AN EXPERIMANTAL STUDY ON BEHAVIOUR OF HOLLOW FLY ASH CONCRETE BLOCKS AS A REPLACEMENT OF CONVENTIONAL BRICKS

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ABSTRACT: hollow fly ash concrete blocks have been utilized as a development material in numerous immature and creating nations. Hollow fly ash concrete blocks are set up without planning details and rules in the majority of the districts, by straightforward blending of fly ash, concrete and total in a customary way by nearby makers. Past investigations have indicated a huge variety in the mechanical properties of hollow fly ash concrete blocks gathered from various locales. In this examination, various procedures were utilized to improve the mechanical properties of Hollow fly ash concrete blocks. Concrete and fly ash were utilized to grow new blend plans. Results indicated a checked increment in the compressive quality of the recently fabricated Hollow fly ash concrete blocks as contrasted and the ordinary blocks. Other mechanical properties including the water retention and modulus of crack of the recently produced Hollow fly ash concrete blocks additionally improved.

Keywords : Hollow fly ash concrete blocks / Compressive Strength / Modulus of Rupture / Water Absorption / Mix Design Ratio

1. INTRODUCTION

Blocks have been generally utilized as development and building materials all around the globe for quite a while. Customary block creation by and large uses blends of muds and shale as crude materials, and requires the procedures of forming, drying and terminating at high temperature. Terminated mud blocks are for the most part development components used to make dividers of structures. The appeal of development of structures offers motivation to discover approaches to satisfy and to take care of the issues identified with the development. Huge numbers of the rustic block proprietors utilizes mud burrowed from their own property. Numerous investigations have announced that adjustment in mud substance cause change in mechanical properties of blocks. A large variation in the values of splitting tensile strength, modulus of rupture and absorption were also observed in different regions. For environmental protection and sustainable development, many researchers have studied the utilization of different waste materials (such as including fly ash, slags, construction and demolition waste, wood sawdust, cotton waste, pulp and paper production residues, boron waste, cigarette butts, waste tea, rice husk ash and crumb rubber) and other natural materials to alter the mechanical properties of conventional clay bricks. As per author's information, limited studies have been conducted by using waste materials and other natural available materials to enhance the mechanical properties of hollow fly ash concrete blocks manufactured in world. However, different kinds of waste materials and ashes such as ceramic waste and fly ash have been studied in the world. In this study, different techniques have been exercised to improve the mechanical properties of hollow fly ash concrete blocks by changing the mix design ratio. Aggregate, Cement and Fly ash is used to develop new mix design. The results (mechanical properties of newly manufactured hollow fly ash concrete blocks such as compressive strength, modulus of rupture, splitting tensile strength and water absorption capacity) were compared with previously published results of hollow fly ash concrete blocks with traditional method of construction from the central region with less satisfactory results of mechanical properties. It was found that proposed mix ratios are very effective to enhance the compressive strength and reduce the water absorption of the hollow fly ash concrete blocks as compared with original mixes.

2. OBJECTIVE

The main objective of this review paper is to investigate the compressive strength of hollow fly ash concrete blocks and compare with conventional bricks.

3. LITERATURE REVIEWS

Mohamed Vadel Bebana,Khadija Ziat, Nawal Semlal , Mohamed (20 November 2019) arranged the paper name was "Demonstrating compressive quality of Moroccan fly debris phosphogypsum geopolymer blocks" In study, two fake neural systems, in particular the multilayer perceptron and the spiral premise work systems, have been explored to preict the compressive strength.While building up the MLP or RBF models, 99 test perception were utilized for preparing and testing.Two assessment steps were performed. The frst step decided the successful number of concealed layers and neurons in each shrouded layer just as the proper enactment work in foreseeing the compressive quality. The subsequent assessment step assessed the precision with which the model would foresee the compressive quality of geopolymers. The MLP neural system with two concealed layers having 8 and 10 neurons and the hyperbolic digression initiation work was the best model for anticipating the compressive quality. Artifcial neural systems can be utilized as a dependable and exact strategy for assessing the boundaries of geopolymer materials.

