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EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF COARSE AGGREGATE WITH SEA SHELLS AND COCONUT SHELLS WITH M30 CONCRETE

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ABSTRACT

In this research work, experiments were conducted followed by collection of materials and the data required for mix design obtained by sieve analysis and specific gravity test. Sieve analysis was carried out from various fine aggregates (FA) and coarse aggregates (CA) samples and the sample which suits the requirement was selected. Specific gravity tests were carried out for various samples of fine and coarse aggregate. The different materials used were tested as per Indian standard specification. Based on the experimental studies carried out on M30 grade concrete as partial replacement of coarse aggregates with sea shells and coconut shells, the following conclusions were drawn.Comparing to traditional concrete, compressive strength of 10% (5% + 5%) of coconut shells (5%) and sea shells (5%) was found to be increased wherein the compressive strength of the concrete cubes gradually decreased from addition of 10% (5% + 5%) of coconut shells and sea shells. 10% mix was considered to be the most preferable, so as to achieve both economic viability and optimum compressive strength. Thus, 10% replacement of coconut shells and sea shells were recommended for both heavy weight and light weight concrete production

Keywords: *aggregate, coconut shells (c s), compressive strength, economical view, partial replacement, sea shells.*

I. INTRODUCTION

In olden times, buildings were constructed with the stones and cemented them with mud, lime, gums. On due course of time, stones were also used in the foundation and super structure was constructed with the bricks made of lime. The lime bricks were casted in the molds made of wood, mix of stone, sand, sea-shells, lime stone and jaggery. Recent investigation of Indian Coconut shells and sea shells has indicated greater scope for their utilization as a construction material. Greater utilization of Coconut shells and sea shells will lead to not only saving such construction material but also helps in solving the problem of disposal. Amidst the trend of increasing population construction work is increasing rapidly, so to replace the old process the new bricks like fly ash bricks came in to field replacing the old lime bricks, whereas the cementing material like mud, lime paste and gums is replaced by various types of cement for any construction activity. As the status of living is increasing, their needs for maintenance are also increasing. So the need for the replacement of the present material in concrete manufacturing has to be urged to meet the needs of the structures. So the most economical, ecological, light – weight and increasing the ease of work construction of the structure is important in the present economy. So the role of the light – weight concrete has come into the field. As modern engineering practices become more demanding, there is a corresponding need for special types of materials with novel properties. Scientists, engineers and technologists are continuously on the search for materials, which can act as substitute for conventional materials or which possess such properties as would enable new designs and innovations resulting in to viable economy, so that a structure can be built sustainable. Many attempts have been made to develop composite materials. For reducing the cost of concrete, greater use of pozzolanic materials like fly ash and blast furnace slag was used.For the cement, sea shells, glass and ceramic material are used for fine aggregates, and for aggregates palm kernel shells, coconut shells and sea shells. The use of these materials as the substitute material in concrete would reduce thedisposal problem now faced by thermal power plants and industrial plants, agricultural areas and at the same time achieving the required strength of concrete. Already many investigations have been carried out as the partial replacement of coconut shells for coarse aggregate. Coconut shells are available in large quantities in the country as a waste product from agriculture.In the present investigation coconut shells in combination with sea shells has been used as partial replacement of coarse aggregate.

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II. METHOD & MATERIAL

In this stage collection of materials required and the data required for mix design are obtained by sieve analysis and specific gravity test. Sieve analysis is carried out from various fine aggregates (FA) and coarse aggregates (CA) samples and the sample which suits the requirement is selected. Specific gravity tests are carried out for fine and coarse aggregate. The various materials used were tested as per Indian standard specifications.

Raw materials required for the concreting operations of the present work are cement, fine aggregate, coarse aggregate (CS a SS) and water. Cement: 43 Grade ordinary Portland cement was used whose specific gravity is 2.985

Table 1 Material properties

S.No.	Property	Test results
1.	Normal consistency	35%
2.	Specific gravity	2.98
3.	Initial setting time	32.33 min
4.	Fineness of cement (Dry sieving method)	98%
5.	Fineness modulus	2.39

The material whose particles are of size as are retained on retained on I.S. sieve no. 4.75 mm is termed as coarse aggregate. The size of coarse aggregate depends upon the nature of the work. The coarse aggregate that is the CS and SS used in this experimental investigation is 20mm size, crushed and angular in shape. The aggregates are free from dust before used in the concrete.
Specific gravity = 2.83; Fineness modulus = 8.626

Total Replacement by CS+SS (in %):
0, 10, 20, 30, 40, 60

Table 2 Mix proportions

Material	kg/cum	Ratio
Water	191.58	0.425
Cement	450.77	1
Fine aggregate	638.17	1.42
Coarse aggregate	1493.7	3.33

Water to be used in the concrete work should have following properties: It should be free from injurious amount of oil, acids, alkalis or other organic or inorganic impurities. It should be free from iron, vegetable matter or other any type of substances, which are likely to have adverse effect on concrete or reinforcement. It should be quite satisfactory for purpose which is used in mixing of concrete.

Fig.1Concrete cubes replaced with coconut and sea shells aggregate

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III. RESULTS & DISCUSSION

The following results were obtained based on the partial replacement of coconut shells and sea shells.

Table 3Compressive Strength

S No.	Compressive Strength (Mpa) At 3 days	Compressive Strength (Mpa) At 7 days
1.	18.23	28.77
2.	18.12	28.32
3.	8.46	18.78
4.	7.86	13.44
5.	4.67	7.89

Table 4Compressive Strength Results for partial replacement of coarse aggregate by CS & SS

S No.	Replacement By CS + SS percentage	3 Days	7 Days	28 Days
1	0	18.23	28.77	38.67
2	10	18.12	28.32	37.42
3	20	8.46	18.78	28.91
4	40	7.86	13.44	18.53
5	60	4.67	7.89	10.43

Based on the results obtained, graphs were plotted to ascertain and evaluate the compressive strengths obtained at different days of curing and different proportions of CS and SS.

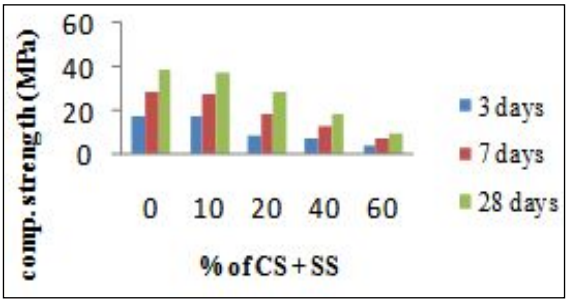

Fig.2 Representation of Compressive Strength Values

From the graph, it is seen that with increasing percentage of coconut and sea shells, the compressive strength decreases for three days, seven days and 28days.

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IV. CONCLUSION

On the basis of the experimental studies carried out on M30 grade concrete as partial replacement of coarse aggregates with sea shells and coconut shells, the following conclusions are drawn

From the above study we conclude that the compressivestrength of the concrete cubes has gradually decreased from addition of 10% (5% + 5%) of coconut shells and sea shells. Whereas comparing to traditional concrete, compressive strength of 10% (5% + 5%) of coconut shells (5%) and sea shells (5%) are found to be increased. Hence for economical view 10% is preferable and in the perspective of compressive strength 10% is suggested.

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