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PARTIAL REPLACEMENT OF THE FINE AGGREGATE BY EGG SHELL POWDER IN CONCRETE

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Abstract- The scope of this project is to determine the usefulness of waste materials like egg shell for preparing concrete.

Increased construction activity and continuous dependence on conventional materials of concrete making are leading to scarcity of the construction material and increased construction cost. An attempt has been made to assess the suitability of egg shell in concrete making in the laboratory investigations. An Egg shell has been tried as fine aggregate in place of sand.

Concrete Cubes were cast and tested for compressive strength after the curing period of 28 days. Partial replacement of conventional fine aggregate by using egg shell 10%, 20%, 30% without affecting the design strength.

The experiments like compression test were conducted on concrete cubes by using M_{20} grade of concrete. The optimum replacement percentage of fine aggregate with using egg shell has been identified based on the experimental analysis the conclusion were made.

Key Words – Partial Replacement of Fine aggregate, Egg Shell Powder etc..,

I. INTRODUCTION

1.1 GENERAL

Concrete industry today is the largest consumer of natural resources, such as water, sand and crushing stones. The concrete industry needs to be reoriented by adoption of environmental friendly and more sustainable technology.

This is being threatened by uncontrolled use of natural resources and increasing amount of pollution. A satisfactory solution to these rapidly increasing concerns is essential.

1.2 OBJECTIVES OF THE STUDY

The main objectives of this investigation are as follows

- To formulate a mix design procedure for concrete using I.S.Code method incorporation the properties of fine aggregate with different proportion of egg shell powder.
- To study the effect of replacement of fine aggregate by egg shell powder.
- To study the effect of replacement of fine aggregate by egg shell powder on strength of hardened concrete with respect to 7 days and 28 days curing compressive test.
- To compare strength of concretes made with different percentage of fine aggregate by egg shell powder with ordinary concrete made with fine aggregate only as aggregate.

II. EXPERIMENTAL INVESTIGATIONS

2.1 MATERIALS USE FOR THE STUDY

2.1.1. CEMENT

OPC Cement 43 grade is used.

2.1.2. FINE AGGREGATE

River Sand is used.

2.1.3. COAURSE AGGREGATE

20mm size coarse aggregate is used.

2.1.4. EGG SHELL

Collected Egg shell is crushed to powder form. Passing through IS sieve 4.75mm to 75 micron is used.

2.1.5. WATER

Ordinary drinking water can be used.

III PROPERTIES AND TEST RESULT OF MATERIALS

3.1. CEMENT

As per IS Code the test were conduced and result were found.

S.NO	PROPERTIES	VALUE
1	Fineness test	4.33%
2	Initial setting time	33 min
3	Specific gravity	3.15

3.2 FINE AGGREGATE

As per IS Code the test were conduced and result were found.

S.NO	PROPERTIES	VALUE	STANDARD VALUE
1	Specific gravity	2.59	2.5-2.7
2	Water absorption	1.0%	0.1-2%

3.3 COARSE AGGREGATE

As per IS Code the test were conduced and result were found.

S.NO	PROPERTIES	VALUE	STANDARD VALUE
1	Specific gravity	2.90	2.6-2.9
2	Water absorption	0.5%	0.1-2%

3.4 EGG SHELL

Specific gravity of egg shell is = 2.11 gm/cc

IV MIX DESIGN

4.1 MIX DESIGN BY I.S. CODE METHOD – MIX DESIGN PROCEDURE

- The mix design procedures are covered in IS 10262-1982.
- The methods given can be applied for both medium strength and high strength concrete.
- IS 10262 of 1982 is described below step by step.
- Wherever it is possible, the new information given in IS 456 of 2000 has been incorporated and the procedure is modified to extent.

THE MIX PROPORTIONS

Cement Propositional ratio is 1 : 1.425 : 3.10 for Water Cement ratio 0.5.

CONCRETE MIX DESIGN AS PER INDIAN STANDARD

- The mix was designed for the characteristics compressive strength of **20N/mm^2**per IS guideline and proportion by weights and volumes were arrived. All the materials were weight and used.

