Replacement of Cement using Eggshell Powder

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Abstract

The paper describes the effect and experimental result of replacement of eggshell powder in cement. The compressive test was carried out for concrete replaced with 10%, 15% and 20% of eggshell powder in Portland pozzolona cement. The results came indicates the eggshell powder can be used in replacement for cement.

Keywords—*Eggshell powder,process,compressive strength.*

I. INTRODUCTION

Development of a nation not only depends upon the technology but also depends upon the infrastructure. Without concrete infrastructure is not possible. Thus concrete is indispensible material in every construction. The major element of concrete is cement. Since cement price is volatile and demand is so high, an alternate material can be used for replacement of cement. Since several replacement experiments were done for coarse and fine aggregate. Hence we go for replacement for cement.The alternate material in our project used was powdered Eggshell. Our project describes the effect of replacement of eggshell powder for cement in proportion such as 10%, 15% and 20 % of ESP. The results outcome were found to be successful.

II. EGGSHELL POWDER

A. General

The chemical composition of Eggshell powder and cement were found to be similar. The main component of eggshell was calcium carbonate (around 51%) . Eggshell waste been evolved from poultry farms, restaurants and hotels. These wastes are used in animal feeds and in many countries they are thrown off. Such waste are collected and implemented in our project.

B. Processing

The processing of egg shell powder is given in sequence (1) Material collection , (2) Grinding and powdering of Egg shell, (3)Sieving of Eggshell powder in sieve, (4)Mixing ofEggshell powder with cement. The sieving of Eggshell powder is done in 75 micron sieve. The residues retained were supplied for fertilizer industries and animal feed production industries.

III. DESIGN AND TESTS

A. Mix Proportion

Our project is proposed of M_{25} grade of concrete and the mix design was based on IS 10262-1982 and IS 383 -1970 codal provisions. The mix proportion arrived was 1:1.139:2.6(cement : fine aggregate : coarse aggregate)

B. Water Absortion Test

Water absorption test was carried out for 7^{th} day saturated cube specimen and oven dried specimen .The water absorption of the specimen was 7 % to 9% (for several specimens)

C. Compressive StrengthTest

The compressive strength were tested for concrete cubes of dimension 150 x 150 x 150 mm. The test was carried in compressive test machine of capacity 100KN. In compressive strength test the loading rate was 50KN/s. The compressive test was conducted on 150mm cube specimens at 7^{th}day and also to be done on 28^{th} day.

IV. RESULTS AND DISCUSSION

A. Tables

Table 1. Chemical Compostion

	EGGSHELL POWDER	CEMENT
Al_2O_3	0.03	6.6
SiO_2	0.08	21.8
Fe_2O_3	0.02	4.1
CaO	55.85	60.1
others	0.62	-
Specific gravity	3.15	2.135

Table 2. Compressive Strength Result

PERCENTAGE OF ESP ADDED	TRIAL NO	COMPRESSIVE STRENGTH ON 7^{th} day N/mm^2
0 %	1	18.49
	2	17.32
	3	18.65
10%	1	22.08
	2	20.81
	3	21.44
15%	1	24.00
	2	22.50
	3	23.60

20%	1 2 3	21.03 18.60 19.11

B. Figures

Fig.1. Drying of Eggshell

Fig.2.Powdering of Eggshell

Fig.3.Compression Test

V. CONCLUSION

The results which came after carrying out all tests found successful which indicates that eggshell powder can be used as an replacement material for cement. From the results it is proved that replacement of eggshell powder if about 10 % to 15 % is effective and when we increasing further the percentage of eggshell powder decreases the compressive strength

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