



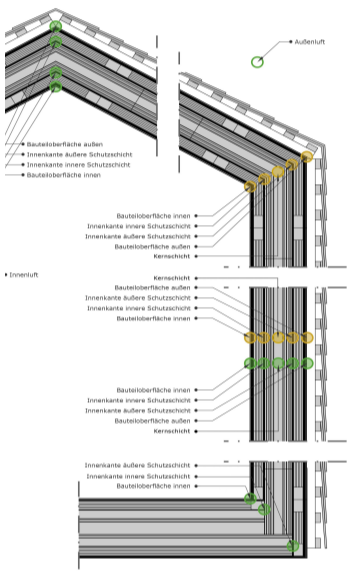
PAPER CONSTRUCTION AND DESIGN RESEARCH GROUP

The Paper Construction and Design Working Group of ISM+D is engaged in fundamental research into innovative building constructions made out of paper-based materials. The group consists of engineers, architects, designers and doctoral students. The primary objective of the research is the development of building materials made of paper with the intention of promoting resource-saving construction possibilities.

For this purpose, experimental and numerical analysis of the mechanical and load-bearing behavior and building physical performance of paper-based components are performed. Furthermore, aspects of circularity and life cycle analysis are incorporated into the assessments. The Group's portfolio is completed by investigations into the durability of paper-based building structures under real weather conditions.



Floor component opening (left), position of the measurement sensors (right). TUDa 2023.

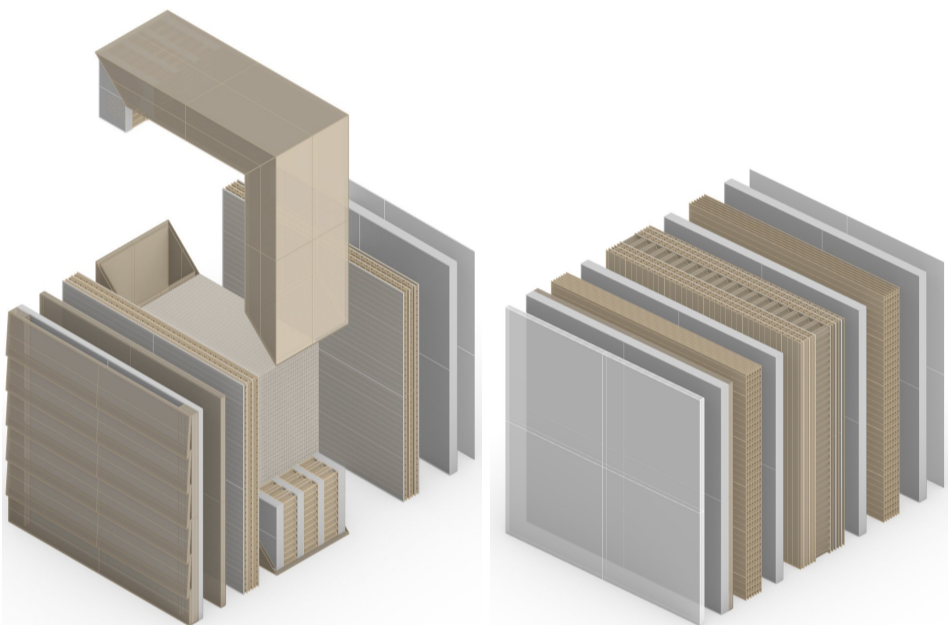


MONITORING OF PAPER-BASED BUILDING ENVELOPE

This project aimed to provide fundamental insights into the hygrothermal behavior of a building envelope made from paper-based materials, particularly corrugated board and cardboard, under real climatic conditions. To achieve this goal, a prototype paper-based building envelope was constructed, and its physical performance was measured through extensive temperature and humidity recordings over a winter period. These field measurements were supplemented by numerical simulations. The comprehensive evaluation of both the empirical data and the simulation results highlights the potential of paper-based materials as a sustainable building option in the construction industry. Notably, their hygrothermal performance suggests a promising role for paper-based materials in reducing the environmental impact of buildings. Unfortunately, the prototype was severely damaged by a fire. A post-use concept was formulated. The experiments conducted during the reuse phase were focused on addressing questions pertaining to the static and constructive nature of the wall and roof structures, as well as their fire protection, thermal conductivity, recyclability, and moisture absorption capabilities.

