3 Standorte – eine Empa – «the place where innovation starts»

Dr. Tanja Zimmermann, Functional Materials Departement, Direktion

Empa
Materials Science and Technology

nachhaltige & resiliente
Materialien & Technologien

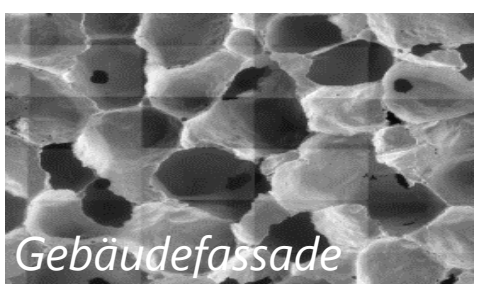
Unsere Stärken Richtung NettoNull und Wohlbefinden

umfassendes Basiswissen für eine ganzheitliche Betrachtung

Empa
Materials Science and Technology

Materialien

Bauwesen

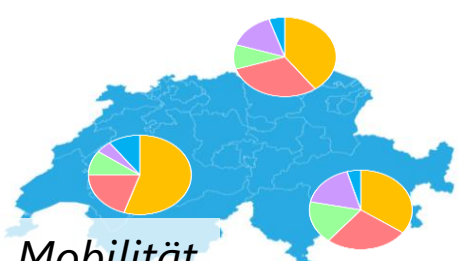

Gebäudefassade


Strassen

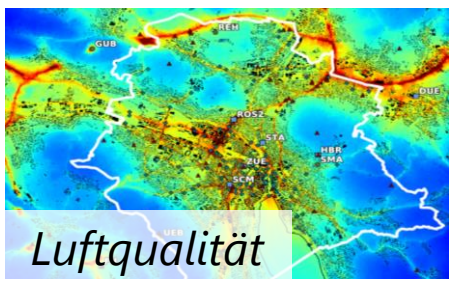
Systeme

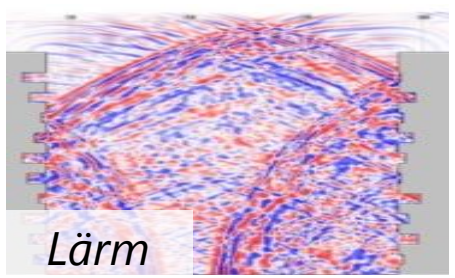

Energie

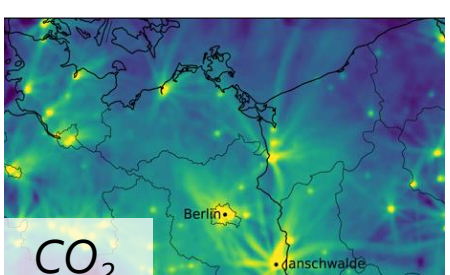

Städtische Wärme


Mobilität

Wohlbefinden

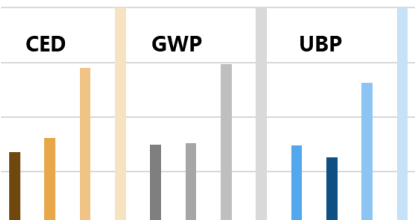

Luftqualität


Lärm



CO_2

Bewertung



Reuse Recycling
Live Cycle

Wood Materials Science ETH und Empa (Prof. Ingo Burgert)

Hauptziele

Holz muss zentraler Bestandteil einer zukünftigen Bioökonomie sein

- Nachwachsende Ressource
- CO_2-Speicherung

➡ **Performance durch Strukturerhalt**

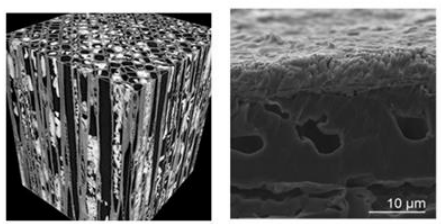
➡ **Substitution von energieintensiven und klimaschädlichen Materialien**

Hauptaktivitäten

Enhanced Wood

New wood-based materials

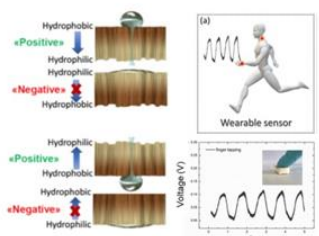
- Surfaces
- Gluing
- Flame retardancy
- Wood-hybrids
- Durability



