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Study On Concrete with Partially Replacement of Cement by Egg Sheel Powder and Steel Slag Review

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ABSTRACT

In the present study an investigation the effect of partial replacement of cement by egg shell powder and steel slag on the various strength and durability properties of concrete by using the mix design of M20 grade of concrete .when cement production produces a large carbon dioxide and causes various effects in the atmosphere. In this program, the use of cement was used to reduce the waste of parts in common applications. It is made on properties of concrete by partial replacement of cement with egg shell and fine aggregate with steel slag. Egg shell powder concrete are varied up to 0 to 20% and steel slag is added to optimum egg shell powder content cement concrete from 0 to 20%.These two waste are recycled as an incomplete replacement of cement and fine aggregate and then characteristics compressive strength & split tensile strength after 7 and 28 days is analyzed and then it is compared with conventional normal concrete strength.

Keywords : Egg Shell Powder, Compressive Strength, Slag Powder

I. INTRODUCTION

Concrete is made of cement, sand, mass mixed with water. Also use the combination to convert its power. Blending as chemicals, mineral compounds used in concrete. concrete is a newly mixed material that can be moulded into any shape. Numbers of cement, mortar (eg, stones or crushed rock) and water mixed together, control concrete structures in wet conditions and solid surfaces. The amount of water required for the chemical mixing of cement and the settlement of the gel pores. Excessive use of water level will result in capillary cavities and less than this will lead to incomplete hydration. Concrete is a mixture of cement (9 - 15%), water (15 - 16%), good adhesion (sand, 25 - 30%), composite (stones or crushed stones, 30 - 45%), air (2 - 6%) and - admixtures chemicals in which cement and water are strengthened by chemical reactions - hydration - binding the substance almost (unresponsive).

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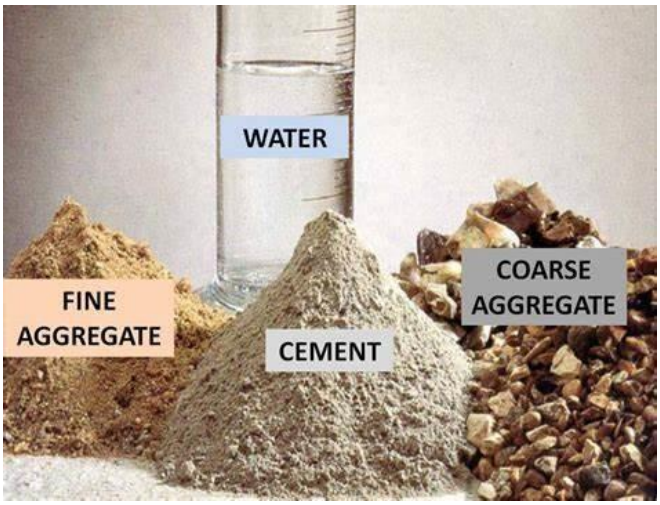


INTRODUCTION OF EGG SHELL & STEEL SLAG

EGG SHELL

Every construction industry wants a wasteful and efficient waste product that can significantly reduce the use of cement and ultimately reduce construction costs. It is widely known that agricultural waste makes up the bulk of the garbage collected in many cities of the world. Egg shells are part of the agricultural waste that pollutes the environment. Egg shells are known to have good energy properties when mixed with concrete. Calcium-rich egg shell is a chicken dung that contains a chemical similar to limestone. The egg shell is the hard outer shell of the egg. It contains calcium carbonate, a common calcium. Some are made up of proteins and other minerals.

India ranks second in the world in annual egg production. Many of these egg shells will be in the trash every year. Disposal of egg shells is a major problem because when sent to landfills it attracts insects and creates problems related to human health and the environment. The shell of the egg is rich in calcium and has a texture similar to that of limestone. The use of egg shell waste instead of natural lime in cement can have benefits such as keeping natural lime and using waste. The purpose of the present study is to determine the possible use of these waste as concrete suspension materials. Eggshell is rich in calcium and like limestone in chemical formulation, it is a waste product. Therefore, to begin the use of egg shell debris to add

concrete to the concrete part, it is necessary to understand the concrete structures made of egg shell powder.

