UNIVERSAL SACRIFICIAL-LAYER THICKNESS INDEPENDENT OF DESIGNED FIRE-RESISTANCE TIME FOR WOODEN FIREPROOF-STRUCTURAL ELEMENTS

Bench-scale tests using fire-retardant Japanese cedar laminated-lumber in barrier

In this study, the following two points were clarified regarding the heating time and the self-extinguishing property after heating for wooden fireproof structural elements.

1. The sacrificial layer, with a thickness designed according to the fire resistance time, may not be self-extinguishing in some cases if the heating time is shorter than the designed fire resistance time. The reason are as follows. First, since the sacrificial layer is too thick to allow the heat to penetrate the barrier layer by the end of heating, meaning the barrier layer will not reach pyrolysis temperature. Second, the sacrificial layer is kept hot by the carbonized layer on the surface, meaning heat loss on the surface does not cause it to self-extinguish.

2. Regardless of the heating time and type of the fireproof performance, the optimum thickness range of surface layer is 25 mm or less. In the range where carbonization is completed during heating, fireproof performance is not greatly affected without using fire retardant wood as the sacrificial layer. Therefore, an optimum design method for wooden fireproof structural elements is to set the sacrificial layer thickness to the upper limit value so that it does not burn by glowing combustion after the end of heating.