Functional Wood

Embedded functionality

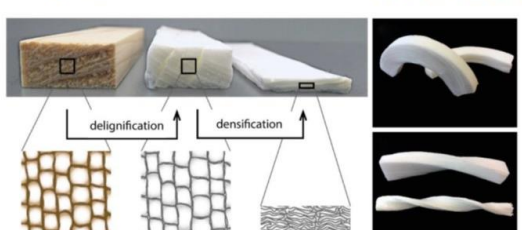
- Sensing
- Optics
- Electronics
- Transport
- Separation
- Catalysis



Cellulose Composites

High-strength biomaterials

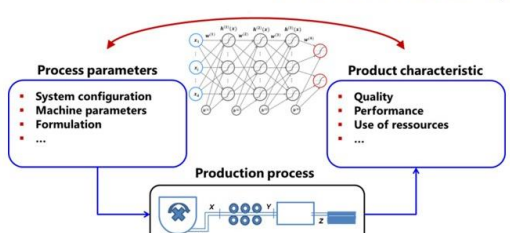
- Mechanical performance
- Shaping of elements
- Densification
- Biobased matrix



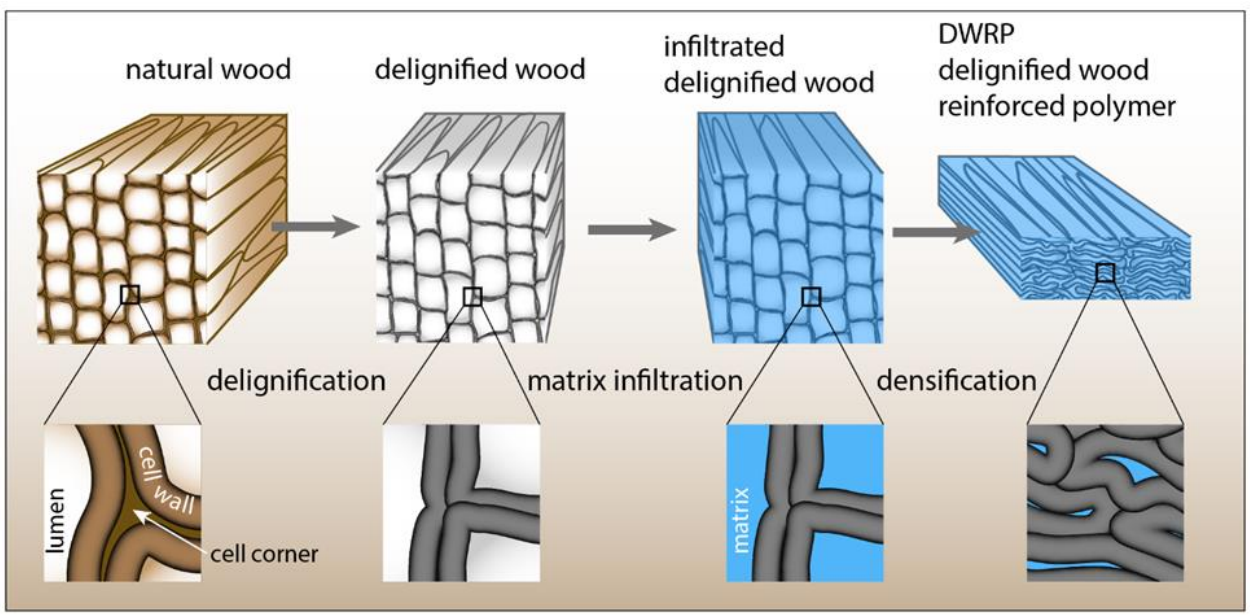
Digital Wood

Machine learning techniques

- Wood grading
- Process optimization
- Quality determination
- Resource efficiency

