



STRENGTH AND PERMEABILITY PROPERTIES OF CONCRETE PROPERTIES BY USING RICE HUSK ASH, FLYASH AND EGG SHELL POWDER

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ABSTRACT

This analysis centers round the growth of the strength and permeableness attributes of concrete by optimum substitution of cement with joint magnitude relation of ash (FA) and Rice husk ash (RHA) with Synthesis Egg shell powder (ESP). 2 classes of ash like ash, rice husk ash with four distinct contents of fifty, 10%, 20%, 30%, and four-hundredth in terms of weight were performed for the substitution of cement and addition of a persistent five-hitter egg shell powder in each substitution. Initially we've got evaluated the physical and chemical attributes of ash, rice husk ash and egg shell powder. The restraints thought of for analysis enclosed compressive strength, rending tensile power, flexure force, water permeableness, sorptivity, total charge passed non-inheritable from swift chloride permeableness check(RCPT) and tempo of chloride particle diffusion according to the diffusion constant. However, assessment results accomplished underscore the purpose that strength and permeableness properties of concrete considerably jumping up to half-hour of cement substitution by combined syllable (15%), RHA (15%) with additive clairvoyance (5%), and after tends to drop with each supplementary accumulation of substitution outside this level.

Key words: ash, Rice Husk Ash, Egg Shell Powder, Compressive Strength, Sorptivity

I.INTRODUCTION

In India now a day, the idea of smart town is growing very quicker. As the principle emphasis is on inexperienced and sustainable improvement. Infrastructure is the simple arm and smart material is important to obtain that feat properly. Smart cloth is a one which offers higher results in low financial system. These commercial wastes are dumped inside the close by land and the natural fertility of the soil is spoiled.

Fly ash is the finely divided mineral residue as a consequence of the combustion of floor or powdered coal in electric strength generating thermal plant. Fly ash is a useful mineral admixture for concrete. Fly ash is a spinoff comprised of the combustion of coal in an electrical generation station. According to Design and Control of Concrete Mixtures (2010). Aluminous which cloth" chemically reacts with calcium hydroxide (CH) to shape composites having cementitious homes It affects many homes of concrete in both sparkling and hardened state.

Cement Industry is main in contributor in the emission of CO₂ in addition to using up excessive tiers of electricity sources inside the production of cement. By replacing cement with a cloth of pozzolanic function,

including the fly ash, the cement and the concrete industry together can meet the growing demand within the construction enterprise in addition to assist in decreasing the environmental pollutants. In well-known mortar is a combination of cement, first-class mixture and water, wherein, coarse aggregate is prevented. Although it is viable to reap benefits of using fly ash in mortar as in concrete, constrained studies has been finished in fly ash mortars. In the existing experimental investigation, the fly ash has been used to look at the effect on compressive and break up power on M25 and M40 grades of concrete

It is found that various have a look at reports have been added to mild as regards the assessment of character performance of Fly ash and Rice husk ash combined concrete. Nevertheless, there is a scarcity in admire of the study reports which targeted at the joint execution of fly ash and rice husk ash.

The underlying reason for the modern-day exploration is to exactly assess Fly ash, Rice husk ash (RHA) and Egg shell powder (ESP) chemically, physically and miner logically differentiated, to explore the feasibility in their employment as a cement substituting substance in the concrete enterprise Fly ash is the utmost popular pozzolan and is observed substantially carried out universally in concrete works. It is universally mentioned that the employment of satisfactory fly ash enhancements the qualities of mortar and concrete. Even though the porosity of the paste is improved resulting from the inclusion of fly ash, the common pore length receives decreased, ensuing in a minimal porous paste.

