

**H.K.E. Society's
Poojya Doddappa Appa College of Engineering
Gulbarga - 585 102.**

***(An Autonomous Institution, Affiliated to
VTU, Belgaum, and Approved by AICTE)***



**A
PROJECT REPORT
ON**

“COST OPTIMIZATION OF GEOPOLYMER BRICKS”

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(An Autonomous Institution, Affiliated to VTU Belgaum, and Approved by AICTE)
In partial fulfillment for the award of degree of*

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ABSTRACT

The objective of the present work is to evaluate the locally available masonry materials such as clay bricks and mortar bricks. The quality of these masonry materials in terms of compressive strength and water absorption is not satisfactory. Therefore to provide good masonry materials with good compressive strength and low water absorption, an attempt is made to prepare geopolymer lateritic soil and mortar bricks and compare with the locally available masonry material in terms of strength and cost.

In order to achieve the desired objective number of trial castings were carried out. chapter 4 deals with the details of trial casting. Initially trial castings were carried out keeping the molarity of sodium hydroxide solution as 16, ratio of sodium hydroxide to sodium silicate as 1:2, alkaline solution to fly ash ratio as 0.35, steam curing temperature of 65°C and dosage of superplasticizer as 4% by weight of fly ash. Depending on the results of trial casting and cost of geopolymer bricks, the molarity of sodium hydroxide solution varied from 16M to 10M and alkaline to fly ash ratio varied from 0.35 to 0.3, remaining parameters were kept constant.

For the initial trial using flyash to lateritic soil ratio of 1:4 trial mix were cast and the compressive strength obtained was 2.174 N/mm² which is slightly lower than locally available clay bricks. Reason for this is that moisture was observed on the bricks after taking out from curing tank. Therefore to overcome this problem bricks were exposed to laboratory environment, after steam curing for a period of two days and the encouraging results were obtained i.e., 2.77 N/mm² which is equal to or slightly higher than the clay bricks i.e., 2.623 N/mm². But this method will consume more time therefore to reduce this delay (two days exposed to environment for drying) bricks were covered with polythene bags to avoid the contact of moisture with the bricks during steam curing and the compressive strength results are quite good i.e., 3.060 N/mm² which is higher than the locally available clay bricks.

An attempt is also made to study the effect of prior heating of soil and using it in the preparation of bricks, this method resulted in poor strength and it is discarded. Another attempt is made for improvement in strength of geopolymer lateritic soil bricks by part replacement of flyash by silica fume. This has resulted in strength lower than the locally available bricks therefore replacement of silica fume by fly ash is discarded.

To study the effect of change in proportion, the fly ash to lateritic soil ratio was changed from 1:4 to 2:2, compressive strength obtained in this case is 3.94 N/mm^2 which is higher than the previous trial casting results and also higher than locally available clay bricks.

Using flyash and soil alone made the stiff and water is required to be added to achieve the desired workability. To reduce the water addition and increase the workability few more trials are carried out replacing soil by sand i.e., 5%, 10%, 15% and 20% in both the mixes i.e., 1:4 and 2:2. This has resulted reduction in water and maintain workability and improvement in strength also. Above trial casting were carried out for two curing regimes one is steam curing another one is sundry. Results of this trial casting are presented in chapter 4.

Using the finalized mix proportions mix design is carried out to decide the ingredients of geopolymer lateritic soil and mortar bricks. Using these fixed proportions bricks were cast, cured and testing for durability and brick prism strength. The details of mix design casting, curing and testing is presented in chapter 5.

The results of durability test and brick prism strength are presented in chapter 6 along with results and discussion and it is observed that both geopolymer lateritic soil brick and mortar brick are durable compare to local brick, and brick prism strength of geopolymer lateritic soil and mortar bricks are higher than locally available mortar and clay bricks.