

COMPARATIVE STUDY ON THE COMPRESSIVE STRENGTH AND PRODUCTION COST OF HOLLOW CONCRETE BLOCK (HCB) WITH AND WITHOUT RED ASH IN TEPI TOWN, ETHIOPIA

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ABSTRACT

Construction materials in construction and technology focuses improving the quality, cost, ease of using materials in different form, increasing performance and so on. But if improving cost is considered, quality should not be compromised. The culture of using alternative ingredients to produce materials is weak in Ethiopia. The main objective of this study was to compare the compressive strength and production cost of hollow concrete blocks with and without red ash in Tepi Town. Specifically, it focused in determining the compressive strength of both blocks, to compare the cost of production and to determine the optimum replacement of red ash for crushed aggregate. According to this study, the HCB without red ash achieved 3.72Mpa mean compressive strength and the HCB with 30% red ash achieved 3.60Mpa mean compressive strength. The optimum replacement was obtained at 30% red ash. The production cost of all HCBs with red ash was found lower than the HCB without red ash. According to the weight comparison made, the HCBs with red ash were found lighter than HCB without red ash. The hollow concrete block with red ash in this study has achieved a better cost reduction in production cost, higher reduction in weight and a smaller reduction in compressive strength than hollow concrete blocks without red ash. The study further recommended to the micro and small HCB producers to increase the production of HCB with red ash, for the contractors and clients of Tepi Town to use this product instead of importing HCB.

Keywords- Compressive strength, crushed aggregate, hollow concrete blocks, production cost and red ash.

I. INTRODUCTION

Recently in Ethiopia, the introduction of different concrete blocks was carried out in the low- cost housing projects. This includes new hollow block size, u shaped blocks, reinforcement for columns inside of

the hollow blocks, combined strip- and slab foundation and others (GTZ, 2005). The key natural lightweight aggregates are diatomite, pumice, scoria, volcanic cinder, and tuff. Except for diatomite, all are volcanic in origin. Pumice and scoria are more widely used for hollow and solid concrete block production in Ethiopia (Abebe Dinku, 2005). The use of scoria (red ash) as a construction material will help conserve energy (as heat insulating material) and will provide low cost cement and lightweight concrete (Khandaker M. Anwar Hossain, 2006). And also the journal claims that the pozzolanic activity tests indicate that finely ground scoria is pozzolanically active and has cementitious characteristics to be used as cement additive. This experimental study was conducted by preparing two types of HCB test samples. The first test sample of HCB was produced by using mix proportion 1:3:2:1 of cement, sand, gravel 00 and crushed aggregate respectively as a control group. The second sample HCBs were produced with red ash by using cement, crushed aggregate and red ash (scoria). The ratio of cement to aggregate used was 1:6. Out of the six parts of aggregate, the aggregate was replaced with 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 100% amounts of red ash by volume.

II. MATERIALS AND METHODS OF RESEARCH

2.1. Study setting or area

This study was conducted in Tepi Town which is located at 609 km from Addis Ababa and found in southern part of Ethiopia in Sheka Zone, coordinates: 7° 12'N 35°27'E / 7.2000N 35.4500E, found at an altitude of 1,097m above sea level and a population of 19231

2.2. Sample size and sampling procedure

The sampling procedure needs to be conducted in order to select samples that are representatives for the



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