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Study on strength of innovative concrete with fly ash and quarry dust

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***Abstract*— Generally, mortar is a uniform combination of fine aggregate and cement. In this study an innovative concepts adopts to synthesis a hybrid mortar with fly ash and quarry dust which are replacing the fine aggregate. The alternative materials are preferably waste products such as quarry dust and fly ash in order to moderate the cost of mortar. The main objective of this work is to study the compressive strength of mortar cubes by various combinations of fine aggregate replaced by fly ash, quarry dust at the age of 7,14,28 days. The results of mortar made with fine aggregate replaced by (50% QD- 50FA),(60% QD- 40%FA), and (70%QD- 30%FA) of quarry dust and fly ash were compared with conventional concrete. It is done the concrete grade of M_{30} and OPC 43 grade cement.**

***Index Terms*— Fly ash, Quarry dust, Compressive Strength**

I. INTRODUCTION

The use of fly ash in mortar is desirable because of benefits such as useful disposal of a byproduct, increased workability, increased sulphate resistance, increased resistance to alkali-silica reaction and decreased permeability.

The decrease in workability can be improved by replacing certain percentage of fly ash by quarry dust. The concurrent use of the two by products will lead to a range of economic and environmental benefits. Quarry dust has been proposed as an alternative to river sand that gives additional benefit to mortar. Quarry dust is known to increase the strength of mortar over mortar made with equal quantities of river sand.

when examining the above qualities of fly ash and quarry dust it becomes apparent that if both are used together, the loss in early strength due to one may be alleviated by the gain in strength due to the other, and the loss of workability due to the one may be partially negated by the improvement in workability caused by the inclusion of the other.

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II. EXPERIMENTAL STUDY

Physical properties of quarry dust: various physical properties of quarry dust are determined in the laboratory are report in table.

Physical Properties of Quarry Dust

S.No	Property	Quarry dust	Code of practice
1.	Specific gravity	2.38	IS:2386(part III)
2.	Sieve analysis	Zone II(coarser)	IS:383
3.	Bulking	70%@8% water content	IS: 2386(part III)
4.	Bulk density	1670kg/m^3	IS: 2386(part III)

Physical properties of fly ash

The fly ash was procedure from mettur Power plant corporation in mettur.

Fineness of test fly ash : 93%

Specific gravity of test fly ash : 2.43

Chemical Properties of Fly Ash

Chemical	Sio_2	Al_2o_3	Fe_2o_3	Na_2o	Mgo	$Caco_3$	So_3

%	61.2	23.00	7.90	0.09	0.05	3.99	0.49

Mix Proportions, Mixing and Casting

The appliances that are to be used kept clean and dry. Each cube shall be mixed separately with the quantities of cement, sand and water, and they shall be 200 grams, 600 grams (p/4+3.5) percentage of combined weight of cement and sand respectively. Where p is the standard consistency of the cement used. The sand 600 grams is taken in three equal ratios of 2mm, 1 mm and 0.6mm particle sizes. The mixture of cement and sand in the proportion of (1:3) by weight is placed on a non-porous plate. The time of mixing shall in any event be not less than 3 minutes. Now this mixture filled in 70.6mm^3 of cube moulds. Remove the specimens from the casted moulds and then cured for 7 days and 28 days in potable water. later at 7 days and 28 days curing the specimens are tested under compressive testing machine for compression test according to IS: 516 and the results are presented under the results heading

III. RESULT AND DISCUSSION

Various combinations of mixes are tried and the same are shown in table 3. The compressive strength values for 7 days curing period for all mixes shown in tables 4 to 6. The relative comparison of compressive strengths of all mixes is shown in figures 1 to 4.

Various mixes with different combination of innovative materials

S.No	Only with fly ash (FA)	Only with quarry dust (QD)	Combination of fine aggregate and quarry dust (FA&QD)
1	50	50	FA50QD50
2	40	60	FA40QD60
3	30	70	FA30QD70

S.No	Mix Type	Cylinder	Cube	Prism
1	7days			
	50-50	140	200	200
	40-60	120	190	180
	70-30	90	180	170
2	14 days			
	50-50	140	250	200
	40-60	140	350	230
	30-70	150	450	250
3	28days			
	50-50	210	300	250
	40-60	240	350	280
	30-70	260	410	300

IV. CONCLUSION

One of the ways to improving sustainability is to reduce the human consumption of natural resources.in order to protect the natural resources such as river sand, this study has identified quarry dust, which is a waste product from stone cursing industry and available almost free-of-cost ,as partial replacement for river sand .compare to the normal concrete to get more strength in this concrete of adding innovative materials. The cost is also reduce in our project.

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