

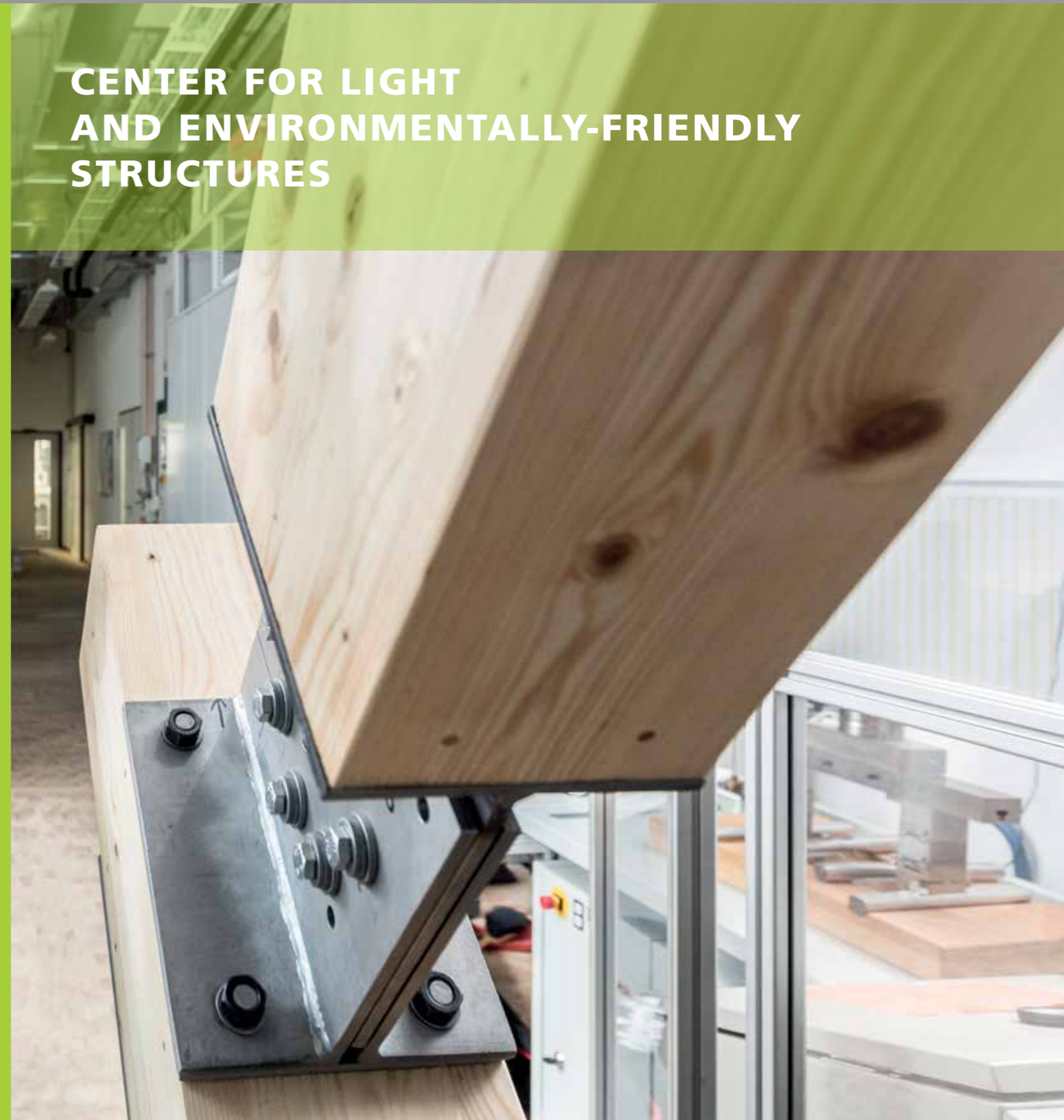
## CENTER FOR LIGHT AND ENVIRONMENTALLY-FRIENDLY STRUCTURES



*We have placed particular emphasis on the use of environmentally-friendly materials in the production of this brochure.*

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## ENVIRONMENTALLY SOUND FOR PRACTICAL APPLICATION WITH SUSTAINABLE SYSTEMS BUILDING

The Center for Light and Environmentally-Friendly Structures at the Fraunhofer WKI develops solutions for the construction industry. We support industrial partners from the wood-based materials and prefabricated housing industry as well as companies from the manual trade sector in the development of new systems. One of our great competences is the linking of simulation procedures with physical and mechanical-constructive methods of investigation. The spectrum ranges thereby from the development of materials for application in the construction industry through the complex questions of individual details up to complete wall systems. With the majority of the developments, we thereby improve the technical feasibility and usability and optimize the economic efficiency.

### Research focusses

#### Load-bearing behavior and building physics

At the Fraunhofer WKI, we investigate the static-constructive properties of wood-based structures and materials through trials and simulations. Furthermore, we specialize in the consideration of the complex and holistic relationships. This includes, for example, the exploration of static-constructive aspects with regard to the load-bearing capacity and usability with building physics effects, with the aid of numerical simulation – including in the case of fire.

#### Fire protection

We develop new solutions for improving the fire protection of wood and wood-based materials. Intumescent fire-protection coatings, smolder-resistant wood-fiber insulation materials and flame-retardant wood-plastic composite materials thereby form the main focus of our research work, which we carry out in collaboration with the industry.

#### Simulation

Numerical simulation has become an indispensable tool in the field of science and enables effective and target-oriented research. With numerical simulation, invisible effects can be visualized and test results can be explained. We create prognoses and validate hypotheses. Furthermore, we have our own measurement technology for the verification of the simulations as well as for the examination of construction parts in real size.

#### Hybrid material systems

The construction of lightweight and environmentally sound structures requires the development of hybrid material systems for multi-story buildings. Through the combination of conventional and renewable building materials it is possible to, for example, reduce the bulk density, improve the thermal insulation or convert a brittle material into a ductile, viscoplastic material.



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### Range of services

#### Building physics

- Natural and artificial weathering of constructions on various scales
- Numerical weathering simulations
- Climate analyses
- Hygro-thermal component behavior
- Heat transmission detection on wooden components
- Deformation behavior of wooden components in differential climates
- Building thermography
- Radiometric material moisture determination
- Hygro-thermal material characteristics
- Evaluation and optimization of constructive wood preservation

#### Fire protection

- Development of reactive systems for the improvement of building material behavior and fire resistance
- Development of detailed solutions
- Development of new materials and materials with improved fire protection properties

#### Mechanics

- Load-bearing capacity of wooden components and connectors
- Material characteristic values
- Shearing load
- Dynamic load simulation, impact loading

#### Testing, monitoring and certification tasks

Further tasks within the department include examinations concerning the issuing of general building authority approvals for timber constructions as well as the monitoring of manufacturers of wooden houses. In this, the WKI is acknowledged by the supreme building inspectorate as a testing, monitoring and certification body and is furthermore also active for private-law quality associations from the prefabricated building industry and the carpentry sector. The task spectrum is rounded off by the preparation of experts' reports on constructions. These include the evaluation of newly-developed components or building materials made from wood as well as new fields of application and the assessment of structural damage.

- 1 *New momentum connector in the test field of the Fraunhofer WKI.*
- 2 *Different insulation materials from renewable raw materials.*
- 3 *Specimen with a core of concrete-wood mixture and a sheath made of flax fiber-reinforced plastic.*

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