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Effect of Changes in the Moisture Content due to Surrounding Relative Humidity on the Contact Stress in Traditional Mortise and Tenon Joints I.

Effects of komisen insertion and joint drying on the contact stress between end grain of column and sill

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Abstract: To understand the stress transmission mechanism in the traditional timber joint, focus was aimed on the contact stress which occurs at the contact surface of mortise and tenon joints. More precisely, the influence of drying shrinkage of members on changes of contact stress at the joint was investigated. A method for continuously measuring changes of the contact stress was developed by placing a small load cell at the interface between the end grain surface of the column and the side grain surface of the sill.

Two types of komisen (wooden square key) were used :

Shirakashi(*Quercus myrsinaefolia* Blume), which is widely used in traditional timber structure, and compressed sugi(*Cryptomeria japonica* D. Don) which was newly developed with the expectation of allowing the use of softwood as an alternative.

Insertion of the komisen with different positioning of holes (shifted by 2 mm) together with the bending force, shear and friction of the komisen can be described to enhance the contact stress between members(column and sill in this case).

Komisen joints made of shirakashi retained a contact stress of 14% (1.1 MPa) after drying for 150 days, with a 10% decrease in weight and a 2% decrease in

dimension. Compressed sugi komisen retained a contact stress of 24% (1.5MPa) after 150 days with a decrease in weight and dimension identical to that of shirakashi.

Keywords: komisen, mortise and tenon, contact stress, compressed sugi

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