

Reuse of Solid Timber - Case Study: IsoTimber Frame System

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Background

IsoTimber is unique type of structural system based on large size wooden boards. A board contains a frame and a core made from timber studs. Air ducts are first milled in the core-studs, which are placed next to each other (Figure 1a), providing good insulation properties (IsoTimber 2021). During the project InFutUReWood (2021) the idea of using reclaimed timber as material for the core-studs was inspired by the research on CLT (Cross Laminated Timber) boards made out of reclaimed wood (Rose *et al.*, 2018, Arbelaez 2019). At the moment the entire building industry chain lacks knowledge on the performance of building products made partially or entirely out of reclaimed timber (timber that had already been used in structures). The aim of this study is to compare the compression strength of IsoTimber boards made from new strength-graded timber with IsoTimber boards containing core-studs made from reclaimed timber.

Keywords: reuse, compression strength test, reclaimed wood.

Experimental

Six standard boards (called S), industrially manufactured according to IsoTimber (2021) had the frame and the core from fresh strength graded timber C14 with cross-section 45 mm x 88 mm of pine - *Pinus Sylvestris* L. For the board with reused timber (called R) the frame was made from strength-graded timber and the core-studs (Figure 1a) were made from reused timber of spruce - *Picea Abies* L., acquired from three demolition sites around Östersund, Sweden. The R-board with reclaimed core-studs was manufactured manually, as described by Henriksson (2021). The size of each tested board was 2400mm length, 1200mm width and

100mm thickness. The compression test was performed at RISE Skellefteå. Boards were placed horizontally, on the test beam. A uniform load was applied longitudinally, using a hydraulic cylinder and steel beams, with movable fastening on the pressure side and rigid fastening on the support side. Load speed: 4 mm/min.

Results and Discussion

The six standard boards (S1-S6, Figure 2) were tested up to 400kN. The plywood boards cracked at the ends at support under a compression force of ranging from 150 – 220kN. No breaking was noticed in the rest of the block. The R-board containing reclaimed timber as core-studs

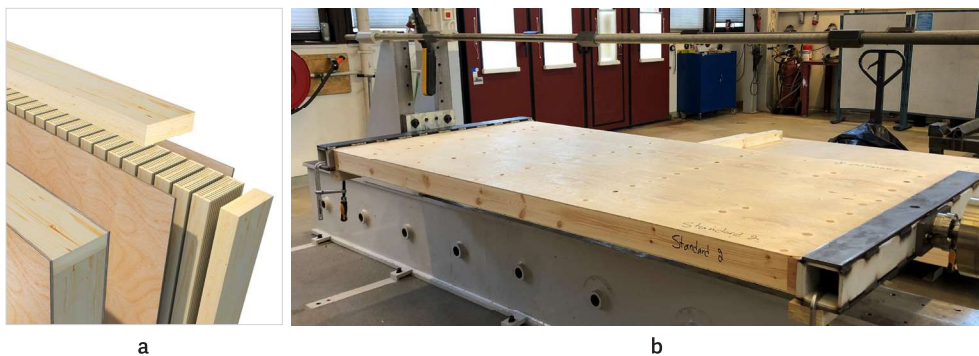


Figure 1 a: IsoTimber composition: core-studs with air ducts placed next to each other, (IsoTimber 2021); b: Test setup : an IsoTimber board under longitudinal compression (photo by Urban Haggström, RISE)

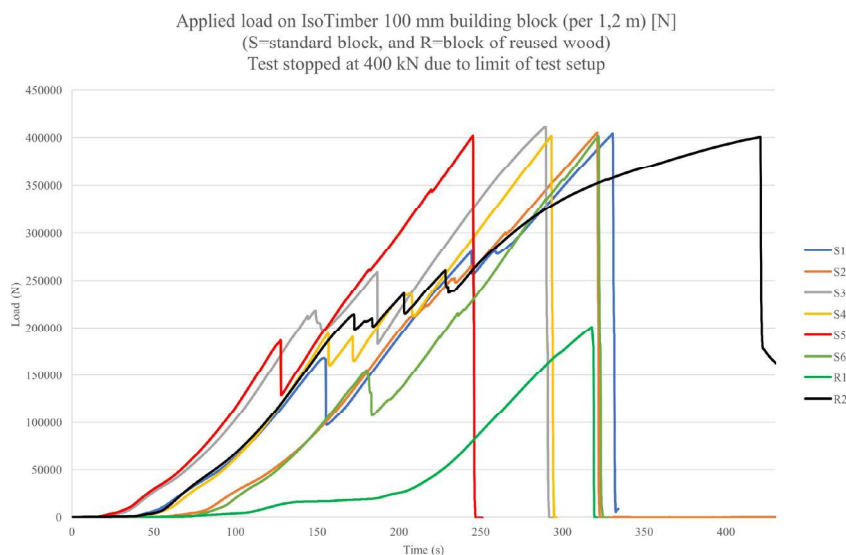


Figure 2 Compression test results. S stands for standard boards (6 samples), R stands for reclaimed timber in the core. R1 and R2 refer to the same samples. R1 shows a pretest of the reclaimed board under a load up to 200 kN and R2 shows the evolution of the same board up to the interruption of the loading at 400 kN.

was tested twice. The first time, when the testing was interrupted at 200kN, no visible damage was visible. The second time the block was tested up to 400kN. The plywood boards were cracked at the ends at a compression force of 220kN. No breaking was noticed in the rest of the block.) The test stopped when the applied load reached 400kN because of limitation in test setup.

Conclusions

The board with reclaimed timber as material for core-studs manufacturing had a slightly higher compression strength than the "Standard" boards containing only new C14 grade timber. The reason might be a more careful manual manufacturing process as well as a higher quality of the reclaimed timber. For future comparison studies it is important to choose the same species, and, for both new and reclaimed wooden products, to measure their mechanical properties with non-destructive testing.

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