Analysis of Multiple Connection Types in Mass Plywood Panels (MPP)

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Introduction

Mass Plywood Panels (MPP) are a veneer-based structural composite lumber panel designed to be used in building applications as both a vertical and horizontal element. Any new product to be used in the industry with confidence requires an exhaustive study of its physical and mechanical properties. Multiple fasteners were chosen to undergo a series of connection tests with MPP. The current European Yield Models were validated by the lateral resistance test to use the dowel strength of plywood to calculate yield loads and yield mode of the MPP. The dowel bearing strength of MPP was calculated showing similar results in the parallel direction. Three different assemblies were tested in two different direction. In terms of strength, ABR brackets and HGA10KT brackets showed similar performances, however, HGA bracket connections showed higher stiffness values in the shear and withdrawal loading directions.

Objectives

1. To study the withdrawal and yield strengths of laterally loaded single fastener connections by testing them under lateral loads.
2. To characterize the behavior of three different connection systems under cyclic loads, in two directions both in the lateral direction (shear) and the withdrawal direction.

Materials

Material:
- 76 mm thick MPP, with a Face-Core-Face Layup
Single fastener connection:
- CNA 4 mm x 60 mm annular ring shank nails
- SDS25300 6.4 mm x 76 mm wood screws
Connection Systems:
- ABR105 Brackets
- CNA annular ring shank nails
- HGA 10KT Brackets
- SDS25300 wood screws
- SDWS22 152 mm exterior structural screw

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Conclusions

- Withdrawal capacity was low, due to the empirical equation accounts for solid sawn lumber.
- The lateral resistance test indicated that the European Yield Model could be used to calculate the yield loads and yield modes for MPP.
- Dowel bearing strength of MPP resulted in similar values to the parallel orientation of the NDS tabulated values of a wood member with a 0.53 specific gravity.
- The HGA/SDS connection had the most consistent performance for both the withdrawal and shear directions. The toe screw had large variability, which could be contributed to the failure type.