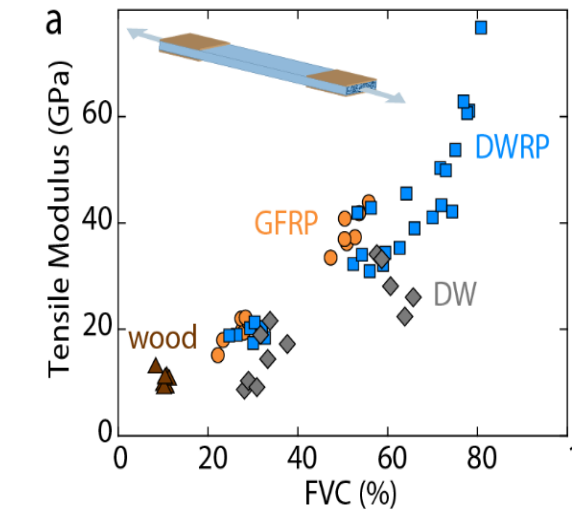


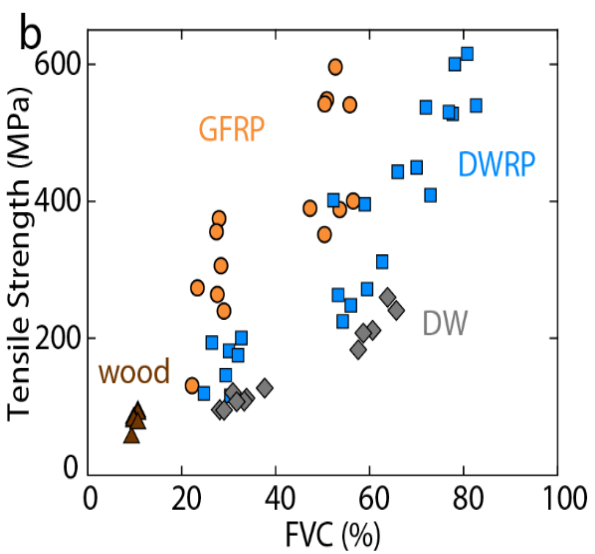
Zellulose-Materialien



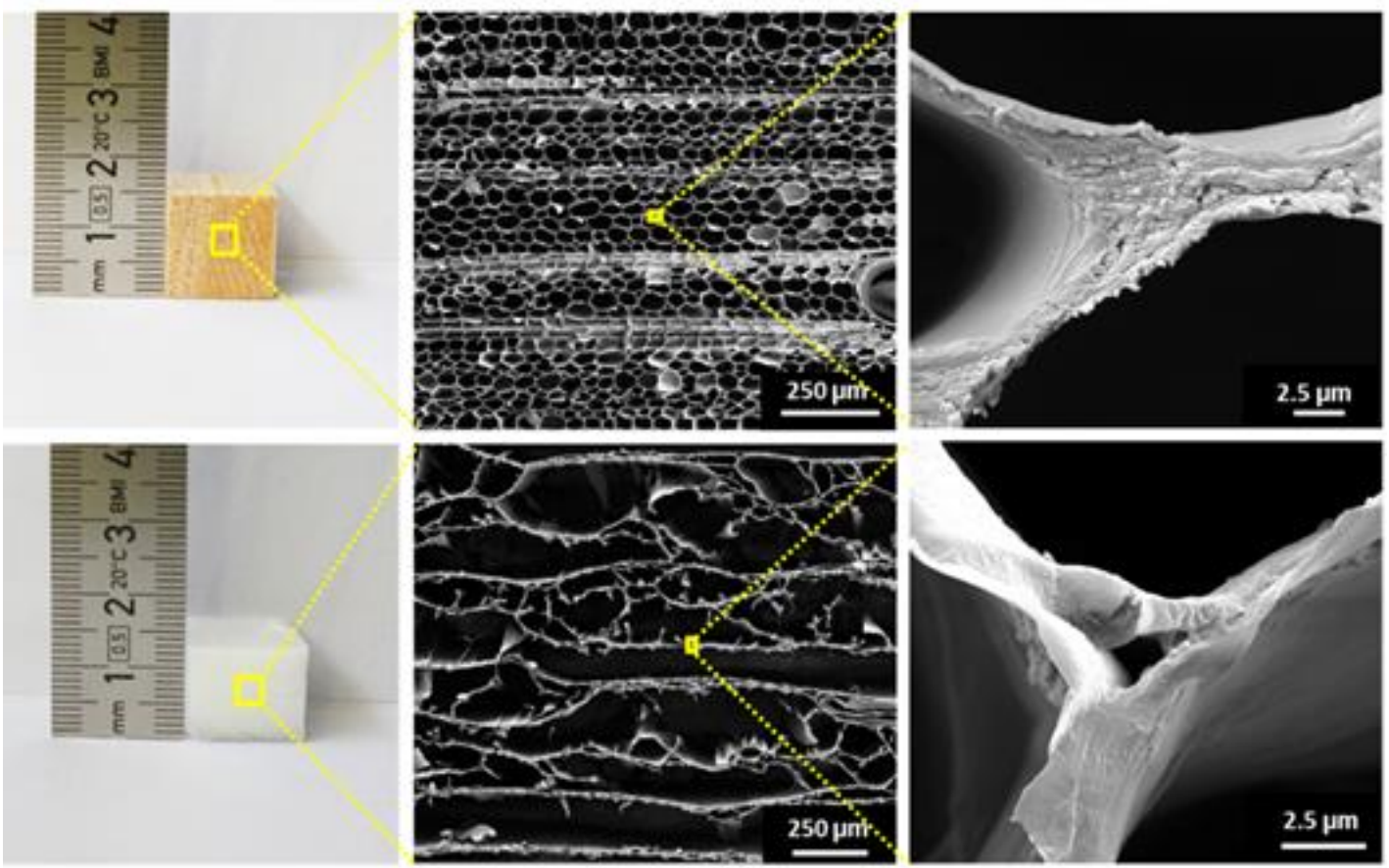
Frey et al. (2018, 2019) ACS Applied Materials and Interfaces

