

Research Article

Prediction of Compressive Strength of Stabilized Earth Block Masonry

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The present study investigates the compressive strength of cement-stabilized earth block masonry prisms with a number of masonry units and joint layer mortar combinations. The compressive strength of masonry was determined to be performed by uniaxial tests on 144 masonry prisms. The simple relationship has been identified for obtaining the compressive strength of stabilized earth block masonry from their corresponding block and mortar compressive strength. The predicted compressive strength of masonry prisms using the proposed expression is compared with 14 empirical equations and experimental data of past research available in the published literature. The compressive strength predicted by the expression proposed in the present study was found to be in good agreement with corresponding experimental data compared with other empirical equations available in the published literature.

1. Introduction

Locally available masonry units made with different materials and various manufacturing processes are being used for masonry construction. In the last couple of decades, there has been a focus on the use of cement-stabilized earth blocks as low-cost housing construction in developing countries [1]. Furthermore, in recent times, there has been an attention to the use of stabilized earth block masonry for construction of low story building due to the scarcity of river sand. Stabilized earth blocks exploit the use of local soil, whilst providing comfortable thermal and acoustic insulation properties [2]. Despite these advantages, however, the use of cement-stabilized earth blocks is restricted by limited understanding of some basic material properties and a lack of appropriate building standards. Although construction using cement stabilized earth block masonry has been practiced for sometimes, the exact behavior of this type masonry structures is yet to be understood completely.

Determining the compressive strength of masonry is a major requirement for structural design. Although the compressive behavior is well studied for brick masonry and

cement block masonry, there continues to be a scarceness of the literature on the performance of stabilized earth block masonry. Also, the information available on the determination of compressive strength of cement block or brick masonry may be inadequate for the determination of stabilized earth block masonry. Masonry compressive strength can be measured experimentally; however, the tests are intense in material and labor. This leads to a search for empirical relations to predict masonry strength based on properties of masonry units (brick or block) and mortar used for joint layers, because brick, block, and mortar strength can be collected from the manufacturer or low-level laboratory testing.

The literature reveals that cement-stabilized earth block masonry generally consists of blocks, which are relatively weak and soft as compared to the mortar adopted. Cement stabilized earth blocks are found to have compressive strength in the range of 2–6 MPa and it is also observed that the compressive strength of cement mortar (1:6) adopted for the construction of masonry in developing countries is higher than that of the blocks [3]. The present study is aimed at predicting the empirical expression for stabilized earth