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Effect of Longitudinal Shear Plane Length on the Tensile Strength of Half-Lapped "gooseneck" Splice Joints (*Kama-tsugi*)

Strain distribution analysis of the tenon using digital image correlation

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Abstract: Strain distribution analysis of half-lapped "gooseneck" splice joints (*Kama-tsugi*) was carried out using digital image correlation. The effect of the shear plane length on the tensile strength of the joint and strain distribution of the tenon was examined. The dimension of the tenon was changed by altering the shear plane length (L) relative to the fixed width (d) of the compression plane and the fixed rise (H) of the shear plane. Results were as follows ;

(1)The tensile strength leveled off in joints whose dimension factors (L/d) were greater than eight.

(2)Large tensile strain perpendicular to the grain was observed near the re-entrant corners of the tenon. From this value of the tensile strain, it was found that local failure occurred prior to reaching the ultimate strength. The estimated area for the local failure was almost constant and was not affected by the shear length.

(3)Shear strain concentrated near the re-entrant corners of the tenon and gradually decreased toward the head of the tenon. The degree of shear strain concentration in its linear elastic region was calculated as the ratio of maximum shear strain to the average shear strain. The value of the degree was 3.7 in the tenon with the standard dimension factor of ten (L/d =10). The degree increased as the dimension factor (L/d) increased up to the dimension factor of fourteen (L/d =14).

(4)The tensile strength of the tenon was estimated by using the degree of strain concentration. The degree of strain concentration was introduced to account for the shear stress concentration at the maximum load. A good agreement was found between the estimated strength and the measured strength.

Keywords: kama-tsugi, shear plane length, tensile strength, strain distribution analysis, digital image correlation

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