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ECONOMIC AND CONSTRUCTION ANALYSIS OF LIGHTWEIGHT MEMBRANES IN HOUSING IN TEMPERATE CLIMATES

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Abstract

Lightweight materials are more viable for use in invariably hot or cold climates than in temperate climates. However, it is possible to use lightweight construction systems and specifically membranes even in housing buildings in temperate climate areas, if their properties are well explored, allowing better environmental performance and cost effectiveness than conventional solutions. In the outer skin and in dividing elements, architectural membranes can be used as thermal regulators, for heating (promoting a greenhouse effect or insulating) and cooling (shading or even evaporative cooling). A lightweight prototype module is proposed and presented here.
Using this module as a reference, four construction solutions are compared in their economic aspects: a conventional heavyweight solution with hollow brick, a lightweight conventional solution with LSF technology, a lightweight solution in cross-laminated timber and a proposed lightweight solution with a membrane. Today's market is not ready for widespread building construction with lightweight solutions, although these present advantages such as the relative reduction of waste on the construction site, less time spent on construction, and at the same time lower transport and labor costs. The results shown in this paper allow us to conclude that, in the Portuguese context, the new solutions are economically competitive as concerns embodied energy and labor costs. In countries with higher wages, these alternative technologies using lightweight materials are more efficient and profitable. In Portugal, with growing consciousness of sustainability issues and more companies exploring these solutions, it is possible to achieve a high level of acceptance.

Key words: composite membranes, construction analysis, economic aspects, lightweight materials

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