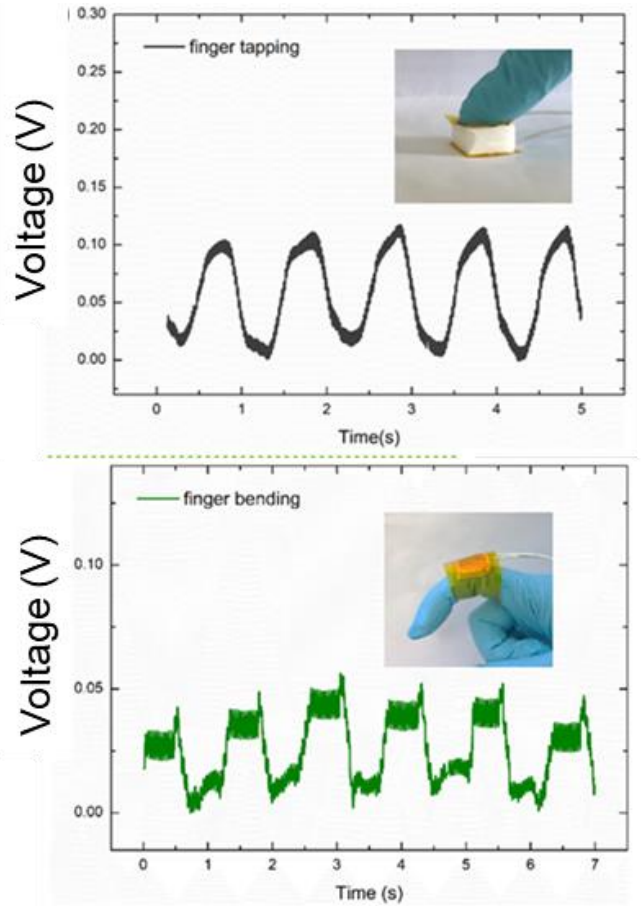
Verdichtete Zellulose-Komposite (Epoxidharz-Imprägnierung)





Verstärkung des piezoelektrischen Effekts durch Delignifizierung





Sun et al. (2020) ACS Nano, Sun et al. (2021) Science Advances

Machine Learning@WoodTec (Dr. Mark Schubert)

Forschung an der Empa, Abt. Ingenieur-Strukturen

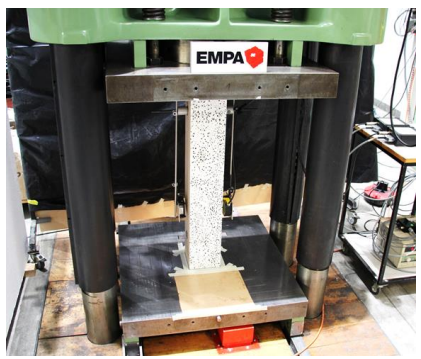
Dr. René Steiger, Dr. Pedro Palma, Jonas Wydler

Empa
Materials Science and Technology

Zuverlässigkeit von Tragwerken, Verbindungen und Bauteilen

Tragwiderstand

- Festigkeit
- Stabilität



T. Ehrhart

T. Ehrhart

- Versagenswahrscheinlichkeit
- Festigkeitssortierung
- Robustheit
- Stabilität (Stützen und Tragwerke)
- NDE, NDT
- Bemessungsnormen (SIA, EC 5)
- Produktenormen, Prüfnormen

