Load-Bearing Behavior of Timber-Concrete-Composite Slabs

Around 38% of the CO2 emissions of a building shell are attributable to floor slabs, most of which are made of reinforced concrete. This opens up enormous potential for improving ceiling systems and replacing concrete with more environmentally friendly materials. Pure wooden ceilings are too expensive due to the high material price, which is why one solution is a composite cross-section that combines concrete and wood. The concrete is placed in the upper cross-sectional area of the bending beam, where compressive stresses predominate, while the advantages of the good tensile strength of the wood are utilized in the tensile area. In order to avoid the relative displacement of the two cross-sections, they are connected at regular intervals using fasteners.

Wood-concrete composite ceilings have been researched and further developed in Germany for many years. However, they have not yet been used on a large scale due to reservations about an innovative construction method, the slightly higher costs compared to a reinforced concrete ceiling, and the lack of a standardized basis. In spring 2022, a technical specification for the construction method was published for the first time, according to which ceilings can be designed. Nevertheless, the reservations for financial and innovative reasons still need to be dispelled.

For this reason, the Technical University Augsburg has been researching the optimization of the wood-concrete composite floor for several years by improving the concrete formulation to save cement and the bond between the two cross-sections. The extent to which non-metallic reinforcement (carbon or basalt grids) can be used has also been investigated. Initial tests were also carried out in the scope of a non-load-bearing interlayer to assess its potential.

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Figure 1: Timber-Concrete-Composite-Beam before a bending test at the THA

Scope of the internships, applied study semester, or thesis.

The main task during the internship will be the execution of tests on Timber-Concrete-Composite members (tensile, bending, and shear tests and more) and the interpretation of test data (i.e., assembling test data in diagrams).

Special requirements

No knowledge of TCC construction is required. The intern will work in our laboratory and our university office. Basic knowledge of Microsoft® Office applications (Excel, Word) is assumed.

Qualification level: Advanced Bachelor's degree or Master's degree

Programs lines: SRI, A2S, BA/MA

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