Physical properties - There are various physical properties are given below

TABLE NO .1.1 PHYSICAL PROPERTIES 0F EGG SHELL

PROPERTIES	AMOUNT
Specific Gravity	1.92
Moisture Content	1.18
Bulk Density	0.8

Surface Area (m2/g)	21.2
Fineness	5.9

Chemical properties – There are various chemical properties are given below

TABLE NO.1 .2 CHEMICAL PROPERTIES OF EGG SHELL

CONTENT	PERCENTAGE
CaO	51.25%
SiO_2	0.14%
AI_2O_3	0.09%
MgO	0.56%
Na_2O	0.22%
Fe_2O_3	0.04%
SO_3	0.6%

II. LITERATURE REVIEW

- Riyaz Khan, Dr. S. B. Shinde International Journal of IT, Engineering and Applied Sciences Research (IJIEASR)[2013] - Steel Slag is produced locally in large quantities, creating problems for the environment when disposed of. in concrete by replacing it partially and completely with good integration to keep other boundaries constant. Shear strength is considered an investigation into the M20 range of concrete by 0.5 w / c average every time. 0.20, 40, 60, 80, 80 & 100% slag steel was used. Good results are obtained with a 60% change rate. Therefore, the use of stainless steel in concrete will improve the strength of the concrete.
- Dhanalakshmi M, Dr Sowmya N J, Dr Chandrashekar A International Journal of Engineering Research & Technology (IJERT) [2015]- The carbon dioxide produced by the cement industries creates pollution and global warming. About 1000Kg of cement production processes about 900Kg of CO2 is emitted. To reduce the impact of air cement production, waste products are used as a component in this study, to pollute the environment and use natural resources. 75 million tons of silica- rich fly ash is disposed of in landfills each year in India. Calcium-rich Egg shell powder is discarded as waste. In the present study, these two waste products are used to partially replace cement and various structures such as performance, compressive strength, and quantity determined. Egg shell powder range up to 12.5% (0%, 2.5%, 5%, 7.5%, 10% and 12.5%) and an ash fly is added to the well-made egg shell powder cement from 0% to at 30% (0%, 5%, 10%, 15%, 20%, 25% and 30%).
- Arun Kumar, G.Vasudhevan International Journal on Applications in Civil and Enviornmental Engineering [2015] M40 concrete with a higher amount of slag metal instead of fine aggregate has been tested in the present study. Quality is determined from the test values. In the case of the best part of the steel slag sand has been replaced by a good proportion by a wide range of 10%, 20%, 30%, 40%, 50%. Visual features are done experimentally. depending on the material the compressive strength, flexural strength, tensile strength is divided and the modulus of elasticity was obtained by experimentation. The results are found to be increasing with an increase in the percentage of iron ore, and it is concluded that iron ore can be used in partial concrete.

III. MATERIAL USED

TABLE 3.1 PHYSICAL PROPERTIES OF CEMENT

S.No	Characteristics	Experiment value	Requirement as per IS :8112 -1989
1	Normal consistency	32	
2	Initial setting time (min)	50	Min 30
3	Final setting time(min)	550	Max 600
4	Specific gravity	3.16	3.15
5	Soundness (mm)	1.00	Max 10

Design Processure

In this project the M20 & M30 concrete range is considered. The mixture was designed using IS 10262: 2009. The mass ratio of M20 was 1: 1.756: 3.06: 0.5 & M30 was 1: 1.51: 2.74:0.45. Cement was replaced with egg shell by 0%, 5%, 10%, 15% and 20% & good adhesion fine aggregate was replaced by the steel slag by 0%, 5% 10%, 15% and 20%. The composition of the mix value was under the table below-

MIX DESIGN OF M20 GRADE OF CONCRETESTEP -I

DESIGN PARAMETER

- Appointment of Grade M 20
- Ultra-Tech 53 cement type in range compliant with IS 8112
- Maximum measurement size of 20 mm
- Minimum cement content 300 kg / m^3 (Table 5 IS 456-2000)
- Maximum water level 0.55 (Table 5 IS 456-2000)
- Working 75mm fall
- Medium Display Status (Table 5 IS 456-2000)
- Good quality management
- Types of angular aggregated angles
- Cement content 450 kg / m^3 (IS 456-2000)

STEP – II

TEST DATA FOR MATERIALS

- cement has been applied to the OPC-53 grade in accordance with IS 8112
- Sp.gr cement 3.15
- Sp.gr of Coarse aggregate 2.750
- Sp.gr of Fine aggregate 2.57
- Sand in Zone - II

STEP –III

- Integrated Power Identification Power
- f'ck = f ck + 1.65 s = 20 + 1.65 x 4 = 26.6 N / mm^2
- there, f 'ck = target pressure force for 28 days
- f ck = features stressful power for 28 days,
- s = standard deviation
- from Table 1 of IS 10262-2009, s = 4 N / mm^2

STEP –IV

- Water Scale Selection
- From Table 5 of IS 456-2000, the maximum water level of the cement = 0.55,
- based on experience, use a water level of cement = 0.50
- 0.50 <0.55 Therefore O.K.

