Visveswaraiah Technological University, Belgaum

A

Project Report

On

"GEOPOLYMER BRICKS BY USING NATURAL SAND AND LATERITIC SOIL"

(SPONSORED BY KSCST, BANGALORE)

Submitted to Visveswaraiah Technological University, Belgaum in the partial fulfillment of the requirements for the award of Degree of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

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2009-2010

ABSTRACT

The locally available masonry material such as clay burnt bricks, solid concrete blocks, hollow blocks etc. are being used for the construction of masonry. But the quality of these masonry materials in terms of compressive strength and water absorption is not satisfactory. The reason for this is lack of technological know how in their manufacturing process. Here an attempt is made to develop good quality bricks for construction activity using geopolymer mortar.

Since the good quality fly ash is available from near by thermal power station at Raichur, also laterite soil is also available near by Bidar district and locally available river sand. Using these available resources an attempt is made to develop mix design methodologies to arrive at final mix proportions for bricks that leads to lowest cost maintaining the good quality of bricks.

In order to prepare geopolymer brick using natural sand and laterite soil number of trial test bricks were cast varying the different parameters such as molarity, fly ash to sand ratio, fly ash to soil ratio, alkaline liquid to fly ash ratio, sodium hydroxide to sodium silicate ratio, curing temperature, method of curing. All these parameters will have influence on the properties of geopolymer brick. Therefore it is necessary to optimize these parameters so as to get good quality and compressive strength of brick. Different parameters were finalized based on the trial tests such as 18 and 16 molarity, fly ash to sand ratio 1:4.5, fly ash to soil ratio 1:4, alkaline liquid to fly ash ratio 0.30 and 0.35, sodium hydroxide to sodium silicate ratio 1:2.5 and 1:2, curing temperature 75^0 C and 65^0C and steam curing method for geopolymer mortar bricks and geopolymer lateritic soil bricks respectively.

The compressive strength of geopolymer mortar brick (70.99kg/cm^2) and geopolymer lateritic soil brick (47.6kg/cm^2) which is higher than the locally available clay brick (15.3kg/cm^2), where as is nearly same to that of mortar brick (68.47kg/cm^2). The water absorption of geopolymer brick is same (6.08%) is irrespective of durability of immersion under water (maximum duration of immersion is 28days). Where as clay brick water absorption increases with duration of immersion (18.77% to 27.9%) but for mortar brick water absorption is same with increase in duration of immersion (7.24%). Geopolymer mortar

brick (70.99kg/cm^2) and Geopolymer lateritic soil brick (52.27kg/cm^2) has maintained its compressive strength even after an exposure to a temperature 50^{0}C for a period of 28days, clay brick and mortar brick also maintain the same compressive strength. In case of alternate wetting and drying test of geopolymer mortar bricks and geopolymer lateritic soil bricks have maintained same water absorption and compressive strength. But clay brick and mortar brick have indicated lower compressive strength at 28days but they have maintained the same water absorption.

All the four bricks, have maintained the compressive strength for 1day oven heating and 1day room temperature is continued for 8days.