The interfacial domain of the interface among combination and the matrix additionally receives refined in view of the employment of the use of fly ash [9, 26]. It is envisioned that during India, the entire coal ash production passed 10 middle lots in 2010. With an eye fixed on scaling up the employment of fly ash, and to fine-song the belongings of concrete, numerous investigators have resorted to employment of massive volumes of Class F fly ashes in concrete. The supplementary pozzolanic agent from agriculture by means of-merchandise like rice husk ash (RHA) are emerging as warm topics of incessant research. Rice husk ash includes excessive silica substance in the shape of non-crystalline or amorphous silica. Hence, it's far a pozzolanic fabric which may be hired as additional cementitious gadgets. Rice husk is an agricultural the

rest derived from the outside covering of rice grains at some stage in milling manner. It incorporates 20% of the 500 million lots of paddy generated in the global Eggshells are agricultural throw away items constituted of chick hatcheries, bakeries, fast food eating places among others that may damage the environment and as a end result comprising ecological troubles/contamination which might need suitable remedy. In the ever hovering responsibilities to exchange waste to wealth, the performance of adapting eggshells to fine application constitutes a concept worth-accepting. It

is systematically acknowledged that the eggshell chiefly consists of compounds of calcium. Okonkwo has proficiently proposed that eggshell incorporates ninety-three.70% calcium carbonate (in calcium), 4.20% organic be counted, 1.30% magnesium carbonate, and zero.8% calcium phosphate. It is envisioned that more or less ninety million tones of chook egg are generated during the sector every 12 months. In India seventy seven.7 billion eggs are produced within the yr 2010-2011. Tamil Nadu, gathering a share of round 20 consistent with cent, is ranked 2nd with almost 2,000 core eggs created in the kingdom every yr. The subsequent in the listing of prominent egg producing states in India include Maharashtra, Haryana, Punjab and West Bengal. With this result in view, tests had been done in three levels as according to normal check approaches. In the initial degree, chemical composition, bodily tendencies, and categorization of Fly ash (FA), Rise husk ash (RHA) and Egg shell powder (ESP) had been performed. This comprised evaluation of regular steadiness, preliminary placing duration, concluding placing period and compressive strength of RHA combined cements. In the second stage, research on concrete specimens changed into performed. This consisted of experiments on compressive electricity, splitting tensile strength and flexural strength. In the 1/3 segment, coefficient of water absorption, sorptivity, resistance to chloride ion penetration and diffusion coefficient were estimated. All the checks were accomplished in triplicate and suggest values are recorded and communicated.

II.LITERATURE REVIEW

The cement has been the predominant building fabric in nowadays's construction because of its binding and high compressive strength homes. Beside this, it also

causes launch of greenhouse fuel carbon dioxide which causes international warming and other environmental issues. Previous researches accomplished by way of researcher's suggests that it enhances the corrosion resistance Capability of produced concrete with RHA and boom in compressive electricity. There search completed in past by using—

D.V. Reddy, Ph.D, P.E. (Professor and Director of the Center for Marine Structures & Geo technique) P.E, Department of Civil Engineering, Florida Atlantic University specifically on 10% and 20 % alternative have finished research with replacement of five%, 10%, 15%, 20% and decided the compressive, flexure strength and break up tensile strength of the hardened concrete.

D.V. Reddy, Ph. D, P.E. And Marcelina Alvarez, B.S unique, using RHA will no longer most effective concrete manufacturing of higher quality and low cost, however additionally reduce carbon dioxide (CO₂) emissions from cement manufacturing. The partial alternative of cement by using RHA will bring about lower electricity intake related to cement production. The capacity market for rice husk strength systems and equipment has been studied by Velupillai et al. (1997). The reference additionally addresses monetary development, urbanization, residing requirements, stricter environmental guidelines, and consolidation within the rice milling industry is the reduction of sure conventional uses balls, and creating new possibilities for using the envelope. He discusses the potential use of rice husk Ash (RHA) as a cementations fabric in concrete mixes. RHA is produced via burning rice husk which is a spinoff of rice milling. The ash content is about 18 to 22% by weight of rice hulls. Research has shown that concrete containing RHA in partial replacement of cement concentrations of 10% to 20% by means of weight of cement has superior overall performance traits as compared to normal concrete. In addition, the use of ORS would bring about are diction inside the price of concrete creation, and the discount of the greenhouse impact on the environment.

Mehta , P.K., give an explanation for the sturdiness of cement mortar in the presence of rice husk Ash (RHA). The strength and durability of mortar with one of a kind replacement stages (10%, 20% and 30%) of ordinary Portland cement (OPC) by means of the RHA is studied here. RHA turned into manufactured from an

out of control combustion manner. The take a look at samples have been organized with 2.73 FM rivers and. The samples have been saved in a managed surroundings to check time. There sults show that the addition of RHA has shown higher consequences for 20% alternative stage OPC 90 days. In the sturdiness test all samples handed for 20 cycles besides 25 percent replacement degree of 30%.