Gebrauchstauglichkeit

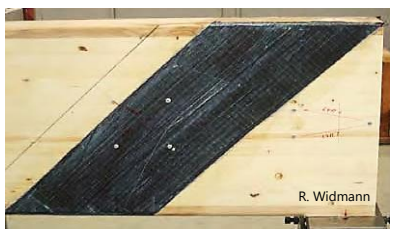
- Funktionstüchtigkeit
- Komfort
- Aussehen

R. Steiger

- Verformungen, Steifigkeit
- Schwingungen
- Steifigkeit von Verbindungen
- Langzeitverformungen (Kriechen)

Dauerhaftigkeit

- Langfristige Zuverlässigkeit des Tragwiderstands und der Gebrauchstauglichkeit



R. Widmann

R. Widmann

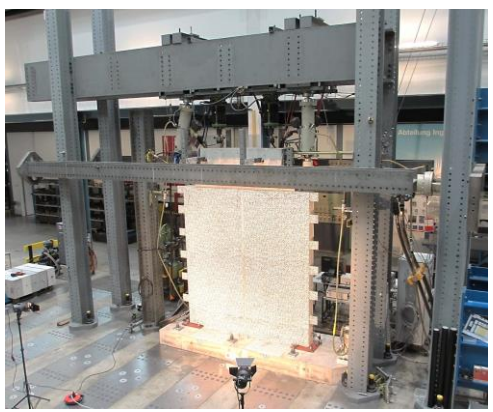
- Nutzung, Nutzungsänderung
- Nutzungsdauer
- Erhaltung von Tragwerken
- Verstärkung von Bauteilen
- Monitoring

www.empa.ch/web/empa/structural-engineering
rene.steiger@empa.ch ; pedro.palma@empa.ch

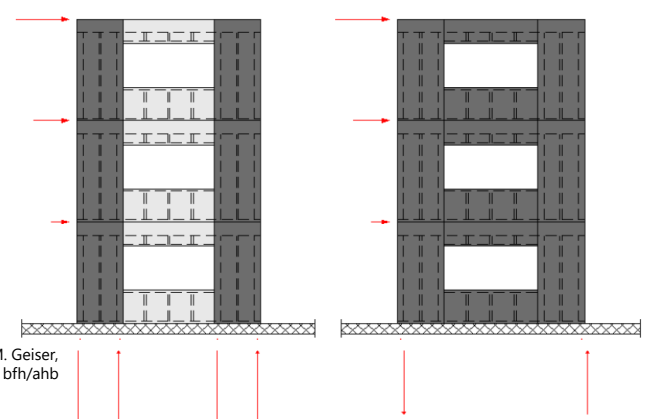
Beispiele von aktuellen Forschungsprojekten

