

Development of wooden rigid frame with Lagscrewbolts

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Lagscrewbolts (registered) were developed as a simple and economical fastener to constitute moment-resisting joint for glulam constructions. Lagscrewbolts have thread like lagscrews on the outside surface and, thread like a nut in the inside or thread on the outside surface at one end of the shank. Photo 1 shows two types of Lagscrewbolts.

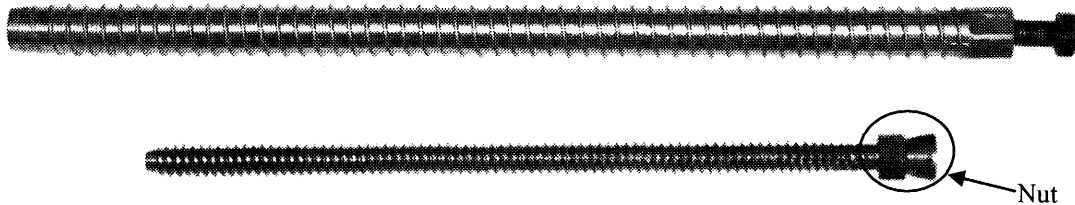


Photo 1. Lagscrewbolts. (Up: thread in the inside, Bottom: thread on the outside)

Our laboratory and Hara Tec Co. have developed the joints for wooden rigid frame with Lagscrewbolts. These joints do not require large diameter Lagscrewbolts. Because the joints using large diameter Lagscrewbolts tended to split due to the difference of stiffness between Lagscrewbolts and wooden members. Therefore we thought that it will be much better to avoid the split failure mode by construction with small diameter Lagscrewbolts. The small diameter Lagscrewbolts such as the bottom of Photo 1 was developed. In addition, a new type of base plate having a special nut as shown in Figure 1 was developed. The plate has a taper and the nut has a space for the deformation. This joint was designed to break in the nuts, not wooden members, nor Lagscrewbolts. The failure mode of this joint is pull-out of the nuts from the plate.

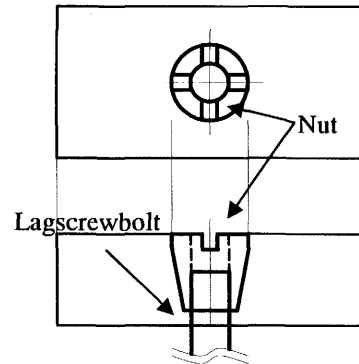


Fig. 1. Mechanism of between nut and bolt.

In the previous studies, pull-out properties of embedded Lagscrewbolts have been evaluated. As the results we could get good values of strength (P_{max}) and slip modulus (K_s). So the T shape specimens were examined for evaluating the properties of the moment-resisting joint. Figure 2 shows the T shape specimen. Table 1 shows the results of strength (P_{max}), slip modulus (K_s) and Energy absorption. As those mechanical properties were sufficient enough, we are going to design a three stories glulam building in this year.

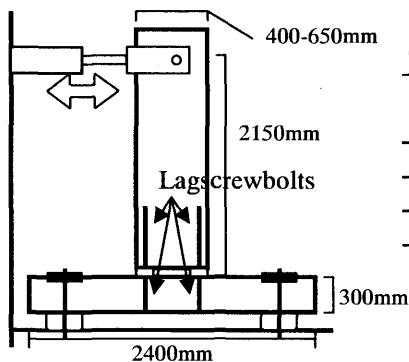


Fig. 2. Test set-up for T-shape Specimen.

Table 1. Results of the bending test for new joint.

	P_{max} (kNm)	K_s (kNm/rad.)	Energy (kNm-rad.)
Beam depth 400mm	47.9	2527	1.58
Beam depth 525mm	75.1	4679	2.18
Beam depth 650mm	84.0	7334	1.44