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Replacement of cement using eggshell and fully replacement by red sand

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ABSTRACT

Due to rapid urbanization, construction materials in developing countries has necessary research to use of alternative materials in civil engineering field. Concrete produced by mixing cement, fine and coarse aggregate allowing that mix to hard. The use of waste or alternative components mixed potentially pozzolanic reactivity can improve strength and properties of concrete.

Egg Shell Powder and red sand is used as a substitute or mixture in cement and sand. Therefore the entire egg shell and red sand product is used in an efficient and eco-friendly.

Keywords - Concrete , Egg Shell Powder, Red Sand ,compressive strength, split tensile, flexural strength.

INTRODUCTION

Energy plays a major role in growth of all developing countries. In the context of low availability of non-renewable use with concrete/mortar. Energy resources coupled with the requirements of large quantities of energy for Building materials like cement, the importance of using industrial waste cannot be under estimated. During manufacturing of one tonnes of Ordinary Portland Cement we need about 1.1 tonnes of earth resources like limestone, etc. The CO_2 emissions act as a silent killer in the environment.So, the search for cheaper substitute to OPC is a needful one.

Red sand is rich in iron content and colour is mainly due to ferric oxides as thin coatings on soil particles while iron oxide occur as hydrous ferric oxide,the colour is red
and when it occurs in hydrate from as limonite the soil gets yellow colour.

MATERIALS USED

Cement:

Cement manufacturing process always have impacts on environment.This is because emission of airborne pollutions like gases especially CO_2 ,dust,noise during blasting in quarries and leads to lot of environmental impacts.The cement industry produces 10% of global warming.In that upto 60% in chemical process and 40% from burning fuel.

Egg Shell:

Eggshell consists of several layers of CaC03, the innermost layer-maxillary 3 layer grows on the outermost egg membrane and creates the base with palisade layer constitutes the thickest part of the eggshell. The top layer is a vertical layer covered by the organic cuticle. The eggshell primarily contains calcium, magnesium carbonate (lime) and protein. In most countries, it is the accepted in practice for eggshell to be dried and use as a source of calcium in animal feeds. The quality of lime in eggshell waste is influenced by the extent of exposure to sunlight, raw water and harsh weather conditions. It is the finely grained powder with suitable proportion which is sieved to the required size before use with concrete/mortar.

Egg Shell Powder:

The egg shell are collected from the hotels and restaurants. The collected egg shells are cleaned and dried for more than two days. Dried egg shells is poured into a grinding mixer and grind well. The grinded egg shell is sieved to obtain egg shell powder.

The chemical composition of Eggshell powder and cement were found to be similar. The main components of eggshell was calcium carbonate (nearly 51%) . Eggshell waste been obtained from poultry farms, restaurants and hotels. Such waste are collected and implemented in our project.

Fine Aggregate :

River sand is the huge problem due to shortage in many area due to large requirement in construction industry.

The unit load of sand cost increase day by day and there is a need for alternative material so replacing sand by red sand

Red Sand :

These are generally found in south Indian states and rich in Iron content. Colour is mainly due to ferric oxides in red but when it contains limonite, soil is in yellow colour.

Coarse Aggregate:

Aggregates which are retained on 4.75mm sieve a classified as coarse aggregate. Generally, the coarse aggregate size ranges from 5 to 150 mm. Normal concrete used for structural members such as beams and columns,maximum size of coarse aggregate is 25 mm. For mass concrete used for dams or deep foundations, the maximum size can be large as 150 mm.

Water:

Water plays a major role in concrete production. It helps in binding the mixture of cement and aggregate together to form a cementitious paste. It hydrates cement and also makes concrete workable. Water used in concrete needs to be pure and free from chemical impurities in order to prevent chemical reactions from occurring which will weaken the concrete, the role of water is important because the W/C ratio is the most critical factor in the production of concrete. During the test period, portable water obtained from the taps in labs of civil engineering department were used.

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 of Eggshell 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.