Panuwat Joyklad, Nazam Ali, Qadeer Hussain (August 2018) they are readied paper name was "Execution of empty block made of fly debris, concrete and sand". In this investigation various strategies were utilized to improve the mechanical properties of CCI blocks. Sand, concrete and fly debris were utilized to grow new blend structures. Results demonstrated a stamped increment in the compressive quality of the recently made CCI block as contrasted and the first blocks. Other mechanical properties including the water retention and modulus of crack of the recently produced CCI empty blocks additionally improved.

K. Gourav, B. V. Venkatarama Reddy (June-July 2014) Fly ash is used for the manufacture of masonry units such as fly ash bricks and concrete blocks. This paper deals with results of an experimental investigation on the characteristics of fly ash-lime-gypsum bricks and their masonry. Review on the existing literature on fly ash bricks/blocks is presented. Characteristics (strength, absorption and durability) of compacted fly ash – lime bricks with and without gypsum additive were examined. Compressive strength, flexure bond strength and stress strain characteristics of fly ash brick masonry using four types of fly ash bricks and cementlime mortar were investigated. The results reveal that it is possible to achieve 8 – 10 MPa compressive strength in saturated state, reasonably low values of water absorption, good dimensional stability and durability characteristics for fly ash lime gypsum bricks using 10% lime and 2% gypsum, fly ash bricks of higher density can be produced using fly ash-sand mixture, instead of fly ash alone and fly ash brick masonry shows higher flexure bond strength when compared with that of burnt clay brick masonry.

Khairul Nizar Ismail, Kamarudin Hussin and Mohd Sobri Idris (31 March 2015) Fly debris is the finely isolated mineral buildup coming about because of the ignition of coal in electric producing plants. Fly debris comprises of inorganic, incombustible issue present in the coal that has been melded during ignition into a shiny, formless structure. Fly debris particles are commonly round fit as a fiddle and range in size from 2 μm to 10 μm. They comprise generally of silicon dioxide (SiO2), aluminum oxide (Al2O3) and iron oxide (Fe2O3). Fly debris like soil contains follow convergences of the accompanying overwhelming metals: nickel, vanadium, cadmium, barium, chromium, copper, molybdenum, zinc and lead. The compound arrangements of the example have been analyzed and the fly debris are of ASTM C618 Class F.

Mohammad Abushad, Misbah Danish Sabri(July 2017) Fly Ash is buildup material Produced by warm force plants is such a major natural danger. The examination report in this paper is completed to consider the use of fly debris in concrete as an element of concrete just as an added substance in order to give a naturally predictable method of its removal and reuse. Concrete in solid blend configuration is supplanted by fly debris as 0%, 10% 20% 30% ,40% half and most extreme quality in 30% for substitution of concrete. It is animated that substitution of concrete in any extents prior higher the compressive quality of concrete and later lower the compressive quality just as moderate its solidifying. And furthermore increment the usefulness and setting time of cement.

Marta Kosior-Kazberuk and Małgorzata Lelusz (14 october 2010) Based on trial outcomes, numerical models were expounded to foresee the improvement of compressive quality of cement with fly debris substitution rates up to 30 %. Quality of cement with various kinds of concrete (CEM I 42.5, CEM I 32.5, CEM III 32.5), following 2, 28, 90, 180 days of restoring, have been examined to assess the impact of expansion content, the hour of relieving and the sort of concrete on the compressive quality changes. The sufficiency of conditions acquired was confirmed utilizing factual techniques. The test aftereffects of chose properties of covers and solidified cement with fly debris are likewise included. The

investigation demonstrated that solid with fly debris is described by worthwhile material characteristics.

Alankrit Chokhani, B. S. Divakar, Archana S. Jawalgi, M. V. Renukadevi, K. S. Jagadish (14 feb 2018) Fly debris being one of the modern waste items represents a genuine removal issue. This paper presents a trial investigation of use of fly debris to deliver obstructs with changing extents and blend mixes. Creation of fly debris squares fundamentally comprise of fly debris and sand, with cementitious item as either concrete, lime or both, for example, fly debris sand-concrete, fly debris sand-lime and fly debris sand-concrete lime are utilized. Four distinct extents for every one of the blend mixes are tested. Compressive quality, water assimilation, Initial pace of retention, and dry thickness of fly debris squares are contemplated. The impact of fractional and complete substitution of concrete by lime is analyzed.

