Cross-Laminated Timber

Cross-laminated timber (CLT) is a type of solid-wood structural panel that can be used for roofs, floors, and walls. Softwood lumber or structural composite lumber (SCL) are used to form layers that are glued together with their primary strength axes perpendicular to each adjacent layer (see Fig. 1). CLT is generally used as a pre-fabricated product, with panel joints and openings for doors and windows machined prior to their arrival at a construction site.

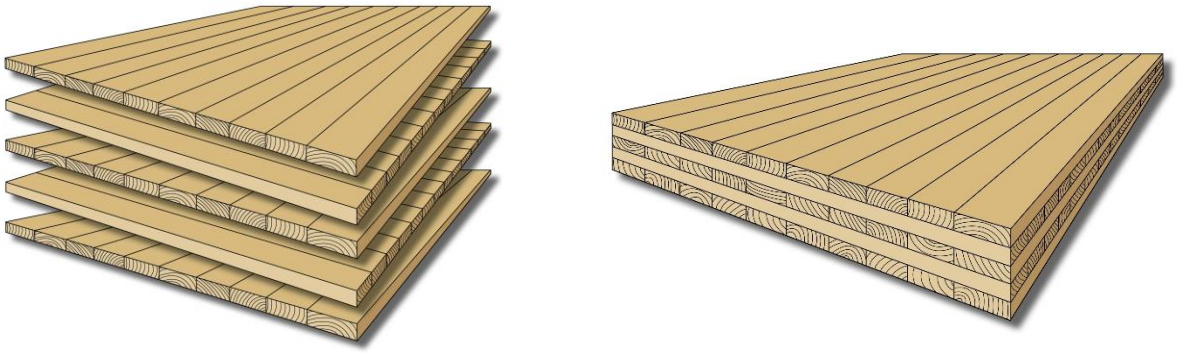

Figure 1. CLT layers shown separated (left) to illustrate alternating intermediate layers oriented perpendicular to the long direction of the CLT panel. Figure at right shows CLT in its final solid configuration.

CLT represents an alternative to steel and concrete in several types of buildings, including low-rise and mid-rise structures. The ease of securing connections combined with its nature as a pre-fabricated panel result in a material that can be used to erect tall structures at a pace far quicker than what is achievable with steel and concrete. Additionally, CLT is regarded as a more environmentally-friendly building material due to the carbon sequestration properties of wood.

As the use of CLT becomes more common in the US and Canada, building codes and standards have expanded to include CLT. For example, the 2015 International Building Code and the 2015 National Design Specification® for Wood Construction, now recognize CLT as a structural system. For CLT to be acceptable for structural use, it must be certified to the nationally recognized standard ANSI/APA PRG 320, *Standard for Performance-Rated Cross-Laminated Timber*. In addition to defining the dimensional tolerances of CLT and acceptable

adhesives that can be used in its manufacture, PRG 320 contains structural performance requirements for various product grades. Performance testing of CLT begins with an evaluation of glue joint strength and durability. When a product is shown to meet the adhesive strength and durability requirements, mechanical property testing is performed. CLT structural qualification testing requires an evaluation of bending stiffness (EI), characteristic bending moment (f_bS), and interlaminar shear capacity (V_s).

CLT can be manufactured using softwood lumber as specified in PRG 320 and assigned a grade based on its structural characteristics and species. Alternatively, CLT can be assigned a custom grade if its properties do not align with the standard grades in PRG 320. There are no standard performance grades for CLT manufactured with SCL; therefore, all SCL CLT must be assigned a custom grade. Whether standard or custom grade, CLT is defined as having a minimum of three layers, and PRG 320 includes design properties for CLT made of three, five, or seven layers, with the maximum permitted depth being 20 inches (508 mm).

The qualification and certification of CLT must be performed by a qualified inspection and/or testing agency. PFS TECO maintains the appropriate ISO accreditations and offers testing, inspection, and certification of CLT.