



## Behaviour of Multi-Storey Cross-Laminated Timber Buildings Under Lateral Loading

<https://research.thinkwood.com/en/permalink/catalogue2715>

Author: Hughes, Claire  
Publisher: Queen's University Belfast  
Year of Publication: 2020  
Format: Thesis  
Material: CLT (Cross-Laminated Timber)  
Application: Walls  
Topic: Connections  
Design and Systems  
Keywords: Lateral Loading  
Tall Wood  
Tall Timber Buildings  
Connections  
Monotonic Loading Tests  
Constant Vertical Load  
Wall Systems  
Experimental Tests  
Analytical Approach  
Multi-Storey  
Language: English  
Research Status: Complete

### Summary:

In response to the global drive towards sustainable construction, CLT has emerged as a competitive alternative to other construction materials. CLT buildings taller than 10-storeys and CLT buildings in regions of moderate to high seismicity would be subject to higher lateral loads due to wind and earthquakes than CLT buildings which have already been completed. The lack of structural design codes and limited literature regarding the performance of CLT buildings under lateral loading are barriers to the adoption of CLT for buildings which could experience high lateral loading. Previous research into the behaviour of CLT buildings under lateral loading has involved testing of building components. These studies have generally been limited to testing wall systems and connections which replicate configurations at ground floor storeys in buildings no taller than three storeys. Consequently, to develop the understanding of the performance of multi-storey CLT buildings under lateral loading, the performance of wall systems and connections which replicate conditions of those in above ground floor storeys in buildings taller than three storeys were experimentally investigated. The testing of typical CLT connections involved testing eighteen configurations under cyclic loading in shear and tension. The results of this experimental investigation highlighted the need for capacity-based design of CLT connections to prevent brittle failure. It was found that both hold down and angle bracket connections have strength and stiffness in shear and tension and by considering the strength of the connections in both directions, more economical design of CLT buildings could be achieved. The testing of CLT wall systems involved testing three CLT wall systems with identical configurations under monotonic lateral load and constant vertical load, with vertical loads replicating gravity loads at storeys within a 10-storey CLT building. The results show that vertical load has a significant influence on wall system behaviour; varying the vertical load was found to vary the contribution of deformation mechanisms to global behaviour within the elastic region, reinforcing the need to consider connection design at each individual storey. As there are still no structural design codes for CLT buildings, the accuracy of analytical methods presented within the literature for predicting the behaviour of CLT connections and wall systems under lateral loading was assessed. It was found that the analytical methods for both connections and wall systems are highly inaccurate and do not reflect experimentally observed behaviour.

Online Access: Free

### Resource Link

---

<https://pure.qub.ac.uk/en/studentTheses/behaviour-of-multi-storey-cross-laminated-timber-buildings-under-> 