TABLE 1. **CHEMICAL COMPOSTION**

	EGGSHELL POWDER	CEMENT
Al2O3	0.03	6.6
SiO2	0.08	21.8
Fe2O3	0.02	4.1
CaO	55.85	60.1
others	0.62	-
Specific gravity	3.15	2.135

DESIGN

Mix Proportion:

Our project is proposed of M_{40} 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)

Casting :

- The size of cubes are 150*150*150mm
- The size of cylinder are 150mm diameter and 300mm height
- The size of prism are 500*100*100mm

Fig 2: Casting of Cube

Fig 3: Casting of Cylinder

Fig4: Casting of Prism

TESTS

Compressive Strength Test :

The compressive strength were tested for concrete cubes of dimension 150 x 150 x 150 mm. The test was carried out in compressive test machine(CTM) of capacity 2000KN. In compressive strength test the loading rate was 50KN/s (1 DIVN = 10 KN) is increased until failure occurs. Based on peak load, the peak compressive stress within the cubes are calculated. The compressive test was conducted on 150mm cube specimens at 7 th day, 14 th day and also to be done on 28 th day.

Split Tensile Test :

The Split tensile strength were tested for concrete cylinders dimensions of 150mm diameter and 300mm length. The test was carried out in compressive test machine(CTM) of capacity 2000KN(1 DIVN = 10 KN). In compressive strength test the loading rate was 50KN/s is increased until failure occurs. Based on peak load ,the peak split tensile stress within the cylinders are calculated. The Split tensile test was conducted on cylinder specimens where load is horizontally applied at 7 th day, 14 th day and also to be done on 28 th day.

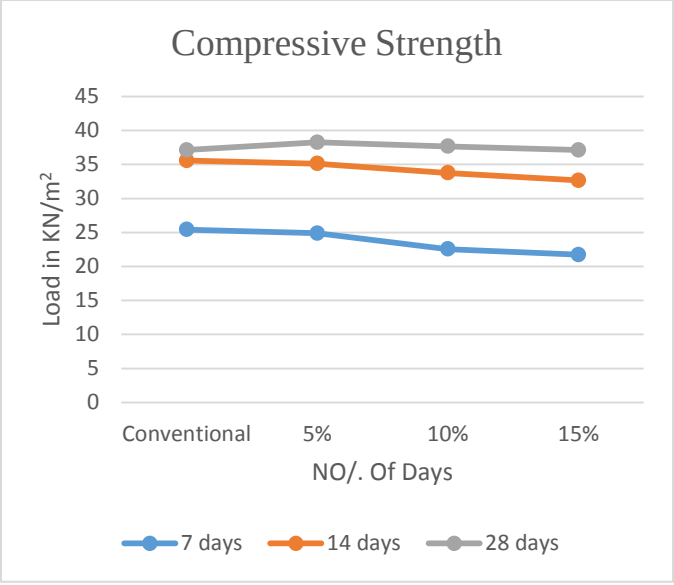
Flexural Strength Test :

The flexural strength were tested for concrete prisms of dimensions 500 x 100 x 100 mm. The test was carried out in flexural test machine of capacity 100KN. In flexural test the loading rate was 50KN/s (1 DIVN = 0.5 KN) is increased until failure occurs. A simply supported concrete prisms is loaded by two point load. Based on peak load ,the peak flexural stress within the prism is calculated. The flexural test was conducted on rectangular specimens at 7 th day, 14 th day and also to be done on 28 th day.

