Pergamon

Cement and Concrete Research, Vol. 26, No. 6, pp. 861-868, 1996
Copyright © 1996 Elsevier Science Ltd
Printed in the USA. All rights reserved
0008-8846/96 $15.00 + .00

PII S0008-8846(96)00068-3

CEMENT-LIME MORTARS JOINING POROUS STONES OF MASONRIES ABLE TO STOP THE CAPILLARY RISE OF WATER

A. Colantuono*, S. Dal Vecchio*, O. Marino, G. Mascolo* and A. Vitale****
*Dipartimento di Ingegneria Industriale, Universita' di Cassino,
Via Zamosch 43 03043 Cassino (FR), Italy.
**Dipartimento di Ingegneria dei Materiali e della Produzione,
Università di Napoli 'Federico II', Piazzale Tecchio 80125 Napoli, Italy.

(Refereed)
(Received January 29, 1996; in final form April 9, 1996)

ABSTRACT

The capillary rise of water in porous stones of masonries can be stopped by interleaving appropriate cement-lime mortars between the building stones. The type of cement in the mortar influences the time requested for the formation of an impermeable lime layer, responsible of the phenomena.

Introduction

The decay of porous stones of masonries is frequently observed on ancient monument. Among the weathering factors, the water movement inside the porous material represents one of the main causes of alteration (1). Such a movement involves wetting and drying cycles with corresponding, not negligible, expansion and shrinkage phenomena that may lead to mechanical stresses. The presence of soluble salts in the moving water causes corresponding salts dissolution-crystallization cycles in the masonry that produce additional mechanical stresses with consequent stones deterioration (2,3).

The presence of water at the base of a masonry, responsible for the capillary rise, can be due to the rain or to the contact with water-bearing stratum. In this case, a vertical transport of water along the wall takes place. It involves a deterioration of a more or less wide band of the masonry located at a certain level respect to the ground (1).

Such a phenomenon represents a serious and hardly solved problem. Recently, cement-lime mortars joining tuff stones, volcanic and porous rocks of central-southern Italy, employed as building stones since ancient times (4,5), have been proved to form an impermeable layer of lime at tuff-mortar interface, able to stop the capillary rise of water (6). Therefore a research has been undertaken to study the role of both the content and the type of cement utilized in cement-lime mortars on the stopping the above mentioned phenomena.

Experimental

The tests were performed by using three different cements complying with the CEN UNI ENV 197-1 Standard, namely a Portland cement type I 32.5, a pozzolanic cement type IV/B 32.5 and