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Assessment of Concrete Strength Using Partial Replacement of Coarse Aggregate for Wast Tiles and Cement for Rice Husk Ash in Concrete

Umapathy U [1], Mala C[2], Siva K [3]
[1](M. tech Structural Engineering student in Faculty of engineering and technology, PRIST University, Thanjur)
[2] (Department of civil Engineering, PRIST University, Puducheery- 613403)
[3](Department of Civil Engineering, Tirumala polytechnic college, Tiruvannamalai-606 611)

ABSTRACT
Conservation of natural resources and preservation of environment is the essence of any development. The problem arising from continuous technological and industrial development is the disposal of waste material. If some of the waste materials are found suitable in concrete making, not only cost of construction can be cut down, but also safe disposal of waste materials can be achieved. So in our project, an attempt has been made to assess the suitability of stone with waste tills in concrete making. In the laboratory tiles has been tried as coarse aggregate has been used as partial substitute to conventional coarse aggregate concrete making and today many researches are ongoing into the use of Portland cement replacements, using many waste materials like pulverized fly ash (PFA) and ground granulated blast furnace slag (GGBS). Like PFA and GGBS a waste glass powder (GLP) is also used as a binder with partial replacement of cement which takes some part of reaction at the time of hydration. In this study, rice husk ash have been used as partially replacements to the cement Cubes were cast and tested for compressive strength, and modulus of rupture after a curing period of 7,17,28 days. The results indicated effectiveness of tiles as coarse aggregate by partial replacement of conventional concrete by 20 %, 30%, 50%and cement as rice husk ash with 10%,15% and 20% without affecting the design strength. Also Combined RHA & Tiles replacement is in above percentage mixing. A total number of 81 cubes, and were cast and tested .This paper recommends that waste ceramic tiles can be used as an alternate construction material to coarse aggregate in concrete. Also recommended to cement is partially rice husk ash.

Keywords **–** Compressive strength, Disposal, Development, Partially replacement, Rice husk ash, Waste ceramic tiles.

I. INTRODUCTION

Concrete is the world's most consumed material. Production of concrete relies to a large extent on the availability of cement, sand and coarse aggregates such as granite, the costs of which have risen astronomically over the past few years. The negative consequences of the increasing demand for concrete include depletion of aggregate deposits; environmental degradation and ecological imbalance. Rising construction costs and the need to reduce environmental stresses to make construction sustainable, has necessitated research into the use of alternative materials, especially locally available ones which can replace conventional ones used in concrete production. If some of the waste material are found suitable in concrete making with use of waste tiles. This study not only reducing cost of construction. Also safe disposals of waste material can be achieved. The use of cheaper material without loss of performance is very crucial to the growth of development of countries. this study also experimental investigation done to study the effect of partial replacement of cement on Rice Husk Ash by 10%, 15% 20% and waste tiles by 20% 30% 50% Numerous tests are performed on wet concrete such as workability test, such as compaction factor test, and slump cone test. The tests on hardened concrete are destructive test while compressive test. The tests on hardened concrete are destructive test while the destructive test includes compressive test on concrete cube for size (150 x 150 x 150) mm. In actual practice, test on workability of wet concrete are carried out to ensure uniform quality concrete only. Strength is not a measurable at that stage with the available technology. RHA has two roles in concrete manufacture, as a substitute for cement, reducing the cost and weight of concrete in the production of low cost building blocks. The workability of RHA concrete has been found to decrease but OPC increases the workability of concrete so RHA and OPC mix together in concrete to improve the workability of concrete. The work presented in this paper reports an investigation on the behavior of concrete produced from blending cement with OPC

by RHA. Regression analysis method for predicting the 7, 14, 28 day's compressive strength of concrete is presented in this project. The proposed method is aimed at establishing a predictive relationship between properties and proportions of ingredients of concrete, compaction factor, weight of concrete cubes and strength of concrete

1.1 THE OBJECTIVES AND SCOPE OF PRESENT STUDY ARE

- To find the optimum mix design with regards to the amount of water, RHA, OPC and cement ratio.
- To investigate the physical properties of the RHA and tiles strength (compression), water absorption and moisture content.
- To study the relative strength development with age of (RHA + OPC) and waste tiles as coarse concrete with control concrete.
- Use of industrial waste in a useful manner.
- To conduct compression test on (RHA+OPC) and control concrete on standard IS specimen size (150 x 150 x 150) mm.
- To conduct compression test on (Tiles+ conventional coarse aggregate) and control concrete on standard IS specimen size (150 x 150 x 150) mm.
- To provide economical construction material.
- Provide safeguard to the environment by utilizing waste properly.

II. MATERIALS USED

1. Cement
2. Fine Aggregate
3. Coarse Aggregate
4. Course aggregate as tiles
5. Cement as rice husk ash
6. Water

Fig 1 Material used in this project

2.1 PROPERTIES OF MATERIAL ORDINARY PORTLAND CEMENT (OPC)

TABLE: 1 TEST ON CEMENT

Properties	Values
Specific gravity	3.15
Initial setting time	30 minutes
Final setting time	10 hours

2.2 PHYSICAL PROPERTIES OF RICE HUSK ASH

1. Initial Setting time=195min
2. Final Setting time = 265min.
3. Compressive Strength = 11 N/mm^2
4. Specific Gravity = 2.09

2.3PROPERTY STONE CERAMIC TILES

PROPERTIES	GRANITE	TILES
Specific gravity	2.67	2.400
Fineness Modulus	3.81	5.91
Minimum size(mm)	12.5	12.5
Impact Value (%)	38	25

