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Effect of Using Egg Shell Powder and Microsilica partially in Place of Cement in M25Concrete

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Abstract
Calcium wealthy egg shell could be a poultry waste withchemical composition nearly same as that of lime stone.Use of natural covering waste is also wont to replace cement byadding sure admixture which is able to improve theperformance. This experimental study aims to researchthe quality of egg shell powder as partial replacementfor cement (OPC 43) within the production of low-priced andlight weight concrete .This study investigates theperformance of concrete mixture in terms ofCompressive strength for seven days and twenty eight days, Flexuralstrength of beam twenty eight days and rending enduringness ofCylinder for twenty eight days severally of M-25 grade concreteat varied replacement levels of OPC by Egg shellpowder and a definite share of small silicon oxide as byweight of cement. Water-binder quantitative relation was unbroken constantfor all cases. These Concrete specimens were deep curedin water underneath traditional region temperature. On thebasis of result that partial replacement of cement in M-25concrete from Egg shell powder and small silicon oxide wasfound to extend altogether strength (Compressive, FlexuralTensile strength) and sturdiness of variationmix of concrete on all age compared to traditionalconcrete. Since it's economically viable thus its use ought tobe promoted.

Keywords: Egg shell powder, Micro silica, fine &coarse aggregates, cement (opc 43 grade), flexuralstrength, compressive strength, split tensile strength.

INTRODUCTION

A huge quantity of waste is generated from poultryfarm of Asian country. in line with a study covering wastegenerated in Asian country regarding 190000 tons every year.These egg-shells waste area unit non-biodegradable andmajority of covering waste is deposited as landfills.Egg-shell waste in landfills attracts vermin thanks toattached membrane in landfills, and causesproblems related to human health andenvironment. therefore this egg-shell waste is useless as alandfill material.Further throughout producing of one a lot of OPC associate degreeequal quantity of CO2are free into theatmosphere. The greenhouse gas emission acts as a silent killerin

the surroundings as varied forms. In thisbackdrop, the look for cheaper substitute to OPCis a required one.

LITRATURE REVIEW

Amual (2005)Carried out the practicalexperiment and reported that Egg ShellPowder (ESP) can be used as a supplement forindustry lime on an expansive clay soil andalso reported that the combination can be usedwhere high subgrade performance is notnecessary.Freire and Holanda (2006) Conductedinvestigation on egg shell waste and found outits use in a ceramic wall tile paste. Based onthe presence of CaCO3 in egg shell it can beused as a alternative raw material in theproduction of wall tile materials they Alsofound that egg shell can be used as an excellent alternative for material reuse and wasterecycling practices Lau Yih Bling (2010)Carried out the investigation in egg-shell andreported that foamed concrete were preparedby egg-shell waste which has reduce the costand time of project. 1 per cent and 5 per centEgg-Shell-Powder were used. From theinvestigation it is concluded that 5 per cent ofESCconsists of unstable compressive strengthand high flexural strength with increaseddensity when compared with control foamedconcrete which was 64% and 35%. In thisstudy it is proved that Egg-shell Concrete(ESC) can produce light weight concretewhich is more environment friendly andimproved properties**.**

MATERIAL USED

Materials utilized in project square measure the following; domesticallyavailable OPC cement of grade forty three was utilized in thiswork. Coarse & fine mixture and water were usedfrom near supply. The particular gravity (S.G) offine mixture (F.A.) and coarse mixture (C.A.)was found to be a pair of.65 and 2.7 severally.Egg shells from native hotels (near JLN Marg,opposite to Rajasthan University) were collected;Table shows chemical composition of egg shell &micro silicon oxide fume.The grinded egg shells were sieved through the ninetymicron sieve size and so packed to use it within thecement replacement.

EGGSHELL POWDER

Eggshell is wealthy in Ca and has identicalproperty as lime stone. As cement is expensive,difficult to get and have one amongst the drawbacks ofgenerating of carbon dioxide in great quantity. therefore this paperdescribes use of poultry covering waste as partialsubstitute of cement. Use of covering waste insteadof natural lime to exchange cement in concrete willhave profit like, minimizing use of cement,conserving natural lime and utilizing wastematerial. covering primarily contain Ca,magnesium, carbonate (lime) and supermolecule.

