

Finite Element Modeling of Heat and Moisture Transfer in Porous Material

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Abstract : This paper presents a two-dimensional model to study the heat and moisture transfer through porous building materials. Dynamic and static coupled models of heat and moisture transfer in porous material under low temperature are presented and the coupled models together with variable initial and boundary conditions have been considered in an analytical way and using the finite element method. The resulting coupled model is converted to two nonlinear partial differential equations, which is then numerically solved by an implicit iterative scheme. The numerical results of temperature and moisture potential changes are compared with the experimental measurements available in the literature. Predicted results demonstrate validation of the theoretical model and effectiveness of the developed numerical algorithms. It is expected to provide useful information for the porous building material design based on heat and moisture transfer model.

Keywords : finite element method, heat transfer, moisture transfer, porous materials, wood

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