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Determination of Bearing Capacity of Nail Joints in Timber-Cement Boards

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Abstract

The aim of this paper is in determination of nail bearing capacity in 4-nails joints of timber-cement boards of selected thicknesses bonded with middle solid wood (spruce) element on the base of destructive laboratory testing according to valid standards [1, 2, 3]. For the laboratory testing were selected 4-nails one-shear joints of cement-splinter boards and middle element made of solid wood.

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1. Introduction

Timber-cement boards are among others [4] used in civil engineering also as a bearing and stiffening wall-cladding of timber structures with the timber wall frame (fig. 1 – a, b).

Material properties (physical and mechanical) of these boards are already relatively narrowly laboratory determined and known. But in Czech standards for design of timber structures there are no specifications for behavior of these joints types, which is necessary for correct design of nail joints of these boards with timber frame.

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Test samples are selected to correspond with values usually used in praxis (timber-cement board and middle solid wood element thickness, diameter and arrangement of dowel type elements – nails) and results of this research are applicable to praxis.



Fig. 1. (a) The usage of timber-cement boards as a wall-cladding - general view (b) detail

Timber-cement boards are made from coniferous wood chips (89%), cement and water glass solution (fig. 2 – a, b).



Fig. 2. (a) Timber-cement board – detail (b) cross section

2. Laboratory testing

There were created 4-nails one-shear joints of cement-splinter boards and middle element made of solid wood. The diameter of nails is chosen 2.8, 3.1 and 3.8 mm. Thickness of two cement-splinter boards is 25 and 35 mm. The destructive laboratory testing was executed according to valid normative regulations for laboratory joints testing [1, 2, 3] with the usage of hydraulic press EU 40 in laboratories of Faculty of Civil Engineering, VSB-Technical University of Ostrava.

The laboratory testing was carried out with set of 50 samples for each board thickness and nail diameter (25 and 35 mm).

Before fitting of the fastener, the test samples were conditioned to the constant weight (the results of two subsequent weighing procedures carried out in the interval of 6 hours did not differ of more than 0.01% of the test sample weight).

The value of samples moisture during the laboratory testing was 12% (measured with piercing moisture meter WHT 860) [5, 6, 7].

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