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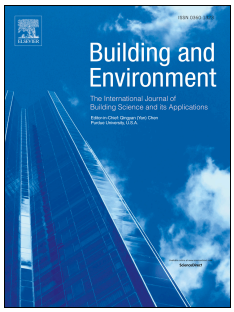

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Modelling of spatially and temporally-varying cavity pressures in air permeable, double-layer roof systems

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ABSTRACT

This paper discusses the development of an analytical model to simulate time-varying pressure distributions (Cp_i) in the cavity of air-permeable layer, double layer systems, given pressure data on the external surface (Cp_e). The model was derived considering the pressure drops associated with the flow through the gaps between panels, which is like an orifice flow, and the cavity flow between parallel plates. Thus, the model uses two primary equations: the unsteady discharge equation and the equation for unsteady flow between two parallel plates. The model accounts for several geometric parameters including the gap (G) between the panels, the height (H) of the panel above the airtight layer and the length (L) of the panels, as well as the loss coefficients for the orifice and cavity flows. The proposed model is able to capture the fluctuations of Cp_i and a good agreement is found between the numerical and experimental results for the mean, RMS and peak coefficients, to a great extent, when spanwise-averaged external pressure coefficients are used as input. For large gap to height ratios, (i.e., G/H = 12.5) the model accuracy decreases.

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