When the rice husk ash is converted with the aid of out of control combustion of typically from 3,000 to 4,500 C, the ignition has no longer been completed and the great amount of unburned carbon located inside the ensuing ash. The reactivity of the amorphous silica is without delay proportional to the surface area of the ash. Some studies papers discovers that now not most effective the temperature, but time is likewise a issue of burning rice husks to produce powerful. In the case of out of control burning combustion especially heap, the burning time is definitely dependent on the ambient environments temperature, humidity and wind pace. Now restrained research has been carried out once more with the rice husk ash collected from un managed combustion manner.

Ramakrishnan S, Velraj Kumar G, Ranjith S, provide an explanation for the conduct of concrete for pavement replacing distinct probabilities of ashes husk up by means of weight of cement for concrete best manage aggregate M40. To examine the effect of the rice hull ash (RHA) at the performance of numerous concrete parameters to produce an monetary concrete for rigid pavements. An strive was made to use the bending power of concrete reaches in the design of the inflexible floor which is extra than the resistance to bending approximately the vital IRC: fifty eight-2002. Test performed to study the impact of rice husk ash (RHA) at the performance of different concrete parameters to produce an economic concrete for inflexible pavements. The partial substitute of cement with RHA gives the equal flexural electricity of concrete which Is more essential for concrete pavements.

OBILADE, I.O. Summarizes the research on the homes of rice husk Ash (RHA) while used as a partial substitute of ordinary Portland cement (OPC) in concrete. OPC became replaced by RHA via weight to zero%, 10% and 20%. 0% substitute served as a manage. Compaction component take a look at become finished on sparkling concrete while the compressive electricity take a look at

turned into completed on 150mm hardened concrete cubes after 7, 14 and 28 days of curing in water. There sults revealed that the compaction component decreases as OPC percent substitute with RHA accelerated. The compressive strength of hardened concrete additionally reduced with growing substitution of OPC with the RHA. It is suggested that similarly studies be conducted to collect greater records approximately the relevance of partial alternative of OPC with the RHA in concrete

Rice Husk Ash (RHA), that is an agricultural by-product has been stated to be an amazing pozzolan through many researchers. Mehta and Perth (2000) studied using ORS to lessen the temperature in high electricity concrete mass and received outcomes showing that the RHA could be very powerful in decreasing the temperature of the concrete mass in comparison to OPC concrete. Malhotra and Mehta (2004) reported later that RHA sample with finer particle length OPC improves concrete houses, consisting of better amounts substitution outcomes in decrease water absorption values and the addition of RHA reasons an boom within the compressive power.

Dr.A.M. Pandel and S.G.Makarande particular, Rice Husk Ash used on this work become carried out within the laboratory by burning the ball using a furnace Ferro cement, incineration with temperatures not exceeding 7000 c. The ash was milled the use of mill Los Angeles 180, 270 and 360 mins, XRD evaluation become conducted to decide the shape of silica powder produced RHA samples. RHA samples have been analyzed by way of electron microscope to expose multilayer porous floor and micro RHA. Other materials used within the concrete mix were Portland cement, coarse mixture 20 mm maximum size, and sand mining 5mm most size as great aggregate. The fineness modulus of coarse mixture and nice aggregate were 2.43 and 4.61 respectively.

II. CONCRETE

Concrete is a composite material composed of exceptional and coarse aggregate bonded together with a fluid cement (cement paste) that hardens (treatment options) over time. Concrete is said to be the second substance maximum used inside the world after water, and is one of the most frequently used building materials. Its usage worldwide, ton for ton, is two times that of steel, wood, plastics, and aluminum blended. Globally, the equipped-blend concrete industry, the most important segment of the concrete marketplace, is

projected to exceed \$six hundred billion in revenue via 2025. This giant use outcomes in a number of environmental influences. Most extensively, the manufacturing method for cement produces big volumes of greenhouse gasoline emissions, main to internet eight% of global emissions. Other environmental worries encompass great illegal sand mining, impacts on the surrounding environment including expanded surface runoff or urban warmness island impact, and capacity public health implications from toxic elements.

