Approximation of Stresses in Multi-Span CLT Beams Based on Refined Zigzag Theory

https://research.thinkwood.com/en/permalink/catalogue2204

Author:	Sieder, Raimund
	Schickhofer, Gerhard
Year of Publication:	2019
Country of Publication:	Sweden
Format:	Conference Paper
Material:	CLT (Cross-Laminated Timber)
Application:	Beams
Topic:	Mechanical Properties
Keywords:	Refined Zigzag Theory
	Stress
Language:	English
Conference:	CompWood
Research Status:	Complete
ISBN:	978-91-88898-64-7
Online Access:	Free

Resource Link

https://open.lnu.se/index.php/compwood/article/download/1873/1736

Refined Zigzag Theory: An Appropriate Tool for the Analysis of CLT-Plates and Other Shear-Elastic Timber Structures

https://research.thinkwood.com/en/permalink/catalogue2725

Author:	Wimmer, Heinz
	Hochhauser, Werner
	Nachbagauer, Karin
Publisher:	Springer
Year of Publication:	2020
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Topic:	Mechanical Properties

Keywords:	Stress
	Load
	Refined Zigzag Theory
	Bending
	Gamma Method
	Shear Analogy
	First Order Shear Deformation Theory
	Plates
Language:	English
Research Status:	Complete
Series:	European Journal of Wood and Wood Products

Summary:

Cross laminated timber (CLT), as a structural plate-like timber product, has been established as a load bearing product for walls, floor and roof elements. In a bending situation due to the transverse shear flexibility of the crossing layers, the warping of the cross section follows a zigzag pattern which should be considered in the calculation model. The Refined Zigzag Theory (RZT) can fulfill this requirement in a very simple and efficient way. The RZT, founded in 2007 by A. Tessler (NASA Langley Research Center), M. Di Sciuva and M. Gherlone (Politecnico Torino) is a very robust and accurate analysis tool, which can handle the typical zigag warping of the cross section by introducing only one additional kinematic degree of freedom in case of plane beams and two more in case of biaxial bending of plates. Thus, the RZT-kinematics is able to reflect the specific and local stress behaviour near concentrated loads in combination with a warping constraint, while most other theories do not. A comparison is made with different methods of calculation, as the modified Gamma-method, the Shear Analogy method (SA) and the First Order Shear Deformation Theory (FSDT). For a test example of a two-span continuous beam, an error estimation concerning the maximum bending stress is presented depending on the slenderness L/h and the width of contact area at the intermediate support. A stability investigation shows that FSDT provides sufficiently accurate results if the ratio of bending and shear stiffness is in a range as stated in the test example. It is shown that by a simple modification in the determination of the zigzag function, the scope can be extended to beams with arbitrary non-rectangular cross section. This generalization step considerably improves the possibilities for the application of RZT. Furthermore, beam structures with interlayer slip can easily be treated. So the RZT is very well suited to analyze all kinds, of shear-elastic structural element like CLT-plate, timber-concrete composite structure or doweled beam in an accurate and unified way.

Online Access:	Free

Resource Link

https://link.springer.com/article/10.1007/s00107-020-01586-x