



State-of-the-art report on fibre reinforced polymer (FRP) utilization in wood products

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Auteur: Pirvu, Ciprian
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 Résumé: Fibre-reinforced wood systems are light, strong, stiff composites that can efficiently replace larger wood members and can be relied on to provide consistent mechanical properties.

This report is an introduction to fibre-reinforced wood systems for members of the Canadian wood products industry. It provides the motivation for reinforcing wood with synthetic fibres, and surveys the choice of materials and their uses. Numerous examples of current applications are discussed to demonstrate the strong and weak points of various approaches and examine the durability and management of fibre-reinforced wood products, as well as to indicate opportunities that exist for the Canadian wood products industry.


This report is intended to be a useful reference for the Canadian wood products industry, and assist future developments in structural and non-structural applications of fibre-reinforced wood products.

Composite materials - Durability
 Fibres
 Board products - Materials used

Documents



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Structural performance of wood diaphragms with thick panels

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Résumé:

Wood design standards in Canada and the United States provide design values for floor and roof diaphragms with sheathing thickness ranging from 9.5 mm (3/8 in) up to 18.5 mm (3/4 in), that are supported by joists spaced less than 610 mm (24 in) on centre. This range of sheathing thicknesses is adequate for housing and small buildings, but for large non-residential structures, diaphragms with thicker sheathing and wider joist spacing may be more appropriate.

This paper includes the findings of a study aimed at providing research information suitable for implementing design values for diaphragms with thick sheathing in the North American wood design standards. Results from quasi-static monotonic tests on fifteen full-scale 7.3 m (24 ft) long by 2.4 m (8 ft) wide diaphragms framed with 38x191 mm or 38x235 mm (nominal 2x8 and 2x10, respectively) solid sawn lumber or laminated strand lumber and sheathed with plywood or oriented strand board are discussed.

A numerical model was developed using the finite element method. The basic properties of the sheathing, framing members and nailed connections were implemented in the model to replicate the structural behaviour of the diaphragms with thick panels. The numerical model was successfully validated against the experimental data. The shear resistance values for the diaphragms with thick panels tested in this study were calculated. The model may be used to interpolate between various diaphragm configurations and calculate shear resistance values for other configurations of diaphragms with thick sheathing.

In the long run, it is hoped that the use of thicker sheathing will enable the use of structural systems that are cost effective for wider joist or beam spacing than systems made with dimension lumber and traditional sheathing thickness. The experimental data and the model developed in this project will be used to develop proposals for implementation of wood floor and roof diaphragms with thick panels in the Canadian and United States wood design standards.

Diaphragms - Strength

Building construction - Design

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