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Alternate Construction Materials & Their Comparisons with Regular Concrete

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ABSTRACT: As in today's world construction is very important in life. Concrete is most commonly used in construction. So the demand of concrete is growing day by day, for satisfying the need of development of infrastructure facilities. Next to the water, Cement concrete is the most consumed materials on the earth. As the demand increasing the cost of materials continuously goes on increasing. To make the construction economical, it is required to develop some other alternate sources. The materials used for preparing concrete are not livable. It is a well-established fact that the most commonly used binder Portland cement not only consumes significant amount of natural resources and energy but also releases substantial quantity of CO₂ into the environment which results in global warming. The mining of popular fine aggregate, sand is causing many environmental imbalances. The coarse aggregates are obtained from quarrying which results in depletion of hard rocks. In view of this, there is a need of developing alternative materials. After reviewing different literatures Cow dung and Coconut shells are taken under study. Cow dung as a binder instead of using cement and crushed Coconut shells as in place of coarse aggregate are found to be suitable as alternate construction materials

KEYWORDS: Cow Dung Ash (CDA), Coconut Shell (CS), Natural aggregate (NA), Natural fine aggregate (NFA), Natural coarse aggregate (NCA).

I. INTRODUCTION

Construction can never stop. It is an endless process. The most widely used material in the construction is concrete. Concrete is a mixture of aggregates (coarse & fine), cement and water. Concrete is used more than any other manmade material in the world. Even we can say that, concrete is the 2nd most consumed substance in the world-behind water. Production of concrete is increasing due to high growth of infrastructure development and construction activities in the world. The large scale production of concrete in construction activities using conventional coarse aggregate such as granite immoderately reduces the natural stone deposits and affecting the environment hence causing ecology imbalance. Increasing demand of natural aggregates show that crushed stone demand will be 2050 million metric tonnes in 2020. By considering the future demands of construction and decreasing rate of natural substances used in construction, it is an important issue to develop alternate construction materials. The huge demand of natural aggregate introduces a serious question about maintenance, of natural aggregate sources for sustainable development. Therefore consumption of alternative waste material in place of natural aggregate in concrete production not only protects environment but also makes concrete a sustainable and environment friendly construction material. Waste materials like fly ash, glass, rubber, artificial sand etc has been used as alternative for replacing natural aggregates. Apart from these waste materials, studies show that agriculture waste coconut shell and Cow-dung ash can also be used as coarse aggregate and binding material respectively for concrete.

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II. COMPARISON OF VARIOUS PARAMETER B/W NATURAL & ALTERNATE MATERIAL'S CONCRETE (DIFFERENT PERCENTAGE OF COW DOUNG ASH (CDA) & COCONUT SHELL (CS)):-

To evaluate the effects cow dung ash (as a binder) and coconut shell (as a coarse aggregate) as a alternate construction material total 5 grades M7.5, M10, M15, M20, M25 (Nominal Mixes) are taken into consideration. Starting from replacement value of 10 % maximum 60% replacement was done with CDA & CS. Their comparisons with natural concrete are mentioned under Table 1, 2 & 3.

Table 1 Shows 7 Days Average Compressive Strength for Different Grades

	M 7.5	M10	M15	M20	M25
7 Days Compressive Strength with Natural Aggregates(N.A.)	6.23	8.20	12.03	15.77	17.33
7 Days Compressive Strength with Different Replacement % age of CDA & CS	5.77	8.07	11.87	15.73	17.07
10%					
20%	5.67	7.87	11.7	15.17	16.67
30%	5.57	7.33	11.77	14.77	17.10
40%	5.70	7.43	11.10	15.10	16.83
50%	5.37	6.77	10.57	12.20	15.23
60%	5.03	6.37	10.00	11.73	14.03

Table 2 Shows 28 Days Average Compressive Strength for Different Grades

	M 7.5	M10	M15	M20	M25
28 Days Compressive Strength with Natural Aggregates (N.A.)	8.80	12.27	18.10	24.83	28.73
28 Days Compressive Strength with Different Replacement % age of CDA & CS	8.43	11.50	17.73	23.03	27.5
10%					
20%	7.73	11.77	16.97	22.90	25.83
30%	7.60	11.13	16.23	22.53	26.17
40%	7.87	11.53	16.27	22.97	26.73
50%	6.97	9.83	14.90	19.53	24.53
60%	6.43	9.20	13.77	18.40	23.13

Table 3 Shows Slum Value of Different Grades in mm

	M 7.5	M10	M15	M20	M25
Slump test value with 100% Natural Aggregates(N.A.)	85	85	90	100	105
Slump test value at different replacement % age of CDA & CS	90	90	95	110	110
10%					
20%	90	95	100	110	115
30%	95	95	105	115	120
40%	100	100	105	120	110
50%	85	105	95	110	95
60%	80	90	85	90	85

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II. RESULTS AND DISCUSSION

Each value in the Table 1 & 2 is the average value of 3 specimens. The overall result of Table 1 and 2 is prepared by casting a total of 210 cubes i.e. 105 cubes for 7 days and 105 cubes for 28 days. For evaluating the effect of cow-dung ash(CDA) and coconut shell(CS) on properties of concrete their different percentage are added to the normal concrete. The Percentage starts from 10% and taken upto a maximum replacement of 60%. Total 5 grades under nominal mixes were taken under study. Compressive strength value of concrete was calculated by casting the standard cube size of 150mm x150mm x 150mm. Cubes are tested after 7 days and 28 days and their values are in Table 1 & 2. The overall results in the Table 1 & 2 show that the compressive strength value of concrete is comparable up-to 40% replacement and after that it starts decreasing. The other parameter is workability which is evaluated with the help of Slump test. Table 3 indicates 35 different values of slump taken for different grades. The Slump value is measured in mm. While reviewing all we can see that the slump value increases up-to 40% replacement value except in one grade. After that this value started decreasing that replies the concrete is workable enough up-to 40% replacement value. It means a percentage of 40% for both the materials does not affect the properties of concrete and can be utilized.

III. CONCLUSION

1. The compressive strength value upto 40% replacement is almost comparable to normal concrete and after that it get decreases.
2. The Slump value in all the grades increases upto 40% replacement value in all the grades except in M10 where it increase upto 50% value. After the replacement value of 50% in all the grades slump value get decreased.
3. The replacement of cow-dung ash as a binder & coconut shell as a coarse aggregate in concrete will be an innovative approach and upto 40% replacement can be done effectively.

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