Empa
Materials Science and Technology

Holzrahmenbauwände mit grossen Öffnungen



P. Palma

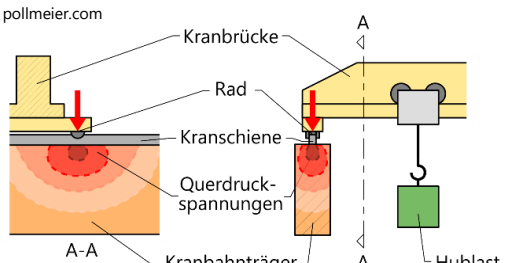


M. Geiser, bfh/ahb

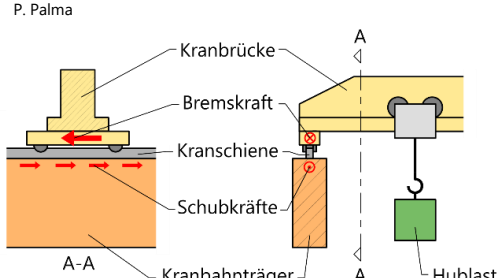
AP Holz-Projekt BFH/AHB, Empa, ETH

Kranbahnträger aus Holz

pollmeier.com



P. Palma



P. Palma

WHFF-CH-Projekt Empa, neue Holzbau AG, Gersag AG

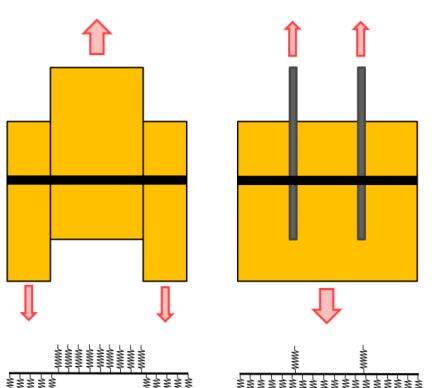
Stabdübel-Verbindungen

ETH

P. Palma

J. Wydler

J. Wydler

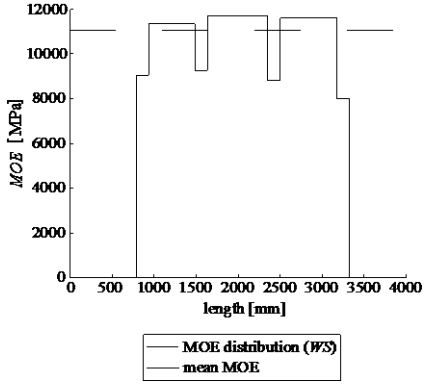


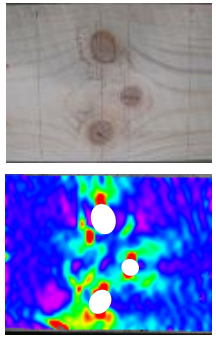
J. Wydler

SNF Projekt Empa, ETH

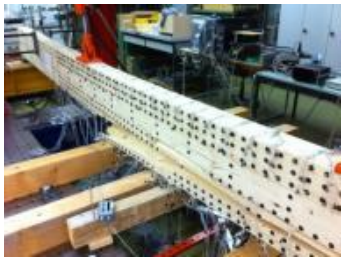
Konstruktionsholz/Verbindungen

ETH – Chair of Timber Structures – Prof. Andrea Frangi



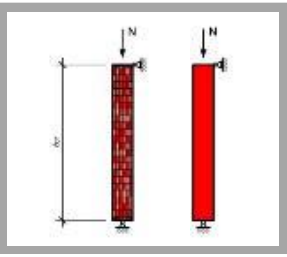


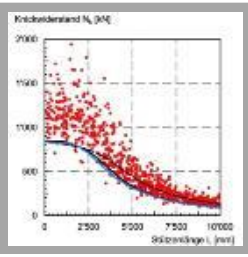
Zuverlässigkeit Leimholz



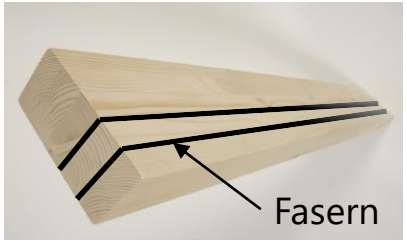