STEP –V

- Water content selection
- From Table 2 of IS 10262-2009,
- water content = 186 litre by a 25mm-50mm drop, 3% water should be added every25mm.
- 186 + (186x3 / 100) = 191.58 litre

STEP – VI Calculation Of Cement Content

- Cement Content Calculation
- W / C rating = 191.58 / 0.5 = 383.16 kg / m^3.
- From Table 5 of IS 456-2000, the minimum cement content of 'low' exposure is 300kg / m^3.
- 383.16 kg / m3> 300 kg / m^3 Therefore O.K.

STEP - VII

Combine calculation with unit volume

- Volume of coarse aggregate = 0.62
- Volume of fine aggregate = 0.38
- volume of concrete = 1 m^3
- Cement Capacity = (Mass Cement / Sp. Cement) x (1/1000) = (383.16 / 3.15) x(1/1000) = 0.121m^3
- Water Capacity = (Mass Mass / Sp. water) x (1/1000)

  = (191.58 / 1)) x (1/1000) = 0.191 m^3
- Total volume in aggregates = [a - (b + c)] = 1 - 0.312 = 0.688 m^3
- Mass of Coarse Aggregate = 0.688 x 0.62 x 2.75 x 1000 = 1173.04 kg / m^3
- Mass of Fine Aggregate = 0.688 x 0.38 x 2.575 x 1000 = 673.20 kg / m^3

