INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	Amit Raj
Roll Number	:	156103044
Programme of Study	:	Ph.D.

Thesis Title: Strength Enhancement of Autoclaved Aerated Concrete (AAC) Block and its Masonry

Name of Thesis Supervisor(s)	:	Prof. Uday S. Dixit and Dr. Arun Ch. Borsaikia
Thesis Submitted to the Department/ Center	:	Mechanical Engineering
Date of completion of Thesis Viva-Voce Exam	:	22-12-2020
Key words for description of Thesis Work	:	AAC · Manufacturing · Shear bond strength· Compressive strength ·Finite Element Method · Building material · Concrete

SHORT ABSTRACT

Autoclaved Aerated Concrete (AAC) is a light-weight building-construction product of fly ash, sand, water, cement, lime and aluminum powder, which is used globally for brickwork. The available AAC blocks have smooth surfaces, due to which they have less bond strength than traditional clay bricks. In this work, first, the mechanical properties of AAC block and its masonry were investigated. A simple analytical model was proposed to evaluate the elastic modulus of masonry prism and was found to be in a close agreement with experiments. Two methods have been proposed to improve the shear bond strength of AAC block. In one method, grooves are introduced on the surface of AAC block akin to a frog in clay brick. With two grooves on the surface of AAC block, shear bond strength enhanced by about 46% without having any adverse effect on the compressive strength. An analytical model was developed to explain the phenomenon of strength enhancement. In the other method, the bond strength in the masonry was enhanced by cement-coating the bonding surface before the application of the mortar. To assess the method, the bond strength (both tensile and shear) of AAC block-mortar interface made of ordinary sand-cement mortar of different compositions and polymer modified mortars (PMM) was studied Afterwards, the block surfaces were coated with a 0.6–0.8 mm thick cement-slurry before applying a 12 mm thick sand-cement mortar. A cost analysis was also carried out to see the impact of cement coating. Considering the bond strength as well as cost, using a lean mortar (cement to sand ratio by weight of 1:6) along with cement-slurry coating was found to be superior to the ordinary sand-cement mortar and polymer modified mortar. A finite element model was developed to assess and analyze the experimental findings. The finite element micro-modeling, governed by plastic-damage constitutive relation in tension and compression, along with cohesive zone, was used to model the AAC block and mortar. A good agreement between experimental and computational results was obtained; however, a detailed analysis is still needed. The proposed methods were found to be effective in enhancing the shear bond strength in the masonry. The method of applying cement coating has been found more effective out of the two methods.