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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 II.[†]

Evaluation of anti-relaxation effects by deformation recovery of compressed wooden Komisen on the contact stress of joints

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Abstract: This research is a continuation of part 1¹⁾, and focuses on studying the effect of cyclic humidity changes. It also evaluates the anti-relaxation effect by deformation recovery of the komisen(wooden square key) made of sugi (Japanese cedar ;*Cryptomeria japonica* D. Don) compressed wood on the contact stress within the hozo-komisen joint (traditional wooden mortise and tenon joint stiffened by the inserted wooden square key) in the Japanese traditional post and beam structures.

The summary of this paper is as follows.

The contact force on small load cells in joints with compressed sugi komisen inserted is shown to higher(40N) than that of joints made of shirakashi (*Quercus myrsinaefolia* Blume) at 80% relative humidity(RH), and reaches 56N at RH 85%.

The contact force on small load cells in joints with compressed sugi komisen inserted increased from 20N to 27N, but in joints with shirakashi komisen inserted it decreased from 14N to 13N at RH40% of the complete cycle. It is concluded that compressed sugi komisen has the effect of preventing relaxation of the contact stress between joint parts by cyclic changes of relative humidity.

As to change of maximum swelling stress(σ_{\max}) due to the cyclic changes of relative humidity at 40%-80% in the restraint condition, in shirakashi it decreased to 3.3 MPa at the 3 rd cycle, but compressed sugi attained 4.6 MPa at all cycles. This clarified the reason why compressed sugi komisen has a higher anti-relaxation effect than shirakashi komisen.

Keywords: komisen, compressed wood, contact stress, mortise and tenon joint, swelling stress

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