

PRINCIPLES OF MECHANICS METHOD FOR WOOD STRUCTURAL PANEL PORTAL FRAMES

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Abstract

A principles of mechanics model to predict the strength of wood structural panel portal frames has been developed. The wood structural panel portal frame consists of a wood structural panel overlapping a header to form a moment resisting connection to resist in-plane lateral loads. The advantage of portal frames is that they can resist relatively high lateral loads for a small wall width. The model is based on moment couples and shear strength of the components. Model predictions are compared to test results for a variety of portal frame constructions that have been tested. All portal frame walls were tested with the SPD (SEAOSC) cyclic load protocol for in-plane shear resistance.

Portal frame constructions investigated in this study range from 16 to 24-inch (406 to 610-mm) wide, 8 to 10-ft (2.4 to 3.0-m) tall, sheathed with OSB or Plywood, and with and without hold down devices at the base of the wall. Also investigated are portal frames built on raised wood floor assemblies with variable base of wall restraint configurations.

The model is compared to ten unique portal frame constructions that were tested. Comparisons between the model predictions and the test results are made. Comparing the model to the test results shows that the model accurately predicts the strength to within about 5% on average.