FUNDING PROGRAM
Future Building Innovation Program.
BBSR - BMWBS)

PROJECT PERIOD
01.04.2021 – 30.03.2023



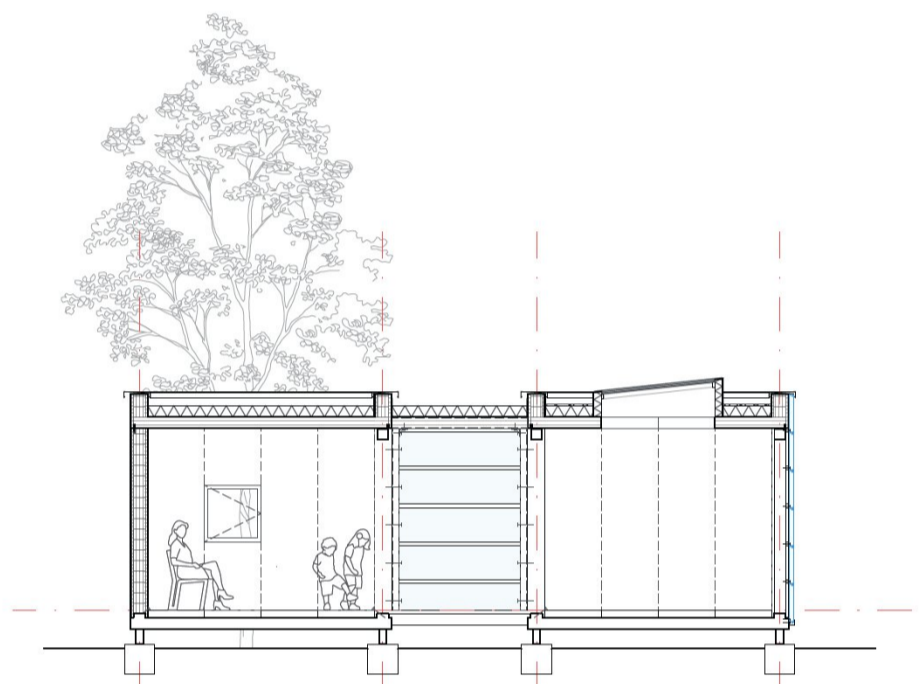
Project isometric view of the lightweight and massive subvariants. TUDa 2023.

PAPER-BASED CIRCULAR EXTERIOR WALL SYSTEM

The objective of the project is the conceptualization, development, and investigation of an external wall system constructed from paper-based materials, suitable for a use in one- to three-story buildings. The project will be realized through the construction of a structure comprising functional layers made of paper materials, in addition to the connection technology of the layers and of individual exterior wall modules. Furthermore, a system catalog for constructive joining will be developed. The project comprises a conceptualization and planning phase, the fabrication of samples on a small and real scale, and the implementation of building physical, static-constructive and mechanical tests. A wall construction design will be carried out with the assistance of prototypes, and an active and passive fire protection concept will be tested. Ultimately, the project will result in the creation of scalable production concepts and a functional wall system.

FUNDING PROGRAM
Zentrales Innovationsprogramm
Mittelstand (ZIM)

PROJECT PERIOD
01.07.2023 – 30.06.2025



General section of the Tiny House. Seelinger 2024.

PAPER-BASED TINY HOUSE

This project aims at the design, development and construction of a tiny houses made of paper-based materials as a cost-effective and sustainable alternative to conventional tiny houses. Given that the typical area of a tiny house is approximately 20-40 m², this project will concentrate on the development of a do-it-yourself prefabricated modular paper-based system. The house will be constructed using a layered structure comprising individual paper-based materials and innovative manufacturing and connection solutions. The construction of the tiny house may be undertaken in either a skeleton or solid form, with the connection technology between walls, floor and roof being the subject of ongoing research and development. The project encompasses a conceptual and planning phase, the fabrication of samples and prototypes on a full-scale basis, as well as the execution of building physics, structural and mechanical tests. Upon completion of the project, the results will be scaled up to the production of a first demonstration object.

FUNDING PROGRAM
Zentrales Innovationsprogramm
Mittelstand (ZIM)

PROJECT PERIOD
01.03.2024 – 30.02.2026



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