Dübel-verbindungen

Stabilität von BSH-Stützen

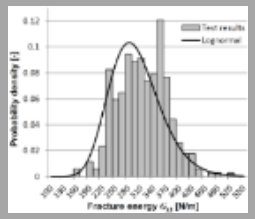


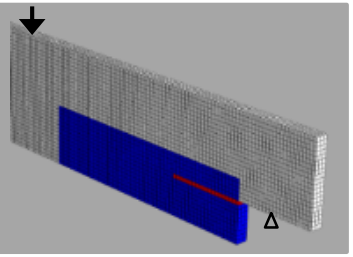


Hochleistungs-BSH



Gekerbte BSH-Balken

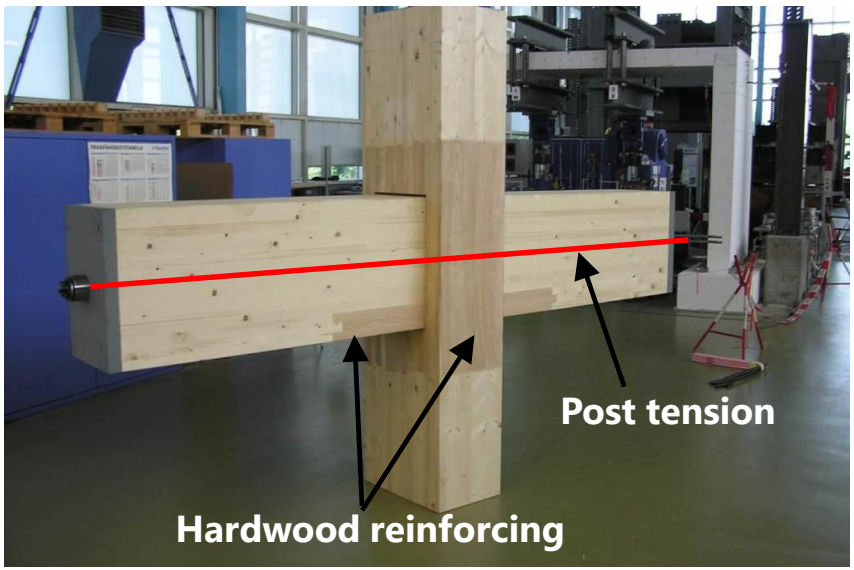




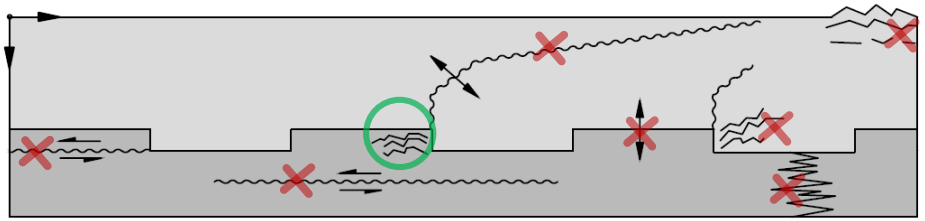
Buche

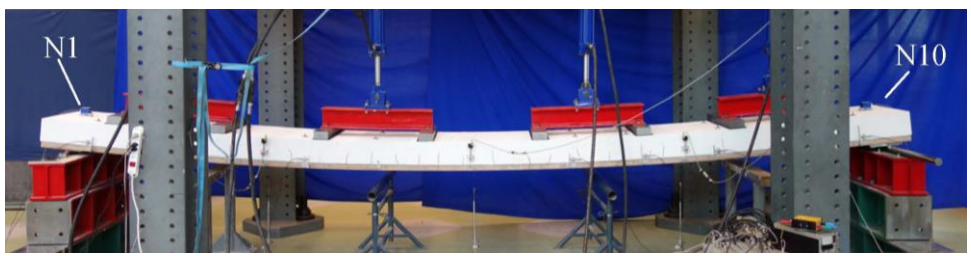
Innovative Holzstrukturen

Vorgespannter Holzrahmen

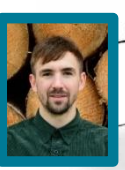


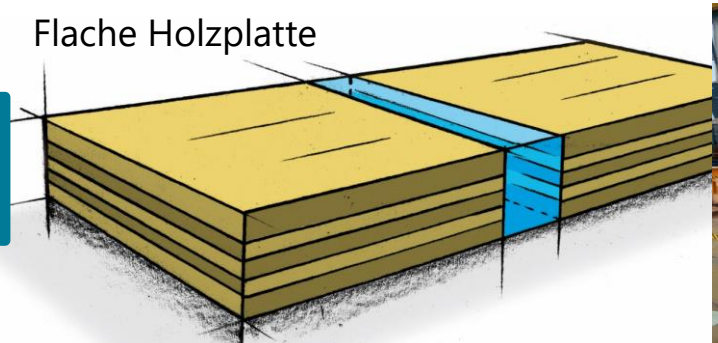
Holz-Beton-Verbundplatte mit gekerbtem Anschluss

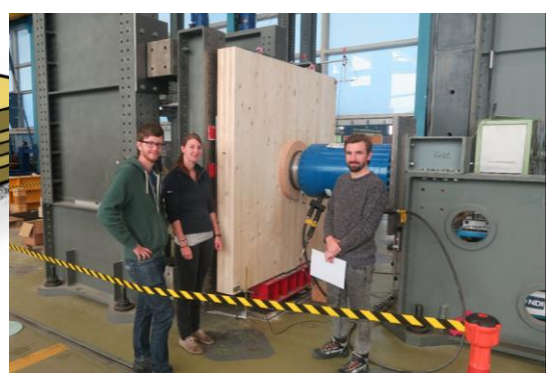




Flache Holzplatte







Holz-Beton-Verbundplatte mit Mikro-Kerben

Innovative Holzstrukturen

Zweifach überspannte Holz-Beton-Verbundplatte

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Innosuisse - Swiss Innovation Agency

Push-out-Test

Plattentest

Biegeversuch

Project Pi (80m), Zug, Switzerland, 2023