III. CEMENT

A cement is a binder, a substance used for creation that units, hardens, and adheres to other substances to bind them collectively. Cement is seldom used on its own, but instead to bind sand and gravel (combination) together. Cement combined with first-rate combination produces mortar for masonry, or with sand and gravel, produces concrete. Concrete is the maximum widely used fabric in existence and is at the back of best water because the planet's maximum-ate up resource.

Cements used in construction are typically inorganic, regularly lime or calcium silicate based, which may be characterized as non-hydraulic or hydraulic respectively, depending on the capacity of the cement to set within the presence of water (see hydraulic and non-hydraulic lime plaster).

IV. FLY ASH

Fly ash is a quality powder produced as a product from commercial vegetation the use of Pulverized coal or lignite as fuel.

1. It is the most broadly used pozzolan siliceous or alumino siliceous in nature in a finely divided form.

2. They are round shaped "balls" finer than cement particles.

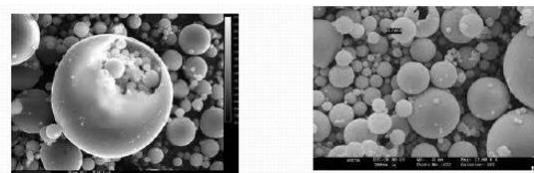


Fig 1: Fly ash

FLY ASH IN CONCRETE

1. Fly ash can be an highly-priced alternative for Portland cement in concrete and using it, improves energy, segregation and ease of pumping concrete.
2. The charge of substitution normally unique is no less than 1 to one ½ pounds of fly ash to 1 pound of cement.
3. Fly Ash debris provide a extra workability of the powder part of the concrete mixture which results in more workability of the concrete and a reducing of water requirement for the identical concrete consistency.

V.RICE HUSK



Fig 2: Rice Husk

Ash Durability is especially motivated by environmental exposure situation, freezing- thawing, touch to the aggressive chemical compounds, kind and satisfactory of constituent substances, water-cement ratio, workability ,form and length of member, degree of compaction, efficiency of curing, effectiveness of cover concrete, porosity and permeability.

During carrier lifestyles of systems, penetration of water and competitive chemical substances, carbonation, chloride ingress, leaching, sulphate assault, alkali-silica response and freezing-thawing are resulting deterioration .Loading and weathering inter link voids and micro-cracks found in transition region and community of same micro cracks gets linked to cracks on concrete surface which gives primary mechanism of the fluid delivery to interior of concrete. Subsequent boom of penetrability ends in easy ingress of water, oxygen, carbon dioxide and acidic ions and so forth into concrete ensuing cracking, sapling, loss at mass, power and stiffness.

VI.EGG SHELLS



Fig 3:Egg Shells

The US meals industry generates a hundred and fifty,000 heaps of shell waste according to year.[13] The disposal techniques for waste eggshells are 26.6% as fertilizer, 21.1% as animal feed elements, 26.Three% discarded in municipal dumps, and 15.Eight%.

Diversity Worm eggs

Nematode eggs gift a two layered structure: an external vitellin layer made from chitin that confers mechanical resistance and an inner lipid-rich layer that makes the egg chamber impermeable.

Insect eggs

Insects and different arthropods lay a big style of patterns and shapes of eggs. Some of them have gelatinous or pores and skin-like coverings, others have tough eggshells. Softer shells are on the whole protein.

VII.RESULT AND DISCUSSION

A.PH Value Mix Proportions

The quantity of chloride wanted for exciting corrosion is in part primarily based at the pH value of the pore water in concrete. At a pH fee within eleven.Five corrosion occurs inside the absence of chloride. At pH exceeding 11.5 a big quantity of chloride is important (28). Table.4 and Fig. Nine illustrate that the pH fee of combination ratio of RA1 to RA5 is at least value of rice husk ash concrete (M30) inside the domain of eleven.Three–eleven.7 Soundness Test for Mix Proportions "Soundness" suggests the functionality of a hardened cement paste to maintain up its volume after placing in the absence of belated growth. This grow this precipitated through surplus amounts of unfastened lime (CaO) or magnesia (MgO). Many of the Portland cement prerequisites restrict magnesia content and

boom. The cement paste isn't always to be subjected to enormous variations in quantity after it has fixed itself firmly. Anyhow, while redundant portions of unfastened CaO or MgO are there within the cement, those oxides can progressively hydrate and bring about boom of the toughened cement paste. Table 5 and Fig.10 show the stability cost of numerous blend ratio of RA0–RA5 11.5 it is desirable for decomposition in habiting concrete. R.N.Krishna (15) cleverly includes the ph.

