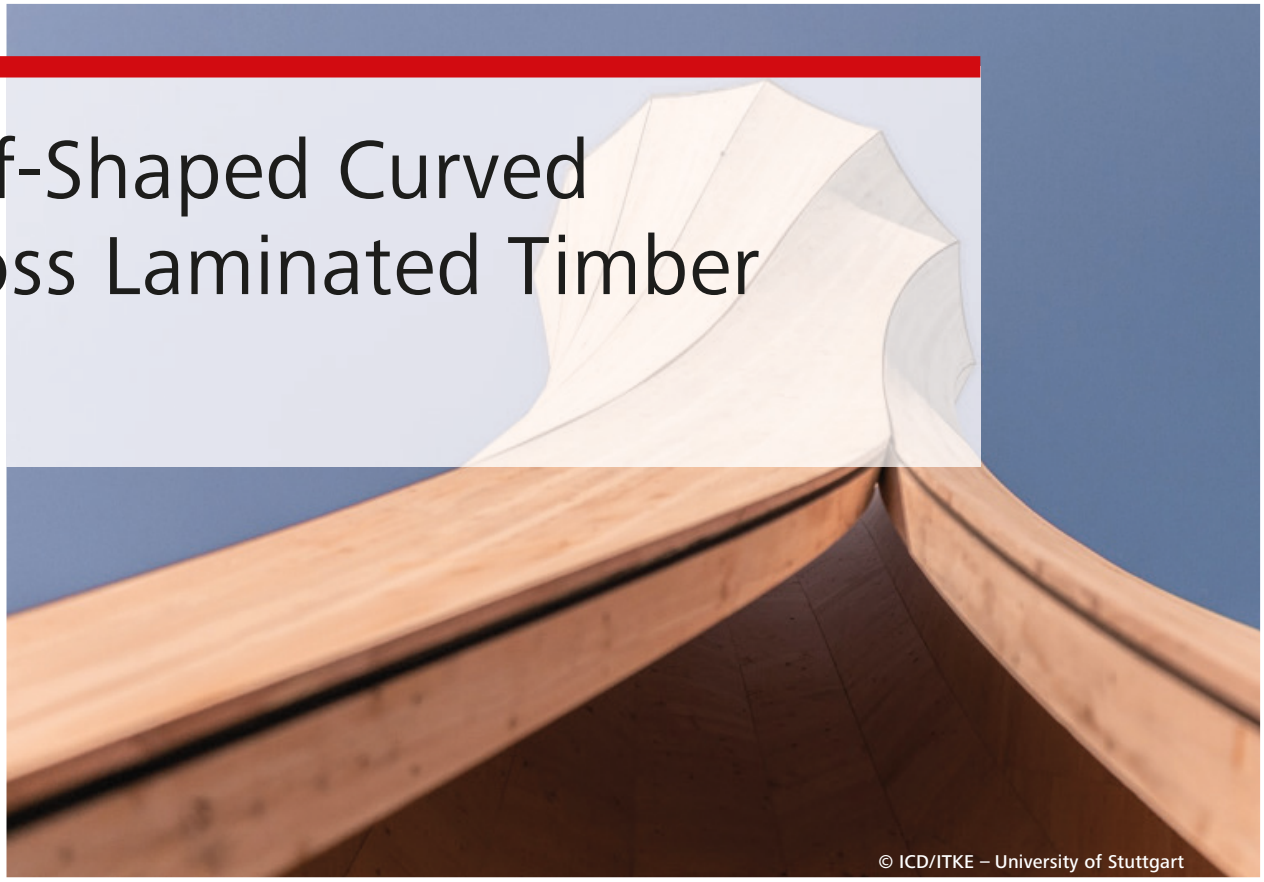
Technology Offer

TT-Ref. 2016-290

Empa
Materials Science and Technology

Self-Shaped Curved Cross Laminated Timber



Invention

Our new self-shaping manufacturing process facilitates the production of highly curved cross-laminated timber (CLT) beyond current industry limitations. The processe utilizes the hygroscopic forces innate to wood as a controlled shaping mechanism. Wood bilayer plates are first manufactured at high moisture content in flat state. The designed curvature manifests itself during kiln-drying by the anisotropic shrinkage of the wood. The curved parts are then glued together to obtain formstable curved CLT. Our approach considerably increases the design space for curved wood parts for a range of applications and scales.

Background

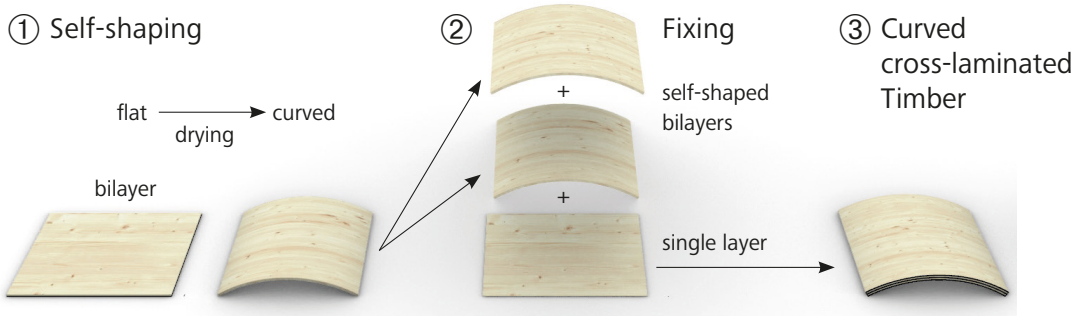
Curved wood beams and panels are integral and efficient load bearing elements in architecture and contruction. The market for CLT is growing rapidly worldwide, yet structurally efficient curved parts are difficult to produce and used sparingly. At present, curved beams and curved CLT are manufactured by physically bending wood boards onto a pre shaped formwork and gluing them together in the deformed state. This conventional approach is limited in level of curvature and in element geometry due to constrained elastic deformation and the need of heavy machines for pressing. The inclreaded labor, material, and complex formwork make the process expensive and in efficient.

Advantages

– Facilitating higher curvature and more complex shapes with thicker layers
– High-precision manufacturing due to reducing of the spring-back effect found in form bending
– Adaptable and scalable to a wide range of size, geometry, curvature and layer thicknesses
– Avoiding the use of heavy machines for forming
– Minimizing formwork and molds as the bilayers are pre shaped.
– Mimimizing material waste by the use of thicker layers and reduced formwork.
– Highly curved and complex shaped wood parts become economoically and ecologically feasible.

Applications

Curved CLT can be employed for structurally efficient large-scale load bearing components such as curved walls for multi-storey wood buildings, roofs, and tubes for silos and towers. Curved CLT parts can also be used for interior architecture or in building shells and facades.



Ownership

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Patent pending

References

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Keywords

wood, Cross-laminated timber (CLT), timber construction, bilayer, smart material, self-shaping, hygroscopic, curvature

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