Novel Non-destructive Apparatus for Measuring Blocks Porosity

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Abstract
Not much information is available in the literature on measurement porosity of the bricks or any other porous solid blocks using non-destructive method. A novel, simple, small apparatus has been designed, fabricated, calibrated and tested for the determination of porosity which takes into account the gas leakage through porous blocks such as bricks. The measurement protocol was documented and the data collected were analyzed to characterize the permeation of air at room temperature through porous blocks. The proposed device consists of piston-cylinder arrangement that includes a compartment to place the sealed test specimen. The design was catered to reduce the gas leak in the radial direction, however in the event that it still happens, the device is capable of detecting and measuring it. The Carman-Kozeny equation was applied to estimate the porosity and the results were found to be comparable to those of standard porous packed beds. It was proven that proposed apparatus was capable of measuring the porosity of brick for engineering purposes.

Keywords
Porosity measurement, cell design, gas penetration, permeable materials, and Carman-Kozeny equation

1 Introduction
Measurements of a material's porosity can be categorized into two categories namely; destructive and non-destructive.
In destructive method, tests are carried out to the specimen's failure. Destruction of the test object usually makes this method more costly compared with the non-destructive