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Fig.1: Eggshell powder

Table.1: CHEMICAL COMPOSITION OF EGGSHELL

S.no	content	By %
1.	CaO	60-70
2.	SiO_2	15-25
3.	Al_2O_3	3-8
4.	Fe_2O_3	0.5-0.6
5.	MgO	0.1-4.0
6.	K_2O & Na_20	0.4-1.3
7.	SO_3	1.3-3.0
8.	Specific gravity	2.14

MICRO SILICA

Micro oxide, or oxide fume, is associate amorphous kindof oxide mud principally collected in baggage house filtersas by-products of the semiconducting material and Ferro-siliconproduction. small oxide contain trace quantity of serious metals oxides and organic deposits, whichoriginate from natural raw materials. Since theconcentration of those impurities is incredibly low. Theeffect of oxide fumes may be explained by 2mechanisms that's pozzolanic reaction and smallfiller impact.

Fig.2: Micro silica

Table.2: CHEMICAL COMPOSITION OF MICRO SILICA

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S.no	CONTENT	BY %
1.	SiO_2	90.21
2.	CaO	0.30
3.	Fe_2O_3	0.15
4.	Al_2O_3	0.12
5.	MgO	0.73
6.	Na_2O	0.46
7.	K_2O	1.53
8.	S.G.	2.2

Table.3: CHEMICAL COMPOSITION OF CEMENT

S.no	CONTENT	BY %
1.	CaO	50.7
2.	SiO_2	0.09
3.	Al_2O_3	0.03
4.	MgO	0.01
5.	Fe_2O_3	0.02
6.	Na_2O	0.19
7.	SO_3	0.57
8.	NiO	0.001
9.	SrO	0.13
10.	Specific gravity	3.12

TEST PROGRAM & RESULTS

Main objective of the current investigation wasto study performance of covering and small silicon dioxideconcrete in terms of strength with traditional watercuring and with chemical softener admixture inthe mixes. Performance of the concrete was assessed through: compressive strength, splittensile strength, flexural strength. The specimenswere tested for 7and twenty eight days. 3 specimenswere tested for every combine and for every solidification age,the mean values were rumored.

Mix proportioning

The mix proportioning for M25 grade concreteused in the present work. It is designed as per IS 10262-1982 standard.

Table.4:ADOPTED MIX PROPORTION

Cement	Fine aggregate	Coarse aggregate	Water
388.7 Kg/m^3	752.84 Kg/m^3	1126.01 Kg/m^3	186 liter
1	1.93	2.89	0.48

EXPERIMENT WORK

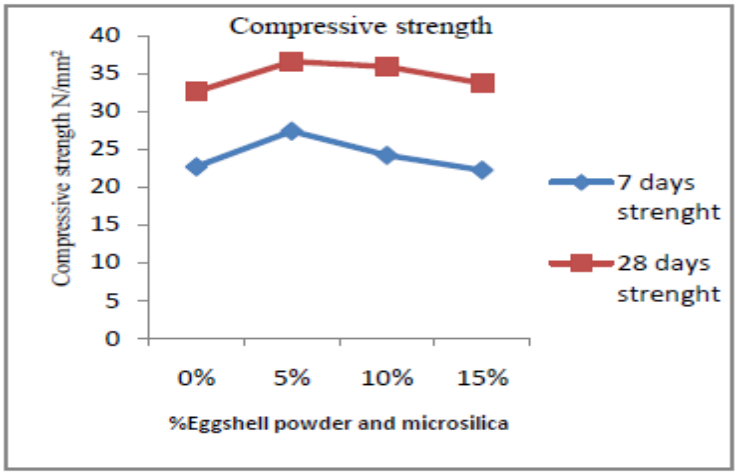
Determine of strength for M25 grade concrete,using OPC with 2.5%, 5%, and 7.5% of eggshell powder and microsilica each as a part replacement of cement.

COMPRESSIVE STRENGTH TEST

Compressive loading test on concrete wereconducted on a CTM of capacity 2000 KN.For the compressive strength test, loading rate of2.5kN/sec was applied as Per IS. 516-1959 [10].The test was conducted on 150*150*150 mm cubespecimen at 7 and 28 days.

$$\text{Compressive strength} = \frac{\text{Total compressive load}}{\text{Surface area of cube}}$$

Specifications	7 days	28 days
0%	22.63	32.58
2.5% ESP & 2.5% MS	27.34	36.57
5% ESP & 5% MS	24.15	35.87
7.5% ESP & 7.5% MS	22.17	33.72



SPLIT TENSILE STRENGHT TEST

Split tensile strength test as conducted inaccordance with ASTM C496 [11]. Cylinders of150*300 mm size were used for this test. The test specimen were placed between the two plates withtwo pieces of 3mm thick and approximately 25mmwide metal strips on the top and bottom of the specimen. The split tensile strength wasconducted on UTM.