TABLE I.

COMPRESSIVE STRENGTH OF FLY ASH, RICE HUSK AND EGGSHELLS MIX IN CONCRETE

PERCENTAGE (%)	28 DAYS (MPA)	56 DAYS (MPA)	90 DAYS (MPA)
RA0	26.7	36.7	40.2
RA1	27.4	38.25	41.9
RA2	28.3	39.5	43.23
RA3	30.25	41.4	45.28
RA4	27.75	37.74	42.00
RA5	25.5	37.03	39.15

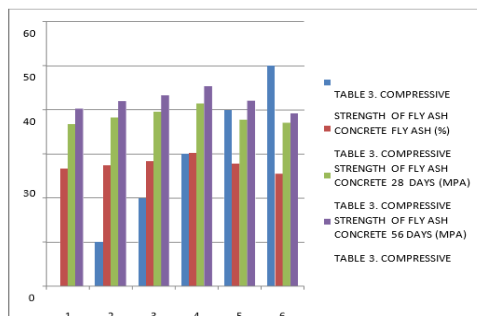
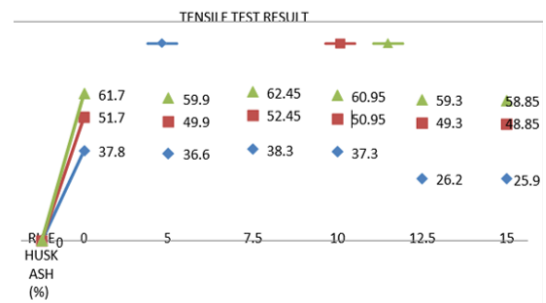


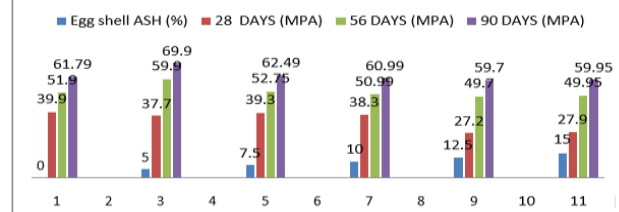
TABLE II

TENSILE TEST RESULT

PERCENTAGE (%)	28 DAYS (MPA)	56 DAYS (MPA)	90 DAYS (MPA)
RA0	3.78	5.170	6.170
RA1	3.66	4.990	5.990
RA2	3.83	5.245	6.245
RA3	3.73	5.095	6.095
RA4	2.62	4.930	5.930
RA5	2.59	4.885	5.885



EGG SHELL TENSILE TEST RESULT



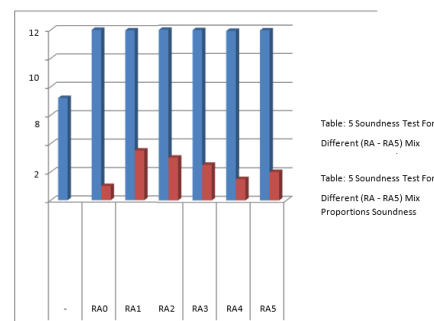
B. Soundness Test

Soundness is the percentage loss of cloth from an mixture combination at some stage in the sodium or magnesium sulfate soundness check. This take a look at, which is laid out in ASTM C88 and AASHTO T104, estimates the resistance of combination to in- carrier weathering. It may be finished on each coarse and fine aggregate.