4. EXPERIMENTAL PROGRAM

4.1. METHEDOLOGY

In the current examination fly debris, total, concrete and water are utilized in a proper extent for the planning of blend. The total utilized is air dried, and sieved through 4 mm. Testing of concrete utilized is according to Bureau of Indian Standards for its fundamental properties, Fly debris utilized has explicit gravity of 2.10. Squares were given with different extents a role as underneath in Table 1.The size of the shape is 400*200*200 mm, utilized for the creation of empty fly debris solid squares. The arrangement procedure is included grouping, blending, and throwing of squares. Demoulding is finished by transforming the shape and evacuating it while squeezing the base plate. Materials are gauged by the individual blend extent and at first blended in dry condition. For wet blending of the materials like fly debris, total and concrete container blender is utilized. Sufficient measure of water is added to the uniform dry blend of square until required consistency is gotten. Measure of water added to the evaporate blend was to 18% by weight of square. It is guaranteed that relieving was done by saving squares in water for a base time of 28 days. Squares are tried for compressive quality, water retention, Initial pace of ingestion and dry thickness 28 days. Results and Discussions In the current examination an aggregate of 16 squares were tried for its physical and mechanical properties. The subtleties of test outcomes are introduced in Table 1 followed by a concise conversation. Compressive Strength of empty Fly Ash solid Blocks The compressive quality of fly debris obstructs for 28 days are given in Table 1. Fly debris substance of 20 % was seen as perfect for quality. Be that as it may, even this quality is satisfactory as a heap bearing structure square.

Figure – mold of hollow concete blocks

4.1.1. Cement: - cement is a substance used for concrete material that sets, hardens, and adheres to other materials to bind them together. Cement mixed with sand and gravel produces concrete. For cementitious binders, water is mixed with the dry powder and aggregate, which produces semi liquid slurry that can be shaped, typically by pouring it into a form. The concrete solidifies and hardens through a chemical process called hydration. The water reacts with the cement, which bonds the other components together, creating a robust stone like material.

4.1.2. Aggregates: - The aggregates used in the manufacture of blocks at the mixer or the mixing platform shall be clean and free from deleterious matter. Both gravel and crushed stone are generally acceptable for making good quality concrete.

4.1.3. Water: - The water used in the manufacture of concrete blocks shall be free from harmful ingredient to concrete or reinforcement, because it causes efflorescence in the blocks.

4.1.4. Fly ash: Fly ash is a fine powder formed by the power plant. For Portland cement concrete manufacture this is a supplementary cement material. When used with Portland cement, a supplementary cement content improves the properties of the hardened concrete by hydraulic or pozzolanic action.

5. RESULT

TABLE 1- VARIOUS TEST PERFORMED ON HOLLOW FLY ASH CONCRETE BLOCKS:-

MIX DESIGN	FLY ASH(%)	FCK AT 28 DAYS(N/MM2)	WATER ABSORPTION(%)	IRA(KG/M2/MIN)	DRY DENSITY(KN/MM3)
M1	0	13.47	3.82	2.39	17.86
M2	10	13.29	3.77	2.86	17.28
M3	20	13.77	2.99	1.8	18.75
M4	30	12.88	3.82	1.18	18.65

