Materials and Structures (2016) 49:2935–2946
DOI 10.1617/s11527-015-0696-1

ORIGINAL ARTICLE

The scale effect on small-scale modelling of cement block masonry

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Received: 21 February 2015 / Accepted: 8 August 2015 / Published online: 14 August 2015

Abstract This paper discusses the effect of scale on the structural behaviour of cement block masonry under various loading condition. A real scale model test makes possible to obtain data similar to real structures. Financial and practical restrictions on testing real scale models, reduced scale modeling becomes popular to understand the overall behaviour of the structure. But, when the reduced scale model used for testing, the scale might have affected its mechanical properties. Therefore, it is important to understand these changes in order to draw correct conclusion on the prototype behaviour. In general, this study was aimed at understanding of the scale model behaviour of masonry by testing masonry components to determine the masonry properties, looking at a comparison of masonry behaviour at prototype and scale models. The performance of four different scale cement masonry was evaluated. Water absorption, compressive strength of cement block, and compressive, shear and flexural tensile strength of masonry prism were measured on each type of scale model. These mechanical properties are used as indicators of potential performance in masonry. Test results show that; apart from the compressive strength of masonry which not significantly influenced by the scale, all other tested properties, namely; water absorption rate, porosity, shear strength and flexural bond strength seemed to be significantly influenced by the scale.

Keywords Cement block masonry · Reduced scale · Scale effect · Material strength

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1 Introduction

Tests on masonry structures become necessary due to several reasons such as;

- To understand the structural behaviour of masonry structures under extreme natural events like windstorms, floods, earthquakes etc.
- To assess and may be strengthened existing historic masonry structures

A prototype model test makes possible to obtain data similar to real structures. However, financial and practical restrictions have been a major problem in experimental studies. In structural engineering, the relatively large size is a critical issue, not only due to limitations of space and construction cost, but also due to limited capacity of loading devices [11]. A resolution to this problem reduces scale modeling of structures, in which the dimensions of a specimen are reduced by a scale proportionally. Recently, structural tests of scaled models become larger and