Tensile loading tests steel plated inserted joint with drift pin on CLT

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CLT is the latest wooden structural material member that will be applied to wall, floor and other uses in large scale wooden construction worldwide. For wooden architecture, its joint system is the most important factor for its structural performance. There are many types of connection methods and different types of fasteners, bolts, drift-pins, nails etc. are used in its construction [1]. For structural design, we have to analyze and clarify the resistant mechanisms and mechanical performance of joints, but the study of connections for CLT members is still in its early stages.

In this paper, we conducted tensile loading tests of plate-inserted connections with drift-pins in the CLT. For the test parameters, we changed the drift-pin diameter, end-distance (e_1) and edge-distance (e_2). CLT members would be composed with 5ply Japanese cedar, its thickness was 150mm, graded Mx60A-5-5 in Japanese Agricultural Standards[2]. The test set up is indicated in Figure 1, the test parameters are shown in Table 1. As the ratio (b/d) of wood thickness (b) to drift-pin diameter (d) is large, we can see the large bending deformation of the drift-pin. On the other hand, if the ratio (b/d) is small, we can't see bending deformation or fracture of the wood member.

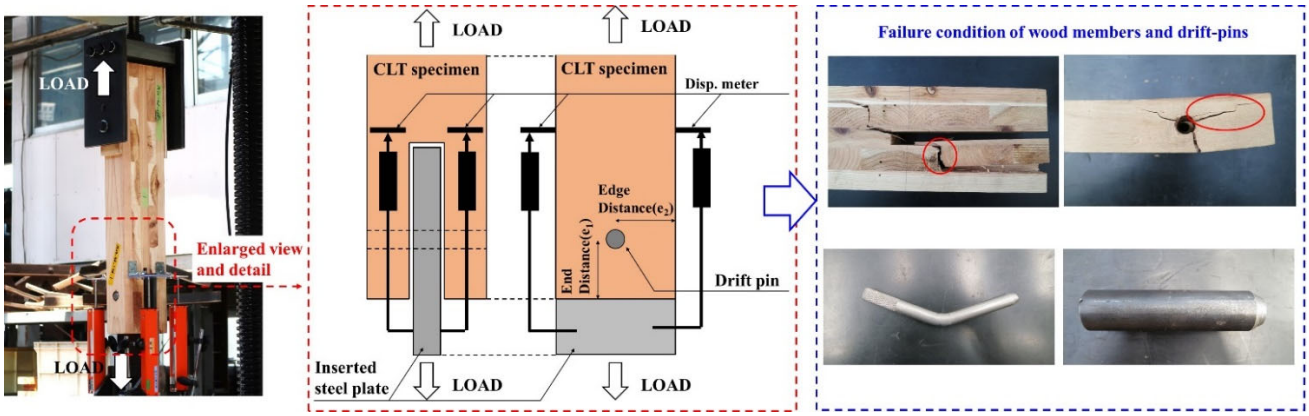

Figure 1: Test and failure condition of tensile loading with inserted plate connection with drift pin for CLT

Table 1 : Test parameter

Diameter of drift-pin	End distance (e_1)	Edge distance (e_2)
12[mm] 24[mm] 36[mm]	4d 5d 7d	1.5d 3d

Figure 2 shows examples of the relationship with maximum load, yield strength and stiffness to the pin-diameter. As shown the figures below, we can see a strong correlation between performance and pin-diameter.

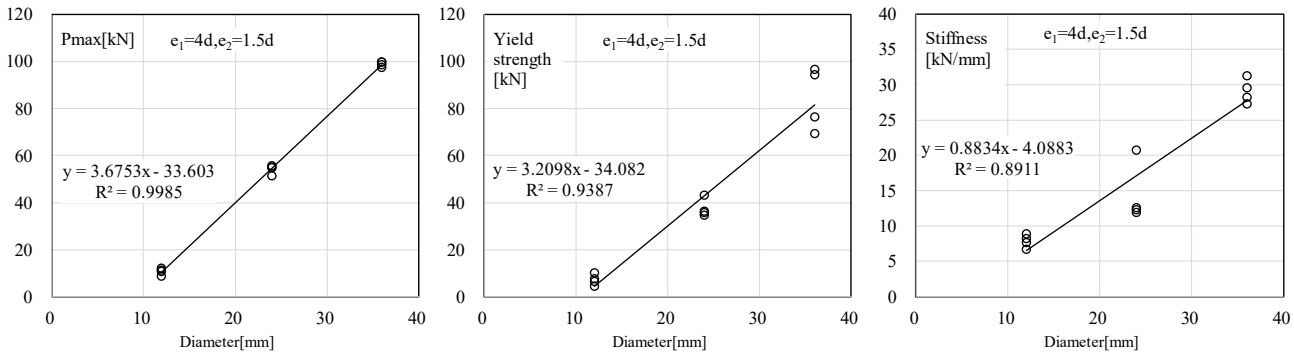

Figure 2: Relationship with mechanical performance and pin diameter (e_1=4d and e_2=1.5d)

References

[1] T. Herzog, J. Natterer, R. Schweitzer, M. Volz and W. Winter: Timber Construction manual, Detail, 2008.
[2] Japanese Agricultural Standard (Japanese), 2013.

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