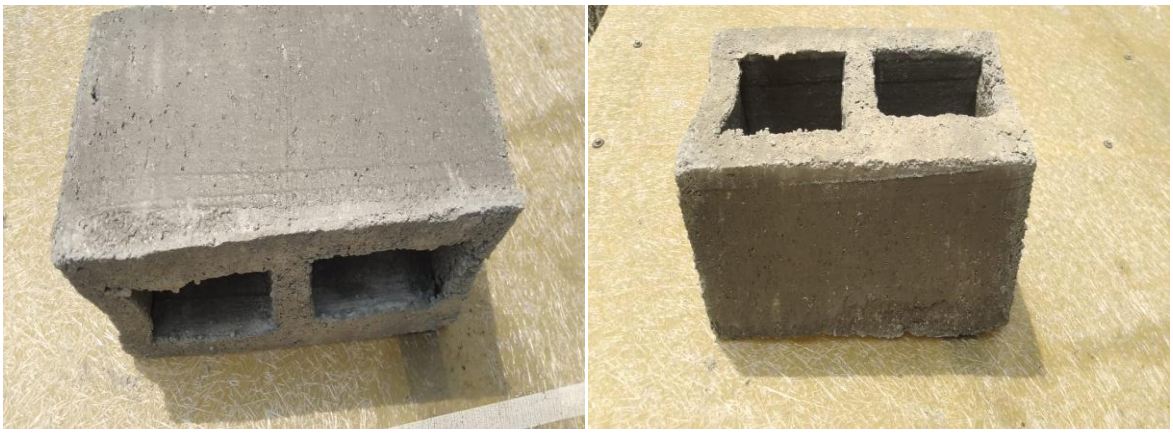
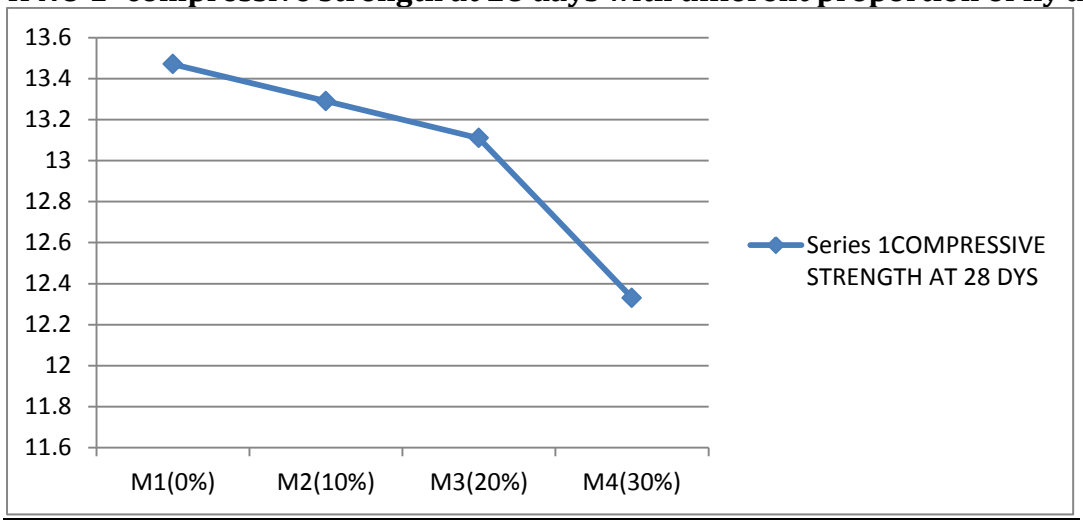
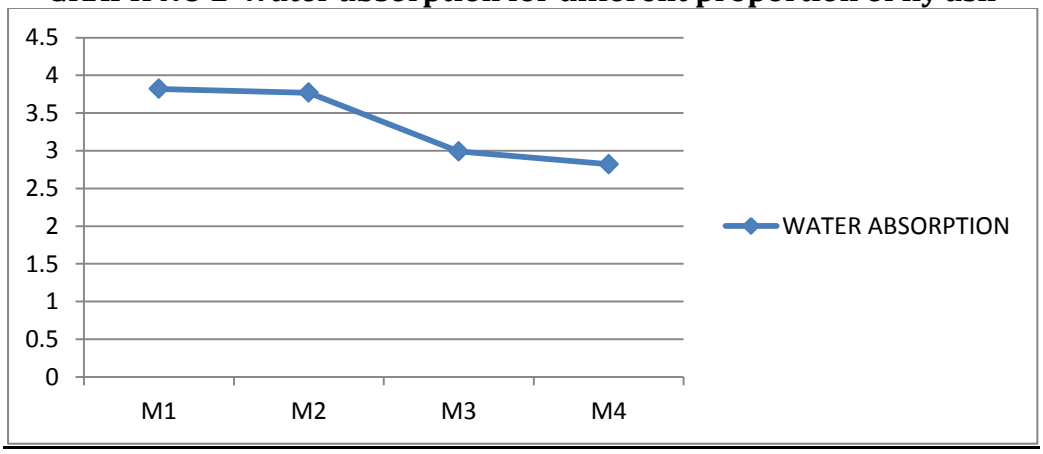


