A calibrated model for experimental hysteretic results of wall joints in CLT panels

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During the last twenty years, the use of cross laminated timber (CLT) in mid- and high-rise buildings has increased in many industrialized countries in Europe, North America and Australia. In South America, Chile has demonstrated a great interest in CLT technology due to the vast forest resource it can be found in this region [1]. However, the seismic hazard and earthquake occurrence rates in Chile confirm the strong necessity to know the dynamic behavior of CLT panels used in buildings. The typical approach in practice, and sometimes the option prescribed by the standards, is the use of a linear analysis with the characteristic design response spectrum. In such a situation, it is necessary to pay attention to the hold-downs and brackets [2,3].

In this work, a calibrated model for wall joints in CLT panels is presented and used to study the dynamic behavior of the connection. To obtain this result, an experimental characterization of three different configurations of wall joint connections (i.e. parallel walls, perpendicular walls (T) and corner walls (L)), is performed from tests subjected to cyclic loading protocols as described in DIN EN 12512 [4]. From these results, the hysteretic models are calibrated to obtain a comprehensive understanding of the viscous damping, ductility and energy dissipation capacity of the connection. The model is successfully validated with results from the hysteric tests performed on CLT panels' specimens. The validation clearly shows the capability of the model to predict the dynamic response of wall joints in CLT panels.

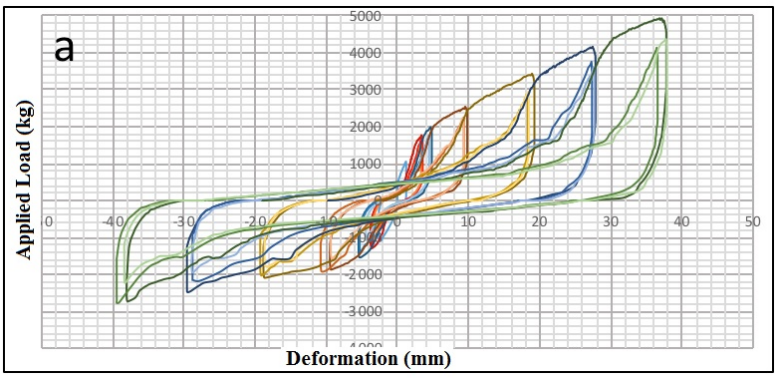

Figure 1: Hysteresis Curve of a parallel wall [5]

References

[1] P. González, E. Saavedra-Flores, E. Pérez, C. Burgos, F. Piña, M. Wagner, Sistema constructivo en madera contralaminada para edificios, Universidad de Santiago de Chile, ISBN 978-956-303-267-3, 2014.
[2] M. Izzi, D. Casagrande, S. Bezzi, D. Pasca, M. Follesa, Seismic behaviour of Cross-Laminated Timber structures: A state-of-the-art review, *Engineering Structures*, 2018, 170:42-52.
[3] Y-L Shen, J. Schneider, S. Tesfamariam, SF Stiemer, Z-G Mu. Hysteresis behavior of bracket connection in cross-laminated-timber shear walls. *Constr Build Mater*; 2013;48:980–91.
[4] DIN EN 12512: Timber Structures-Test Methods-Cyclic testing of joints made with mechanical fasteners. English version of DIN EN 12512:2001+A1:2005, 2006.
[5] J. Ahumada, E.Campos, Análisis experimental de uniones de muro de paneles de madera contralaminada solicitados por carga cíclica. Memoria de título de Ingeniero Civil en Obras Civiles. Universidad de Santiago de Chile, 2017.

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