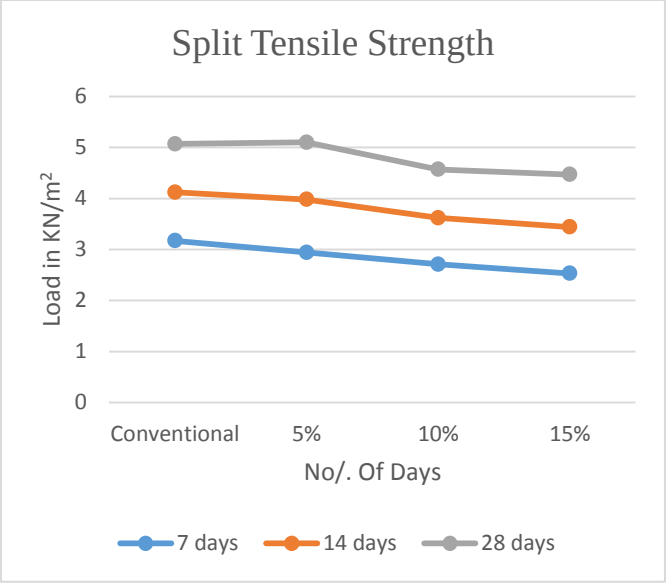
RESULTS AND DISCUSSION

TABLE 2. **COMPRESSIVE STRENGTH RESULT**

PERCENTAGE OF ESP ADDED	NO OF DAYS	COMPRESSIVE STRENGTH (N/mm^2)
5 %	7	24.87
	14	35.12
	28	38.24
10%	7	22.56
	14	33.76
	28	37.65
15%	7	21.72
	14	32.65
	28	37.13



Graph 1: Compressive Strength



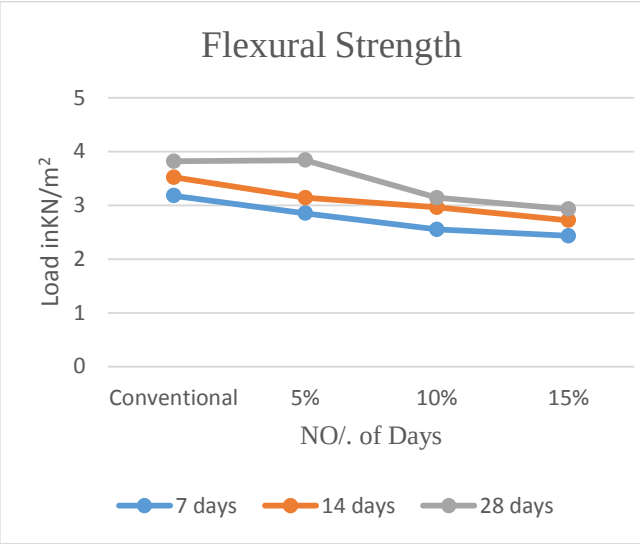
Graph 2: Split Tensile Strength

PERCENTAGE OF ESP ADDED	NO OF DAYS	SPLIT TENSILE STRENGTH (N/mm^2)
5 %	7	2.94
	14	3.98
	28	5.10
10%	7	2.71
	14	3.62
	28	4.57
15%	7	2.53
	14	3.44
	28	4.47

***TABLE N0 3*: SPLIT TENSILE STRENGTH**

PERCENTAGE OF ESP ADDED	NO OF DAYS	FLEXURAL STRENGTH (N/mm^2)
5 %	7	2.85
	14	3.14
	28	3.84
10%	7	2.55
	14	2.96
	28	3.14
15%	7	2.43
	14	2.74
	28	2.93

***TABLE NO 4*: FLEXURAL STRENGTH**



Graph 3: Flexural Strength

CONCLUSION

The result of 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 5 % is effective and when we increasing further the percentage of eggshell powder decreases the compressive strength. Using Red sand fully reduces strength but partial replacement may encouraged.

REFRENCES

[1] Amu O.O., Fajobi A.B., and Oke B.O., (2005), Effect of Eggshell Powder on the Stabilizing Potential of Lime on an Expansive Clay Soil, Research Journal of Agriculture and Biological Science , Vol. 1, pp. 80-84

[2] Bureau of Indian Standards, IS 10262 : 2009, Concrete Mix Proportioning-Guidelines.

[3] Bureau of Indian Standards, IS 4031 : 1968,For Determining the properties of Cement.

[4] Dr Amarnath Yerramala "Properties of concrete with eggshell powder as cement replacemnet".The indian concrete journal october 2014.

[5] Shetty M.S.,Concrete Technology and Practice, sixth edition, S.Chand and company limited.

[6] Sathish Kumar.R, "Experimental Study on the Properties of Concrete Made With Alternate Construction Material", International Journal of Modern Engineering Research (IJMER), Vol. 2, Issue. 5, Sept.- Oct. 2012 R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.
M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.