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Prediction of Reinforcement Effect by Screw on Triangular Embedment Perpendicular to the Grain with Variation of Screw Locations

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Author(s)

Satoru Murakami, Akihisa Kitamori, Kiho Jung, Wen-Shao Chang, Kohei Komatsu

ABSTRACT

In this study, the reinforcement by screws for the wood perpendicular to the grain subjected to a rotational moment has been studied. For the estimation of rotational stiffness and yield moment, the reinforcement effect by the screws which varies depending on their position under the bearing plate was evaluated by taking the internal displacement distribution of the wood into account. The Finite Element Analysis (FEA) was used to investigate the internal displacement distribution of the wood. Then an appropriate function was found out to meet well with various internal displacement distributions under the bearing plate. The equations, which can estimate rotational stiffness and yield moment of the bearing performance of the wood reinforced by screws, were derived from the shear resistance mechanism between the screw and wood by considering their relative displacement distribution. Then rotational tests were carried out with the wood reinforced by the screws, setting screw thread at the various positions. Agreements between prediction and experimental results were very well. It was found that the screw reinforcement was effective, provided screw length should be longer for the wood height.

KEYWORDS

Screw; Reinforce; FEA; Rotational Performance; Timber Structure

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References

[1]   I. Bejtka and H. J. Blass, " Self-Tapping Screws as Reinforcements in Beam Supports," CIB-W18, Florence, Italy, 2006.

[2]   I. Bejtka, " Verst?rkung von Bauteilen aus Holz mit Vollgewindeschrauben," Band 2 der Reihe Karlsruher Berichte zum Ingenieurholzbau. Herausgeber, Karlsruhe University, Karlsruhe Germany, 2005 (In German).

[3]   S. Murakami, A. Kitamori, K. Jung, I. B. Hassel and K. Komatsu, " Prediction of Reinforcement Effect by Screws on Compression Performance of Wood Perpendicular to the Grain," Open Journal of Civil Engineering (Accepted).

[4]   A. Kitamori, K. Jung, Y. Kataoka and K. Komatsu, " Effect of Additional Length on Partial Compression Perpendicular to the Grain of Wood: Difference among the Supporting Conditions," Journal of Structural and Construction Engineering, Vol. 74, No. 642, 2009, pp. 1477- 1485 (In Japanese).

[5]   B. Madsen, R. F. Hooley and C. P. Hall, " A Design Method for Bearing Stresses in Wood," Canadian Journal of Civil Engineering, Vol. 9, No. 2, 1982, pp. 338-349. doi:10.1139/l82-035