving sandwich panels

About this project

CCLT

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Markets:

Material: Wood

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

Cross laminated timber (CLT) is a key building material in modern timber construction because it is load-bearing, dimensionally stable and easy to prefabricate. However, cross laminated timber has a high dead weight. The solid inner layers are made of slow-growing softwood, which increases both the resources required and the transport and assembly weights. However, lighter constructions that better utilise static reserves and are ecologically more advantageous are required for extensions, modular construction methods and redensification.

At the same time, the requirements for resource efficiency and climate protection are increasing in the construction industry. Although conventional CLT binds CO#, it requires a lot of solid wood and causes high transport-related emissions. The industry is therefore looking for alternatives that save material, reduce mass and at the same time maintain or improve building physics performance.

This is where the researchers in the CCLT project come in by replacing the solid core layers with a honeycomb-like structure made of bamboo rings. Bamboo grows extremely quickly, is very strong and has a significantly lower density. These properties open up the opportunity to make CLT lighter, more efficient and more environmentally friendly.

Purpose

The project team is developing a new cross-laminated timber sandwich material in which bamboo rings replace the solid wood layers in the core. The aim is to significantly reduce the weight of the panels while maintaining or improving the load-bearing capacity, rigidity and physical properties of the structure. The researchers are investigating how different core geometries affect the load-bearing behaviour and performance of wall, ceiling and roof structures.

Another focus is on the design of a recyclable panel. The project team is developing concepts with which the materials can be separated by type and reused. This includes variants with different joining strategies and potential utilisation cycles.

In the long term, the COMBOO Cross Laminated Timber (CCLT) material should fulfil the requirements for building authority approval. The researchers want to provide a lightweight yet high-performance alternative to conventional CLT that opens up new possibilities in timber engineering, modular construction and additions.

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Procedure

The team is initially developing various sandwich structures with bamboo cores of different geometries and heights. They characterise the mechanical, thermal and acoustic properties and create models to derive the load-bearing capacity. At the same time, they set up test stands for bonding, joining methods and material tests. The scientists are investigating different types of bamboo, developing support systems for processing and analysing alternative separation and structuring processes.

For industrial implementation, the project partners are developing prototype machines that precisely cut bamboo canes and prepare their surfaces for bonding. The team then develops joining and connection solutions for wall, ceiling and roof structures as well as approaches for unmixed dismantling strategies.

This is followed by ecological assessments, comparisons with existing CLT systems and calculations on CO# and GHG savings. The results are incorporated into the preparation of the building authority approval and into concepts for subsequent series production.

Funding duration:

Funding sign:	03LB2074	**Funding amount:**	EUR 1.5 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2074A - CCLT in the federal funding catalogue

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Project coordination

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knippershelbig

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CORDES HOLZBAU

Lightweighting classification

	Realisation
Offer	
Products Materials	✓
Services & consulting	

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Lightweighting classification

	Realisation
Field of technology	
Design & layout	
Functional integration	
Measuring and testing technology	
Modelling and simulation	
Plant construction & automation Plant construction, Automation technology	✓
Recycling technologies Recycling	✓
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining Adhesive bonding	✓
Material property alteration	
Primary forming	
Processing and separating Sawing	✓
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials Wood	✓
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals	
Plastics	
Structural ceramics	
(Technical) textiles	