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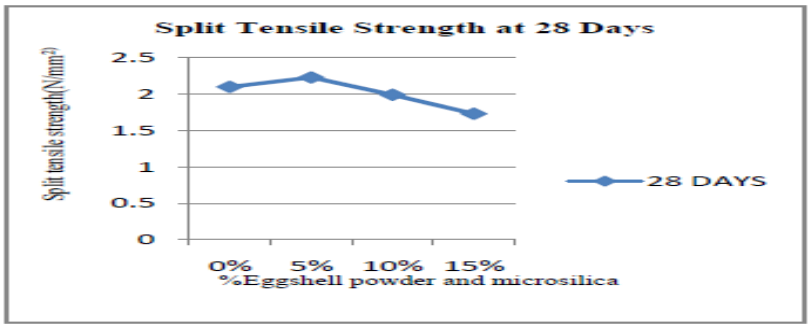
Split tensile strength = $\frac{\text{Total load applied}}{\text{Bearing area of cylinder}}$

$= 2*P / \pi *D*L$

Specifications	28 days
0%	2.1
2.5% ESP & 2.5% MS	2.23
5% ESP & 5% MS	1.99
7.5% ESP & 7.5% MS	1.73



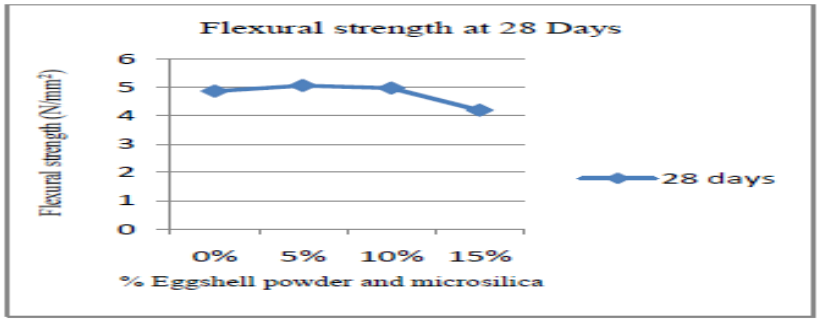
FLEXURAL STRENGTH TEST

The flexural strength test as conducted inaccordance with IS 516:1959[12]. Beam of100*100*500mm size were used for this test. The test specimen to be tested is placed on the testingapparatus on two 38mm diameter roller with acenter to center distance of 450mm. the load isapplied through two similar rollers mounted at theone third marks spaced at 200mm center to center.The load is applied gradually at a rate of0.7N/mm*mm/min.

Flexural strength = $\frac{\text{Total applied load}}{\text{Bearing area of prism}}$

$= P*L / B*D*D$

Specifications	28 days
0%	4.87
2.5% ESP & 2.5% MS	5.07
5% ESP & 5% MS	4.98
7.5% ESP & 7.5% MS	4.81



CONCLUSION

Extensive experimentation has been carried out todetermine utilization of the egg shell powder andmicro silica as cement substitute material bymaking the cement mortar and concrete. Also to

find out the effect of addition of microsilica withhe cement. Based on the results obtained from theexperimental work the following conclusions canbe drawn

1. Increase the workability of concrete mix
2. Replacement of 2.5% ESP & 2.5% micro silicacan be added without any reduction in strengthof concrete
3. Increase the compressive strength and splittensile strength of conventional concrete
4. Impart better smooth surface of concrete
5. Mortar was of very consistent composition

Fig.3: Mortar

FUTURE SCOPE

1. Eggshell powder can be used as filler in hotmix asphalt (road construction).
2. Eggshell is seldom used as stabilizingmaterials for soil.
3. Durable and better strengthened structurecan be constructed at cheaper rate.
4. Cockle shell, which dumped as waste canbe used as partial replacement in concrete
5. This could be a best approach forutilization of waste.
6. This could be a better contribution toenvironment problem as it will reducelandfills problem.

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