ABSTRACT

This thesis investigated light-frame wood/concrete hybrid construction as part of the NSERC Strategic Network on Innovative Wood products and Building Systems (NEWBuildS). A review of eight wood/concrete niche areas identified three with potential to be used in mid- to high-rise structures. Light-frame wood structures of seven or more storeys with wood/concrete hybrid flooring seem to have little feasibility unless a concrete lateral-load-resisting system is provided and material incompatibilities are solved. Non-load-bearing light-frame wood infill walls in reinforced concrete frame structures were recognized to have potential feasibility in mid- to high-rise structures. A full-scale, single frame test apparatus was successfully designed and constructed at the Insurance Research Lab for Better Homes. The frame is statically loaded to accurately replicates realistic horizontal sway and vertical racking deformations of a typical eight storey reinforced concrete frame structure at SLS and ULS. A linear-elastic analysis of the test apparatus was generally able to predict the results during testing. The 2.4m x 4.8m (8 ft. x 16 ft.) infill wall specimen did not satisfy serviceability deflection limitations of L/360 when subjected to representative out-of-plane wind pressures of +1.44/-0.9 kPa. The out-of-plane response was not significantly affected by horizontal sway deflections of +/-7.2mm or vertical racking deflections of +9.6mm. Although a nominal 20mm gap was provided to isolate the wall from the surrounding frame, insulation foam sprayed in the gap facilitated load transfer between them.

Keywords*: Wood/Concrete Hybrid, Light-frame Wood, Infill Wall, Reinforced Concrete Frame Structure.*