Chapter 7- Recommendations

This section is divided in to two portions- a section on recommendations for design and construction for the implementation of CLT panels in the built assembly for cold climates in Canada, and second, a section for further research.

7.1. Recommendations for Design and Construction

With respect to construction moisture, the simulations found that the water content may become dangerously high if uncovered CLT panels are exposed to prolonged periods of precipitation (e.g., months). Concerns of mould and rot may consequently arise. However, should these panels be installed in a vapour permeable system, the walls will have the capacity to reach a safe equilibrium moisture content over the period of a few years by drying to the exterior and the interior. On the other hand, wall assemblies built with wet CLT panels and vapour impermeable membranes (either interior or exterior) will experience high moisture contents for prolonged periods, and hence likely experience some form of bio-deterioration. This is not likely a concern for panels exposed to only a few days of wetting.

One simple and practical solution to reducing construction moisture (other than covering the CLT panels until they are clad) includes installing water and air barrier membrane systems on the CLT while still in the factory that become parts of the finished wall assembly. Alternatively, a temporary, low-cost hydrophobic coating (which could acts as a primer for subsequent membrane application) could be used. This approach not only reduces the exposure to moisture during erection of the structure, but also ensures superior quality control of the application of the membrane and reduces delays on the construction site.

7.2. Recommendations for Further Research

A literature survey revealed very little information directly related to the moisture properties and risks of CLT panels used in wall assemblies. Even less information is available for CLT panels when considered in wall assemblies in cold Canadian climates. The research reported here is just a beginning. Much remains unknown, and hence, further research in to CLT moisture performance and risk should be conducted. A very small number of samples and wood sources / species was considered in the experimental work. Much work should be conducted to provide a stronger statistical backing to the results.

The experimental aspect of this research consisted of a water uptake test, to determine the effective liquid diffusivity. A simulation study to assess the relative importance of liquid and vapour transport mechanisms in CLT was also undertaken. However, as both studies were conducted in the free water saturation range of the material, the vapour diffusivity used may not accurately represent the impact of vapour diffusion in the hygroscopic range of the material, as the effect of liquid diffusivity overwhelms and obscures any contributions from vapour diffusion. Further study should be conducted to assess the vapour diffusivity of CLT panels in the hygroscopic ranges.

At the time of publication of this document, research was being undertaken by other members of the NEWBuildS research network in to obtaining functional material properties of CLT, such as air permeance, vapour permeance, and sorption isotherm, among others. It is possible that further material testing may be required to ascertain sub-assembly level effects of CLT panels (e.g. how checks and cracks in the CLT panel may affect sorption isotherms, capillary condensation, vapour flow, etc.).

During the simulation portion of this thesis, some aberrations were observed in the manner in which the liquid diffusivity for redistribution behaves compared to that of suction; as soon as the sample is removed from a source of water, rapid redistribution of the moisture occurs (much faster than if the sample was exposed to the water source). While the properties are modelled after experimental data, further research needs to be conducted in refining the process and understanding of the physical phenomenon.