Structural Performance Evaluation of Column-*Nuki* Connection in Traditional Japanese Wooden Buildings

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ABSTRACT

Traditional Japanese wooden buildings have been constructed using internal wooden frame structures. Plus-shaped column-*nuki* connections are important to evaluate the seismic performance of these buildings, and these connections include several joint types, one of which is the oblique scarf joint. However, only very few extant studies have examined column-*nuki* connections and oblique scarf joints.

In seismic evaluations of traditional Japanese houses, the extant design equation has been considered only for continuous *nuki*. As shown in reference [1], oblique scarf joint *nuki* are evaluated as 0.5 of the design equation for continuous *nuki* in traditional Japanese houses. Therefore, there exists a possibility that structural-performance evaluations of column-*nuki* connections with oblique scarf joint *nuki* are inaccurate. Thus, this study aims to evaluate the structural performance evaluation of column-*nuki* connections in traditional Japanese wooden buildings.

Full-scale tests were performed on specimens with either the continuous or oblique scarf joint *nuki*, and results obtained were compared based on parameters, such as the type of connection and number of dimensions. Subsequently, corresponding analytical results were calculated using an extant design equation, and the same were compared against experimental values to determine the validity of using the design equation for column-*nuki* connections in traditional Japanese wooden buildings.

Results obtained in this study demonstrate the initial stiffness to be approximately identical for specimens with continuous or oblique scarf joint *nuki*. The yield and ultimate bending moment of oblique scarf joint *nuki* specimens were observed to be approximately 10–70% smaller compared to those corresponding to continuous *nuki* specimens. In addition, all oblique scarf joint *nuki* specimens demonstrated an initial cleavage failure followed by multiple failures. Results of these comparisons demonstrate that failure can be partially estimated using the extant design equation considered in this study.

REFERENCES

[1] Editorial Committee for Manual of Seismic Design for Wooden Frame Structures: *Manual of Seismic Design for Wooden Structures Taking Advantage of Traditional Structural Techniques - Methods for Seismic Design and Seismic Reinforcement Design Based on Response-Limit Capacity Analysis* -, Gakugei Shuppan Sha Co. Ltd., Japan, March 2004, pp.79