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EFFECT OF TEMPERATURE ON WATER CAPILLARY RISE COEFFICIENT OF BUILDING MATERIALS

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8 ABSTRACT

9 The presence of water is one of the main decay factors in buildings. Capillarity is the most 10 usual mechanism of water penetration into building materials in liquid phase. Free capillary 11 water uptake experiment, utilized for the estimation of the capillary rise coefficient A_w , a 12 crucial hygrothermal materials property, is widely used for the characterization of building 13 materials.

The main aim of this work was to investigate the effect of temperature on the capillary water 14 absorption coefficient. Different categories of building materials such as stones, bricks and 15 mortars of various compositions, for three different levels of air temperature (20, 25 and 30 16 °C) were studied. A linear dependence of the capillary water absorption coefficient with 17 temperature was found for all examined materials, however with different slope values for 18 19 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 20 temperature of 15°C and a very good agreement between experimental and predicted values of 21 the A_w was obtained. Finally, other models correlating the capillary water absorption 22 coefficient A_w with temperature suggested by other researchers were evaluated. 23

24 **KEYWORDS**

25 Building materials, capillary rise, temperature, sorptivity.

26 INTRODUCTION

The role of water in the mechanism of deterioration of porous building materials has been 27 recognized from ancient times [1]. Water enters building materials in water or vapor phase but 28 the major moisture transfer mechanisms are at liquid phase [2]. Water penetrates into a 29 building material's pores with several ways. Potential sources of water are: the ground, the 30 environment (rain, sea, water vapor etc.), possible water sewage leakages, use of water for the 31 production of building materials, interventions with the use of extensive quantities of water, 32 33 salts' hygroscopicity etc. [3-5]. The most common way by which ground water can rise into 34 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 35 causing the appearance of rising damp into the structure. 36

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