TABLE: III

Soundness Test For Different (RA0-RA5) Mix Proportions

Mix designation	Symbol	pH Value	Soundness value(mm)
-	Water	7.2	
RA0	OPC	12	1
RA1	2.5FA2.5RHA5ESP	11.96	3.5
RA2	5FA5RHA5ESP	11.96	3
RA3	10FA10RHA5ESP	11.94	2.5
RA4	15FA15RHA5ESP	11.88	1.5
RA5	20FA20RHA5ESP	11.92	2



D. Ph. Test

C. Rapid Chloride Ion Penetration Test (RCPT)

In this experimental examine, Rapid Chloride permeability check (RCPT) became used to decide the resistance to penetration of chloride ions. This check determines the electrical conductance of the extraordinary grades of concrete mixes and affords a rapid indication of its resistance to the penetration of chloride ions

CHARGE PASSED (COULOMBS) CHLORIDE PERMEABILITY	
>4000	High
2000–4000	Moderate
1000–2000	Low
100–1000	Very low
<100	Negligible

PH TEST

TABLE 2:
MEASURED pH VALUES FOR VARIOUS CONCRETE MATERIALS

Material	Measured pH*
0.4 w/cm cement paste	12.71
0.4 w/cm mortar	12.69
0.4 w/cm concrete	12.62
0.55 w/cm concrete	12.49
Concrete with 15% fly ash (0.45 w/cm)	12.58
Concrete with 50% fly ash (0.45 w/cm)	12.37
Concrete from 20-year-old sidewalk	10.45

*All values are for sample size of 5 g (0.18 oz) and dilution ratio of 1:2.

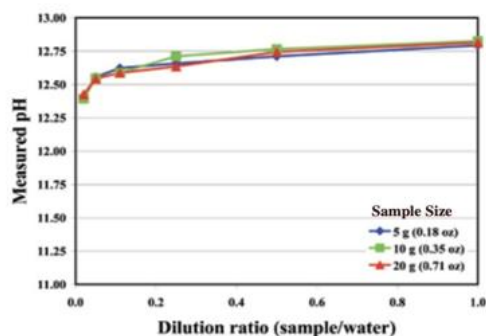
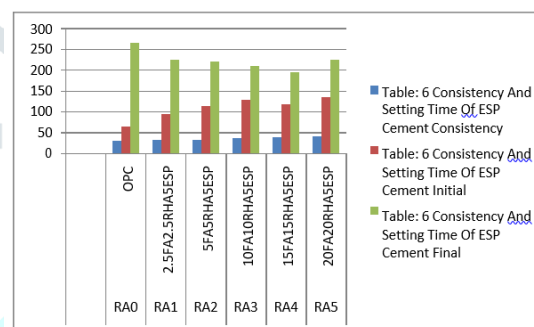


Fig. 1: Measured pH versus dilution ratio for cement paste with a 0.4 w/cm

RAPID CHLORIDE ION PENETRATION TEST (RCPT)



Table:17 Consistency And Setting Time Of ESP Cement				
Mix designation	Symbol	Consistency (%)	Initial	Final
RA0	OPC	31	65	265
RA1	2.5FA2.5RHA5ESP	33	95	225
RA2	5FA5RHA5ESP	33	115	220
RA3	10FA10RHA5ESP	37	130	210
RA4	15FA15RHA5ESP	39	119	195
RA5	20FA20RHA5ESP	42	135	225



VIII.CONCLUSION

The subsequent deductions had been constructed from the modern study: Rice husk ash (RHA) and Fly ash-F (FA) is a precious pozzolanic fabric loaded completely with unstructured silica content (87.65% and 53.68%) with a reasonably negligible diminution on ignition price. The Egg shell powder (ESP) incorporates 93.70% calcium carbonate (in calcium).

1. The combo portrayal of RA4 (15FA15RHA5ESP) improves the strength and permeability traits. These homes have been distinguished to ensure concrete to alternative concrete as follows: a) Around fifty six.Eight% decrease in Water permeability b) Approximately seventy five.Fifty five % decline in Chlorine penetration. C) Roughly forty nine % diminution in chloride diffusion The above elements of the resilience trends of substitute concrete are notably better to the OPC concrete. Hence support concrete homes result in an superior plan life

2. Compressive and tensile electricity improves with the boom in the share of Fly ash and Rice Husk Ash up to substitution with additive of Egg shell powder RA4 (15FA15RHA5ESP) of 7, 14, 28,fifty six and ninety days curing.

3. In the long term, our examine has exposed the reality that RA4 (15FA15RHA5ESP) may be dealt with as an best introduction in view of developed value of compressive power, water permeability, reduced chlorine penetration, superior corrosion inhabiting and perfect functionality

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