Photoelastic Analysis of the Mechanical Stress in Korean Traditional Joints

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In building korean traditional houses, various kinds of joints such as Je-hyeo-chog joint(Dovetail Halving), Mettugi-jang joint(Stepped goose neck splice), Nabi-jang joint(Butterfly key joint), Bitteog joint(Nibbed scarf joint), Maj-jang bu joint(Tabled splice), Eosteog joint(z-splice) have been used. we analyse the stress distribution in these joints visually by using photoelastic analysis method. Our purpose is to analyze stress change on each joint and compare them. We construct a devise to investigate the isochromatic fringes appearing on each joints when they are compressed along the direction of the joint. Then, the fringes are analysed in two different ways. First, the stress strength on each joints are compared by measuring the spread distance of the isochromatic fringes. Second, the changes in isochromatic fringes are analysed by using an image processing method, which reveals several important sections that strongly influence the stress patterns. This process eliminates a few irrelevant patterns and makes the analysis more precise. Our Analysis shows that the Dovetail Halving Joint and Stepped goose neck splice joint are comparatively more stable than other joints against the compression along the direction of the joints. The image processing method data support such results. These results may be useful in restoring damaged cultural heritages.

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