UPDATE: DYNAMIC TESTING ON CLT CONNECTIONS

This White Paper summarizes the on-going testing campaign on CLT Connections under Dynamic loading. It its intended to provide readers with background information, an update on progress and some initial observations on a very exciting research topic. This testing campaign is being carried forward at the University of British Columbia, and is a one of a kind, comprehensive research project that focuses on the behaviour and performance of three of the most commonly utilized panel joints in CLT: Butt, Surface Spline and Half Lap joints.

The preliminary results that are presented here will be the basis for a topic-specific webinar that MyTiCon Timber Connectors will host towards the end of the year.

Surface Spline Joint Specimen

Butt Joint Specimen

Half Lap Joint Specimen

Phase I of this project consisted in testing the aforementioned types of CLT panel joints under static, monotonic loading. The results, as summarized by Figure #1, show that connections with self-tapping screws inserted at 45° and therefore, loaded in axially, exhibit a very high intial stiffness and ultimate capacity, but are prone to brittle-type failure mechanisms.

Conversely, connections with screws inserted at 90° and loaded in pure shear, exhibit lower initial stiffness and ultimate capacity, but much higher relative ductility due to fastener yielding.

Finally, connections with screws inserted at both angles, show a nice compromise between high initial stiffness and capacity and exhibit moderate ductility.

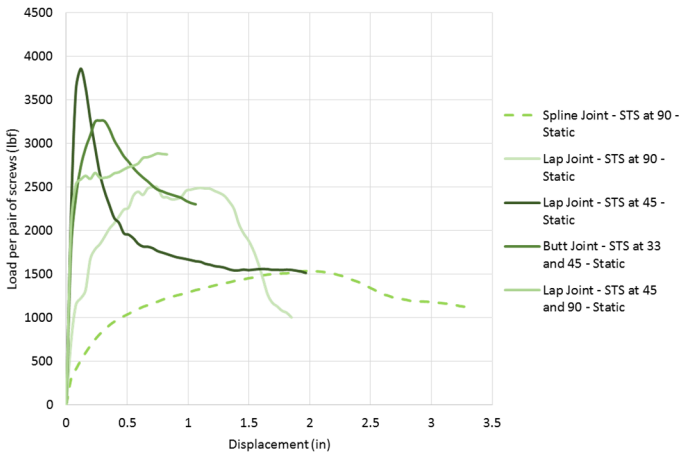

Figure #1: Static Test Results

* Test data and pictures used throughout this document are courtesy of Dr. Thomas Tannert

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Phase II of this project consisted in testing the same type of CLT panel joints but now, under cyclic loading. The results, as summarized by Figures #2 to #5 are very promising as adequate levels of relative ductility, initial capacity and stiffness were obtained when compared against the results obtained from the monotonic testing campaign.

Surface Spline joints with screws at 90° (pure shear), as seen in Figure #2, exhibited lower initial stiffness and capacity, yet a very good overall relative ductile behaviour. Conversely, Half Lap Joints with screws at 45° exhibited high initial stiffness, a slight reduction in capacity and brittle behaviour. This is illustrated in Figure #3.

