

Potential and Strategies for the Reuse of Wooden and Hybrid Ceiling Elements

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The circular economy in timber construction is becoming an increasingly important issue. In order to reuse as much mass as possible in the future, this work aims to demonstrate the potential of timber and hybrid ceilings as effective material stores and to develop strategies to improve implementation.

Introduction

Even sustainable resources such as wood are not available in infinite supply. The sustainable usage is therefore essential. It explains why a circular economy makes sense and that Design for Disassembly (DfD), after Design for Reliability (DfR) and Design for Adaptability (DfA), closes the circle of sustainable construction.

State of the Art

This chapter is intended to show that, in addition to the many challenges involved in the reuse of load-bearing components, there are already some solutions and potentials. It is divided into standardisation, salvageability and reuse. Standardisation explains why timber construction is complex and which measures are important for later reuse (e.g. the

standardisation of components within a building). Salvageability shows the problems of dismantling, but also possible connections and entire dismantlable systems. Reuse shows three examples of the reuse of buildings consisting of modules, elements and components.

Methods

In addition to an intensive literature review on a very current topic, for which new papers are published daily, three experts from the fields of research (Jürgen Graf, RPTU), design (Christoph Dünser, HK Architekten) and execution (Thomas Wehrle, ERNE AG) were interviewed to get an overview of the topic. In the case study, four multi-storey buildings with different ceiling systems and a high potential for dismantling were analysed.

Case Study

This empirical case study examines four currently planned/built buildings (Hortus, Brock Commons, Wandelbarer Holzhybrid and Zhwatt H1). The buildings all meet modern standards, but differ in construction and their focus on sustainability. The salvageability and reuse potential are critically examined in order to draw conclusions.

Strategies

In order to be able to reuse ceilings in the future, the client must develop a vision for the future of his building at an early stage. This allows the ceiling elements and all subsequent components to be designed accordingly. For regular buildings, elements can be reused as a whole (e.g. prefabricated timber hybrid ceilings in office buildings), while a monolithic ceiling system (e.g. CLT in residential construction) should be chosen for more individual floor plans. The connections should be concentrated at defined locations and joined with standardised fasteners (e.g. metric steel screws).



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Precasted hybrid ceiling elements after assembly (Source: Boltshauser Architekten)