The concrete mixed details are furnished below

Concrete grade	: M_{20}
Characteristic compressive strength required	: 20 N/mm^2
Maximum size of aggregate	: 20 mm angular
Degree of quality control	: Good
Type of exposure	: mild

TEST DETAILS FOR MATERIALS:

Specific gravity of cement	: 2.97
Specific gravity of fine aggregate	: 2.59
Specific gravity of coarse aggregate	: 2.90
Water absorption test on coarse aggregate	: 1.5%
Water absorption test on fine aggregate	: 0.5%
Free moisture	
1. Coarse aggregate	: 1%
2. Fine aggregate	: 2.5%

V METHODOLOGY

As per mix design the M_{20} Concrete were well mixed with different proportion of Egg Shell powder (0, 10, 20, & 30 in Percentage of fine aggregate partially replacement). Concrete were casted in cube size 150mm x 150mm x 150mm, then cured and finally tested after 7, 14 & 28 days.

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5.2 COMPRESSIVE STRENGTH

Cube tested on	7th day				14th day				28th day			
Egg Shell %	0	10	20	30	0	10	20	30	0	10	20	30
Compressive Strength (N/mm^2)	14.35	14.20	15.68	15.51	16.57	16.53	18.70	18.49	20.68	20.46	21.58	21.40

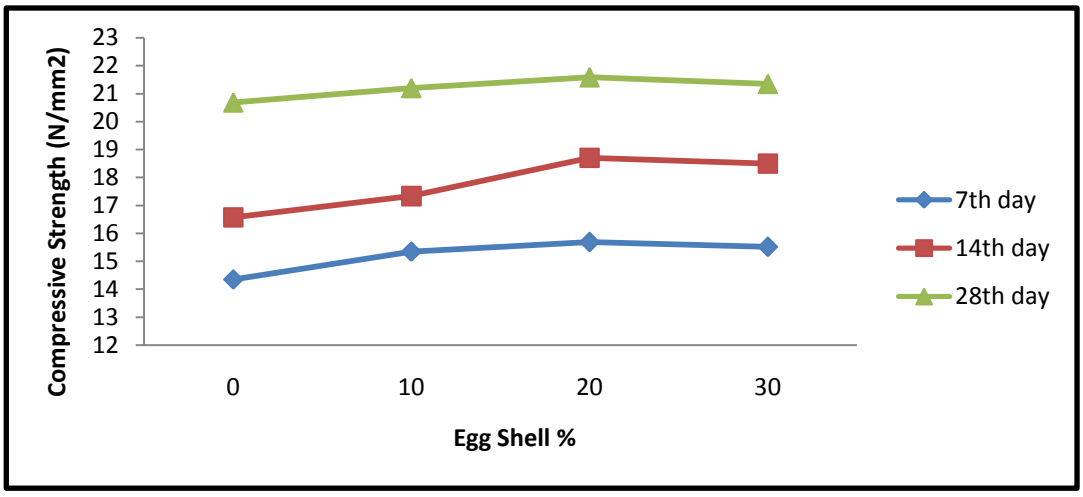

Fig: 5.1 Compressive strength of concrete with different % of Egg shell

Egg Shell

Egg shell is Sieve

Cube casting

CONCLUSION

The following conclusion can be drawn from the present investigation

- ✓ Compressive Strength of partially replaced egg shell Concrete is improved.
- ✓ 20% egg shell is produced higher compressive strength. The fine aggregate (River Sand) can be partially replaced with 20% of Egg shell powder.
- ✓ Egg shell is available in significant quantity as a waste and they can be utilized.
- ✓

BIBLIOGRAPHY

1. Beaudoin J.J. et al., 1979: Partial replacement of cement by fly ash in autoclaved products theory and practice. Journal of Material Science 14, pp 1681-1693.
2. Freire M.N. et al., 2006: characterization avian eggshell waste aiming it use in ceramic wall tile paste. In journal of ceramic 52 pp 240-244.
3. Jayashaker.R, Mahindran.N, Ilangovan.R. -"Study on Concrete using egg shell powder."
4. Egg shell be used to fight climate" by TIMON SINGH
5. Neville –"Properties of Concrete" – Pearson Education (Singapore) Pvt.Ltd., Delhi.
6. IS CODE Manual of concrete IS -1979.
7. Method of tests for strength of concrete IS: 516-1959.
8. Method test for permeability of cement mortor and concrete IS: 516-1959.
9. M.S Shetty – "Concrete Technology" –S.Chand& Company, New Delhi.