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CLIMATE CHANGE : SOLUTIONS BY DESIGN

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TEXTILE MEMBRANES IN HOUSING – ADAPTATION TO TROPICAL CLIMATES

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ABSTRACT

Construction industry is responsible for a great portion of the environmental impacts in the world; some authors refer that these can be as high as 50% of the global impacts. The research for lower environmental impact constructive solutions, namely by the weight reduction is thus a main concern when the objective is to reduce the footprint of buildings, especially in urban areas. Textile membranes are usually used to cover big spans with complex geometries, using the special properties of the Hypar (Hyperbolic paraboloid). However it is possible to use membranes on small external façades and coverings, with low spans, as a junction of small Hypar modules, with still their mechanical special properties well explored, allowing a very small weight and thus a low environmental impact when compared to conventional façade and covering solutions, even those considered as lightweight, such as glass façades.

Apart from this, the research on membrane materials for thermal regulation allows extending its possibilities in order to fulfil contemporary demands of comfort, and these are especially adequate to tropical climates, where thermal mass is not a requirement for passive comfort. In the outer skin, architectural membranes are very appropriate to be used as passive systems for cooling (i.e. for shading or ventilation). A prototype based on this concept was developed in the School of Architecture, on Azurém Campus of the University of Minho, using small span membranes on façades and roof. This solution is presented in this paper from its mechanical and structural concept, as well as its embodied energy and thermal/lighting performance potentialities.

Keywords: Lightweight buildings, Passive cooling, Test-cells