Figure-hollow concrete block of fly ash

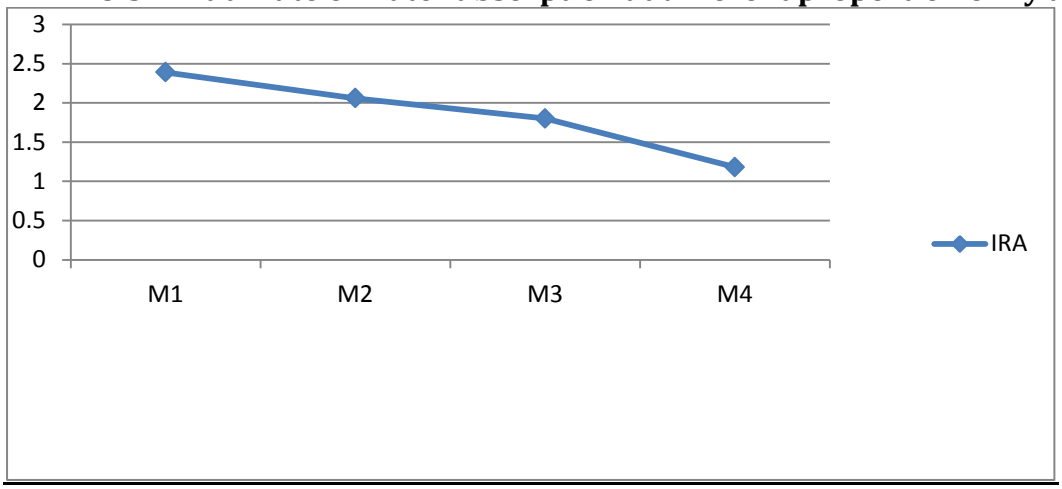
GRAPH NO 1- compressive strength at 28 days with different proportion of fly ash



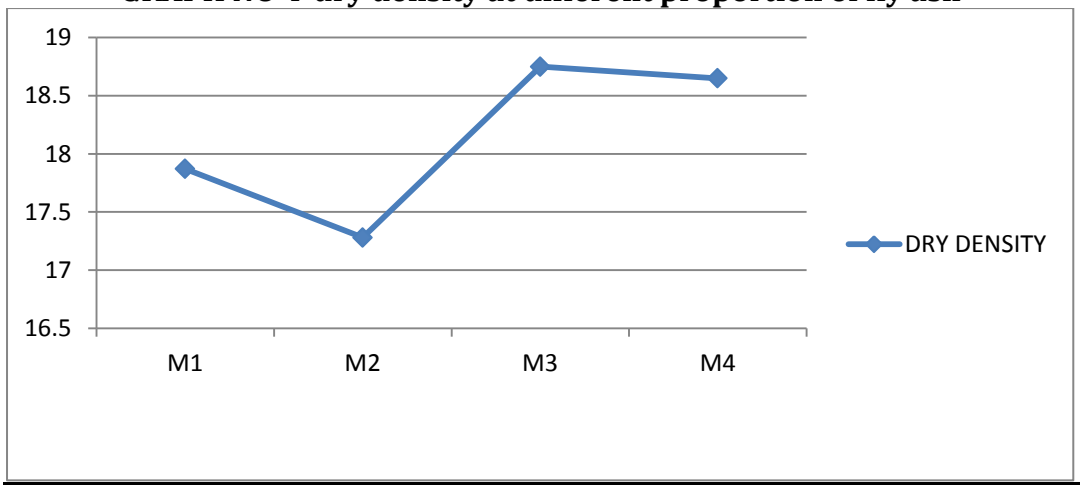
GRAPH NO 2-Water absorption for different proportion of fly ash



GRAPH NO 3- Initial rate of water absorption at different proportion of fly ash



GRAPH NO 4-dry density at different proportion of fly ash



6. CONCLUSIONS

In this study, the effect of fly ash, cement and aggregate on various property of hollow fly ash concrete blocks is experimently investigated. The standard tests were performed to determine compressive strength, water absorption, Initial rate of water absorption, Dry Density. Some conclusion are as follows:-

1. The compressive strength of blocks found to be enhance as compared to conventional bricks.
2. Water absorption of the blocks is reduced as compare to conventional bricks.
3. Dry density of blocks also increased with increase in fly ash content.

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