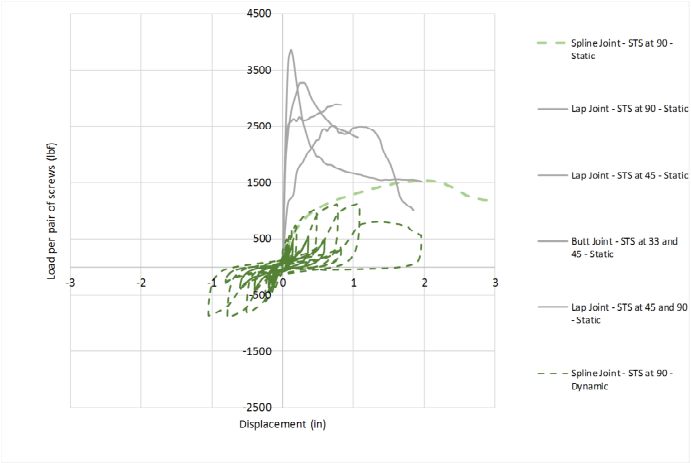

Figure #2: Dynamic Test on Spline Joint

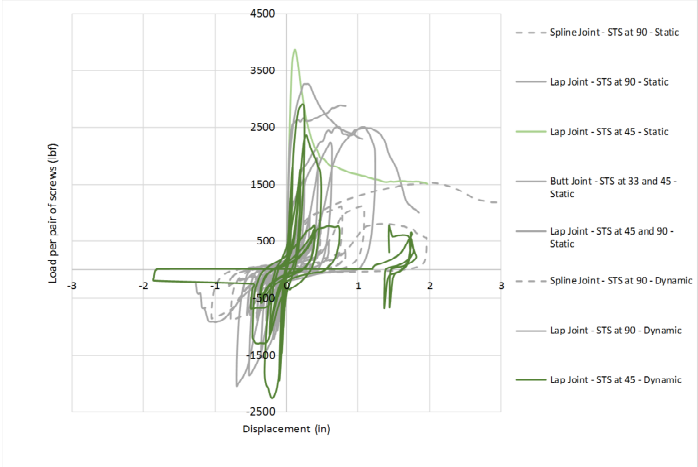

Figure #3: Dynamic Test on Half Lap Joint (Tension screws)

Finally, the tested Butt Joints (Screws at 90°) and Half Lap Joints (with screws at 45° and 90°) both exhibited the most promising performance under cyclic loading. Overall, the Butt joints had very similar ultimate capacity and relative ductility as the static cases, yet experienced a slight reduction in initial stiffness. Furthermore, Half Lap joints with screws in both angle orientations, exhibited very high initial stiffness and relative ductility values, yet experienced a slight reduction in capacity. These results are shown in Figure #4 and #5, respectively.

Initial observations look promising, and full experimental results and analysis will be provided in our webinar scheduled for the end of the year. Stay tuned...

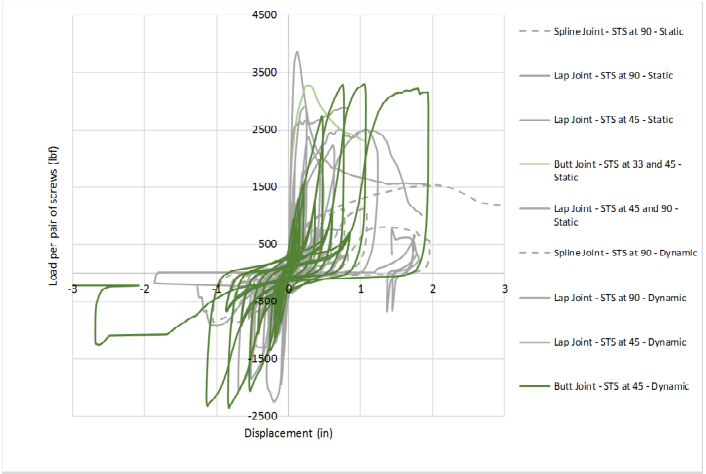

Figure #4: Dynamic Test on Butt Joint

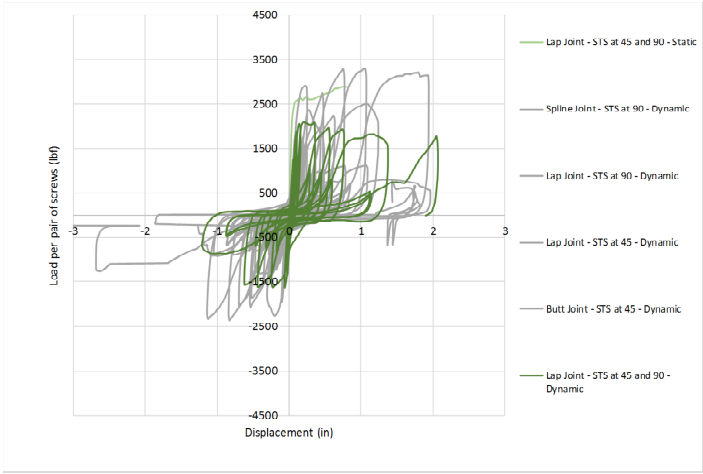

Figure #5: Dynamic Test Results on Half Lap Joint (both 45° and 90° screws)