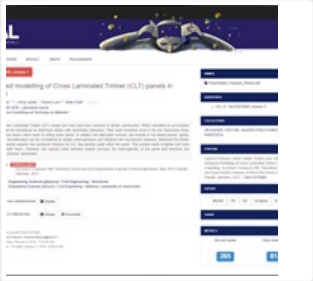


Advanced Modelling of Cross Laminated Timber (CLT) Panels in Bending

https://research.thinkwood.com/en/permalink/catalogue1796

Author:	Franzoni, Lorenzo
	Lebée, Arthur
	Lyon, Florent
	Forêt, Gilles

Publisher:	HAL archives-ouvertes.fr
Year of Publication:	2015
Country of Publication:	Germany
Format:	Presentation
Material:	CLT (Cross-Laminated Timber)
Application:	Wood Building Systems
Topic:	Mechanical Properties
Keywords:	Bending
	Model
	Panels
	Shear
	Stiffness
	Failure Behavior
	Shear Force
	Reference Test
Language:	English
Conference:	Euromech Colloquim 556 Theoretical Numerical and Experimental Analyses of Wood Mechanics
Research Status:	Complete
Notes:	May 2015, Dresde, Germany
Online Access:	Free

Resource Link

https://hal.archives-ouvertes.fr/hal-01270289

Bending Behavior of Regularly Spaced CLT Panels

https://research.thinkwood.com/en/permalink/catalogue1616

Author:	Franzoni, Lorenzo
	Lebée, Arthur
	Lyon, Florent
	Forêt, Gilles
Year of Publication:	2016
Country of Publication:	Austria
Format:	Conference Paper
Material:	CLT (Cross-Laminated Timber)
Topic:	Mechanical Properties
Keywords:	FEM
	Bending Stiffness
	Shear Stiffness
Language:	English
Conference:	World Conference on Timber Engineering
Research Status:	Complete
Notes:	August 22-25, 2016, Vienna, Austria p. 2368-2376

Summary:

A regular alternation of lamellas and voids filled by insulating material within each layer of CLT can lead to cellular panels with improved acoustical, thermal and fire performance. In order to support the development of these innovative and lighter engineered wood products, their mechanical behavior is investigated in this paper by means of experiments and modeling. First, an experimental campaign on spaced CLT panels and related results are presented. Then, both simplified and refined modelings are applied. The chosen accurate modeling is a periodic homogenization scheme handled by a plate theory [1] and based on unit-cell strain energy computation with FEM. It appears that the simplified approach can predict the bending stiffness (EI) of CLT panels with large voids but not their transverse shear stiffness (GA) which can be precisely predicted with the more refined modeling. Finally, the influence of several panel's parameters on the mechanical response is pointed out as well.

Online Access: Free

Resource Link

http://hdl.handle.net/20.500.12708/172

Closed-form Solutions for Predicting the Thick Elastic Plate Behavior of CLT and Timber Panels with Gaps

https://research.thinkwood.com/en/permalink/catalogue1295

Author:	Franzoni, Lorenzo
	Lebée, Arthur
	Lyon, Florent
	Forêt, Gilles
Publisher:	ScienceDirect
Year of Publication:	2018
Country of Publication:	Netherlands
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Topic:	Mechanical Properties
Keywords:	Elastic Behavior
	Gaps
Language:	English
Research Status:	Complete
Series:	Engineering Structures

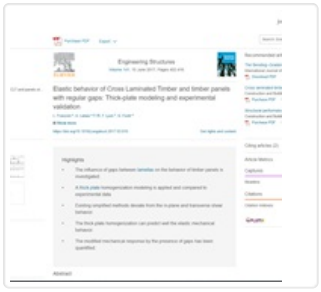
Summary:

In a former paper by the authors [1], the elastic behavior of Cross Laminated Timber (CLT) and timber panels having periodic gaps between lateral lamellae has been analyzed. A thick plate homogenization scheme based on Finite Elements computations has been applied. The predicted behavior was in agreement with experimental results. In this paper, simplified closed-form solutions are derived in order to avoid FE modeling. Both cases of narrow gaps of CLT panels and wide gaps of innovative lightweight panels are investigated. CLT and timber panels with gaps are modeled as a space frame of beams connected with wooden blocks. The contribution of both beams and blocks to the panel's mechanical response is taken into account, leading to closed-form expressions for predicting the panel's stiffnesses and maximum longitudinal and rolling shear stresses. The derived closed-form solutions are in agreement with the reference FE results and they can be used for practical design purposes.

Online Access:	Free

Resource Link

https://hal-enpc.archives-ouvertes.fr/hal-01978742/document



Elastic Behavior of Cross Laminated Timber and Timber Panels with Regular Gaps: Thick-Plate Modeling and Experimental Validation

https://research.thinkwood.com/en/permalink/catalogue1341

Author:	Franzoni, Lorenzo
	Lebée, Arthur
	Lyon, Florent
	Forêt, Gilles
Publisher:	ScienceDirect
Year of Publication:	2017
Country of Publication:	Netherlands
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Topic:	Mechanical Properties
Keywords:	Homogenization
	Gaps
	Elastic Behavior
	Bending Stiffness
	Thick Plates
Language:	English
Research Status:	Complete
Series:	Engineering Structures

Summary:

In the present paper, the influence of periodic gaps between lamellas of Cross Laminated Timber (CLT) on the panel's elastic behavior is analyzed by means of a periodic homogenization scheme for thick plates having periodic geometry. Both small gaps, due to the fabrication process of not-gluing lateral lamellas, and wider gaps are investigated. The results obtained with the periodic homogenization scheme are compared to existing closed-form solutions and available experimental data. It appears that the plate bending stiffness can be well predicted with both homogenization and simplified methods, while only the homogenization approach is in agreement with the experimental in-plane and out-of-plane shear behavior. The influence of several properties of CLT lay-up on the mechanical response is pointed out as well.

Online Access: Free

Resource Link

https://hal-enpc.archives-ouvertes.fr/hal-01691125/file/PaperSpacedCLT_PDF.pdf

Influence of Orientation and Number of Layers on the Elastic Response and Failure Modes on CLT Floors: Modeling and Parameter Studies

https://research.thinkwood.com/en/permalink/catalogue1418

Author:	Franzoni, Lorenzo
	Lebée, Arthur
	Lyon, Florent
	Forêt, Gilles
Publisher:	Springer Berlin Heidelberg
Year of Publication:	2016
Country of Publication:	Germany
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Topic:	Mechanical Properties
Keywords:	Failure Modes
	Bending
	Elastic Behavior
Language:	English
Research Status:	Complete
Series:	European Journal of Wood and Wood Products
ISSN:	1436-736X

Summary:

In the present paper, the bending behavior of Cross Laminated Timber panels is investigated by means of the linear elastic exact solution from Pagano (1970; 1969). The resulting stresses are the input for a wood failure criterion, which can point out the first-crack load and the respective dominant failure mode. Heterogeneous layers are modeled as equivalent and homogeneous layers. This simplified and deterministic modeling gives results in good agreement with a reference experimental test. A comparison is made with respect to the panel's global stiffness and failure stages within the apparent elastic stage. Finally, parameter studies are carried out, in order to quantify CLT limitations and advantages. The effect of varying properties like the panel's slenderness, orientation of transverse layers and number of layers for a fixed total thickness are investigated.

Online Access:	Free

Resource Link

https://hal.archives-ouvertes.fr/hal-01306593/document