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Assessment of the connection properties of a prefabricated wooden sandwich panel under static and cyclic loads

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Abstract

This paper presents the results of a study assessing the resistance of a recently developed standing wood-based prefabricated sandwich panel. The work was carried out in the framework of a product test, and consisted in a total number of 154 tests upon several different configurations. The connections investigated were those involved in constituting the lateral force-resisting system for a wall assembly, namely the panel-to-sill connection and the vertical connection between panels. For some configurations the test were performed in both monotonic and cyclic condition in order to get information about strength and stiffness properties as well as ductility and energy dissipation capacity. The varied parameter within each configuration were the type of connector, screws and nails; their inclination, 90° and 60° degrees; and the material composing the sills, Solid Timber and Solid Wood Panels. The variation of the parameter allowed identifying which configuration yielded the best performances.

Keywords: Timber structures, cyclic tests, joints with mechanical fasteners, ductility, yielding, strength and deformation characteristics.

1. Introduction

During the last decade, timber buildings have become an attractive alternative to systems built with other materials as concrete, steel and masonry. Although the main reason of the increasing popularity of timber structural systems is related to the growing interest in sustainable building, timber products also have proven excellent performance in relation to speed of construction and an excellent capacity to withstand earthquakes loads.

The high demand for timber buildings have driven the industry to conceive an increasing number of engineered timber products. In this context, the role played by standards, specifying the test methods for timber structures, is very important.

The behaviour of a timber structure under lateral cyclic loads (e.g. wind and earthquake loads) mainly depend on the response of its connection systems, (as showed by several studies [1], [2]). Furthermore, joints and assemblages made with mechanical fasteners for load-bearing timber elements in seismic regions in Europe, need to be tested according to EN 12512 [3]. This is because information about properties as ductility, dissipation of energy and impairment of strength are needed in order to design according to EN 1998 [4]. Such parameters are determined from the analysis of the load-displacement curve of a destructive test.

The tested elements consist of two outer parallel-aligned multilayer solid wood panels. Wooden dowels are used to connect the outer layers to each

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