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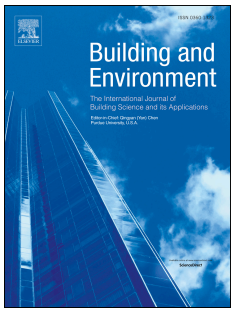

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N. Karagiannis, M. Karoglou, A. Bakolas, A. Moropoulou

PII: S0360-1323(16)30262-1

DOI: 10.1016/j.buildenv.2016.07.008

Reference: BAE 4563

To appear in: *Building and Environment*

Received Date: 18 March 2016

Revised Date: 12 July 2016

Accepted Date: 12 July 2016

Please cite this article as: Karagiannis N, Karoglou M, Bakolas A, Moropoulou A, Effect of temperature on water capillary rise coefficient of building materials, *Building and Environment* (2016), doi: 10.1016/j.buildenv.2016.07.008.

EFFECT OF TEMPERATURE ON WATER CAPILLARY RISE COEFFICIENT OF BUILDING MATERIALS

N. Karagiannis[1], M. Karoglou[1], A. Bakolas[1*], A. Moropoulou[1]

[1] Dept. of Materials Science and Engineering, School of Chemical Engineering, National Technical University of Athens, Zografou Campus 15780, Athens, Greece

[*] tel:+30210772715, fax:+302107723215, email: abakolas@mail.ntua.gr

ABSTRACT

The presence of water is one of the main decay factors in buildings. Capillarity is the most usual mechanism of water penetration into building materials in liquid phase. Free capillary water uptake experiment, utilized for the estimation of the capillary rise coefficient A_w, a crucial hygrothermal materials property, is widely used for the characterization of building materials.

The main aim of this work was to investigate the effect of temperature on the capillary water absorption coefficient. Different categories of building materials such as stones, bricks and mortars of various compositions, for three different levels of air temperature (20, 25 and 30 °C) were studied. A linear dependence of the capillary water absorption coefficient with temperature was found for all examined materials, however with different slope values for each material. In order to assess the validity of the linear dependence of the capillary water absorption coefficient on the temperature, capillary rise experiments were performed at the temperature of 15^{o}C and a very good agreement between experimental and predicted values of the A_w was obtained. Finally, other models correlating the capillary water absorption coefficient A_w with temperature suggested by other researchers were evaluated.

KEYWORDS

Building materials, capillary rise, temperature, sorptivity.

INTRODUCTION

The role of water in the mechanism of deterioration of porous building materials has been recognized from ancient times [1]. Water enters building materials in water or vapor phase but the major moisture transfer mechanisms are at liquid phase [2]. Water penetrates into a building material's pores with several ways. Potential sources of water are: the ground, the environment (rain, sea, water vapor etc.), possible water sewage leakages, use of water for the production of building materials, interventions with the use of extensive quantities of water, salts' hygroscopicity etc. [3-5]. The most common way by which ground water can rise into the pore structure of a building material is by force of capillarity. Capillary rise is, by definition, the upward vertical movement of ground water through a permeable wall structure causing the appearance of rising damp into the structure.