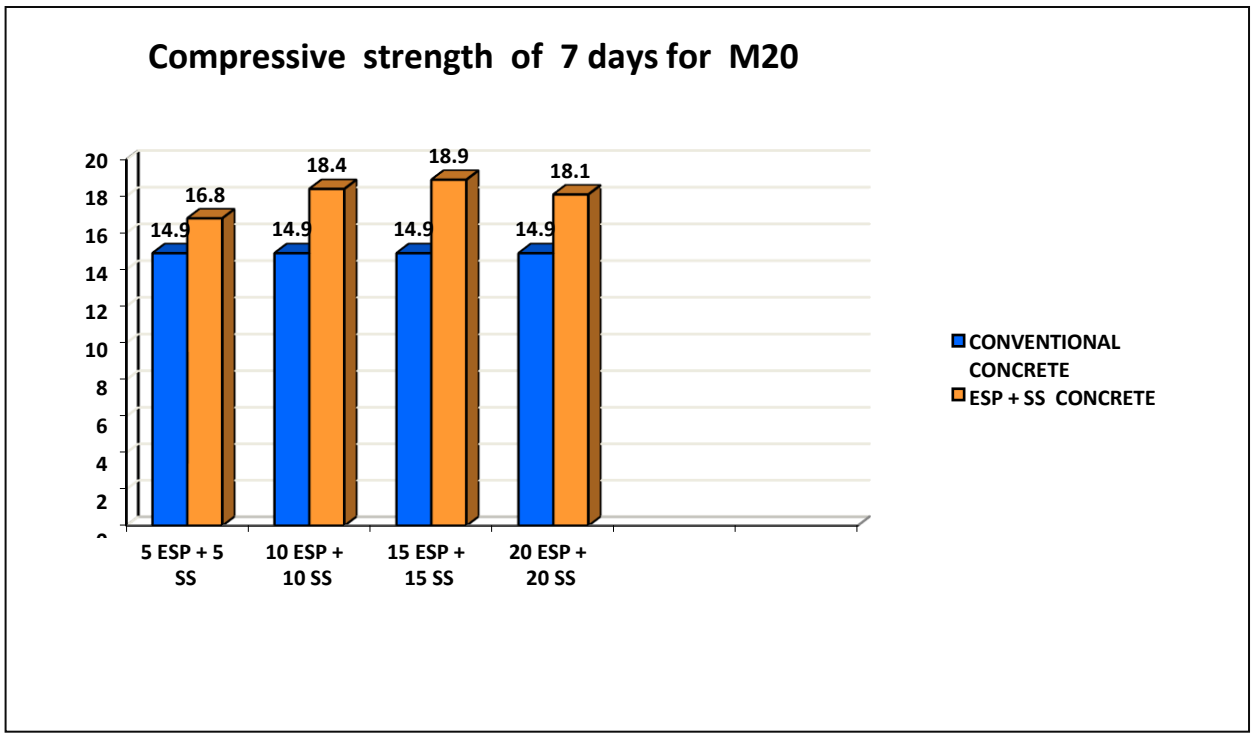
Result

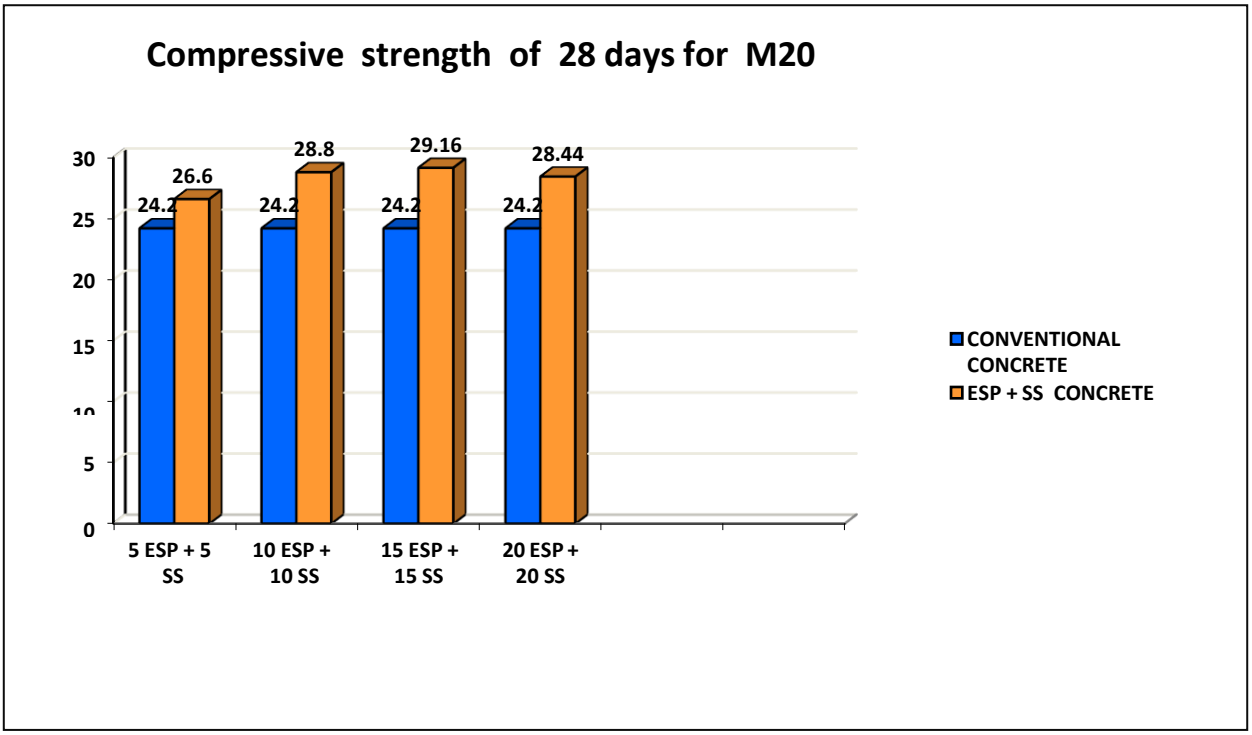
Effect of EGG SHELL and STEEL SLAG on the compressive strength of the cubes

TABLE 5.1 COMPRESSIVE STRENGTH OF M20 GRADE CONCRTE

S.No	Percentage Replacement Of Cement (%)		Percentage Replacement Of Fine aggregate (%)		Compressive Strength (MPa)	
	Cement	Egg Shell	Fine Aggregate	Steel slag	7 Days	28 Days
(A)	100	0	100	0	14.9	24.2
(B)	95	5	95	5	16.8	26.57

(C)	90	10	90	10	18.4	28.8
(D)	85	15	85	15	18.7	29.16
(E)	80	20	80	20	18.1	28.44





IV. CONCLUSION FOR COMPRESSIVE STRENGTH TEST

- Concrete is environmentally friendly, due to the use of industrial waste.
- The use of egg yolks and iron in the concrete industry can reduce the amount of waste dumped into the environment.
- The addition of ESP & steel slag to cement concrete leads to reduced performance.
- Egg powder is fast. The higher the ESP content, the faster the acceleration effect.
- Better mechanical and physical concrete structures can be obtained by replacing Egg shell powder with metal slag by mixing.
- The compressive strength was higher than the 5% ESP control concrete & steel replacement iron for 7 and 28 days of treatment years. ESP and steel replacement of more than 15% was less powerful than M20-grade concrete control.
- The compressive strength of the standard concrete cubes is 24.2 MPA for 28 days, while the compressive strength of the cement replacement is 15% ESP and a good composite of 15% steel in 28 days obtained at 29.16 MPA. Also, it was found that the compressive strength of the replacement concrete cubes was 4.96% higher than standard concrete in the M20 range.

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