III. EXPERIMENTAL PROGRAM

The mix design is produced for maximum size of aggregate is 20mm conventional aggregate and crushed ceramic aggregate. The variation of strength of hardened concrete using solid wastes as partial replacement of conventional aggregate is studied by casting cubes, until 50%. The concrete was prepared in the laboratory using mixer. The cement, fine aggregate and coarse aggregate and solid wastes tiles and rice husk ash are mixed in dry state and then the desired water quantity is added and the whole concrete is mixed for 5 minutes, the concrete is poured in the mould which is screwed tightly. The concrete is poured into the mould in 3 layers by poking with tamping rod for cubes of 150X150X150 mm size were tested for compression. The cast specimens are removed after 24 hours and these are immersed in a water tank. After a curing period of 7, 14,28 days the specimens are removed and these are tested for compressive strength and the results are compared with conventional concrete.

MIX PROPORTION OF CONCRERE WITH RHA REPLACEMENT

%REPLACEMENTRHA	RHA Kg/m^3	CEMENT Kg/m^3	AGGFINE Kg/m^3	AGG COARSE	WATER
CONVENTIONAL	0	377.6	576	1201.01	188.8
10%	37.76	339.84	576	1201.01	188.8
15%	56.64	320.96	576	1201.01	188.8
20%	75.52	302.08	576	1201.01	188.8

MIX PROPORTION OF CONCRETE WITH TILES REPLACEMENT

% REPLACEMENT TILES	CEMENT Kg/m^3	FINE AGG Kg/m^3	TILES Kg/m^3	GRANITE Kg/m^3	WATER
CONVENTIONAL	377.6	576	0	1201.01	188.8
20%	377.6	576	240.202	960.808	188.8
30%	377.6	576	360.303	840.707	188.8
50%	377.6	576	600.505	600.505	188.8

For 50 kg MIX COMPOSITION OF REPLACEMENT IN TILES AND RHA

S.NO	MIX	OPC (kg)	RHA (kg)	TILES (kg)	GRANIT (kg)	SAND (kg)	WATER (l)
1	conventional	50	-	-	94.5	80	25.03
2	Mix 1	45	5	18.9	75.6	80	25.03
3	Mix2	42.5	7.5	28.35	66.15	80	25.03
4	Mix3	40	10	47.25	47.25	80	25.03

IV. RESULTS AND DISCUSSION

4.1 GENERAL

In order to assess mechanical properties of concrete using waste tiles aggregates and cement by RHA with partial replacement, suitable size specimens were cast and tested at the appropriate ages as per the guidelines of I.S 516-1959. Care was taken to maintain accuracy of weight of the concrete ingredients and well calibrated measuring devices used to find the loads. This chapter presents the test results and discussion.

4.2 COMPRESSIVE STRENGTH

Compressive strength has been found out at the ages 7, 14 and 28 days after moist curing the specimens continuously. The test results are presented in table 6.1.

Strength of concrete mainly depends on three factors viz.

i. Strength of coarse aggregate ;
Ii Strength of mortar matrix;
Iii Bond strength between mortar part and coarse aggregate;

The result of the present investigation reveals that the strength of concrete up to 25MPa is governed by the strength of all the above factors.

Strength of concrete beyond the level is governed by the strength of the aggregate alone.

COMPRESSIVE STRENGTH OF RHA REPLACEMENT CONCRETE UNIT OF Pascal

S.NO	REPLACEMENT OF OPC WITH RHA	7 DAY	14 DAY	28 DAY
1	CONVENTIONAL	16.67	25.77	33.34
2	10%	13.01	14.44	25.38
3	15%	12.44	20.84	22.66
4	20%	11.77	19.10	20.66

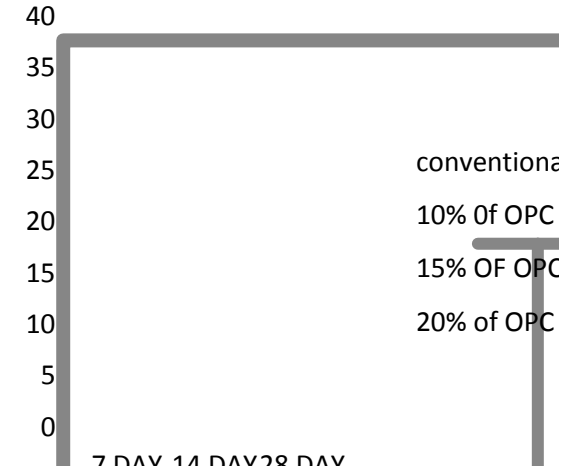
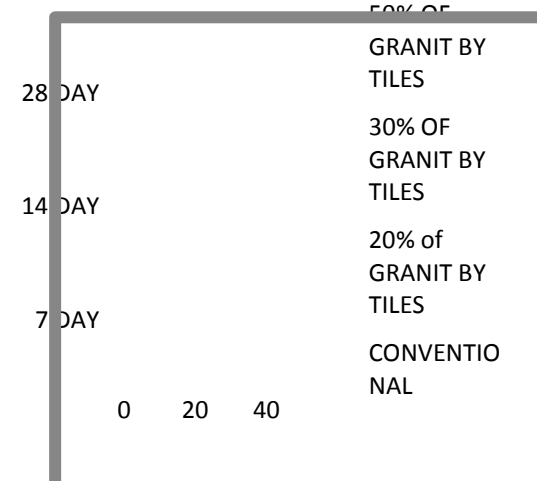


CHART SHOWS REPLACEMENT OF OPC FOR RHA

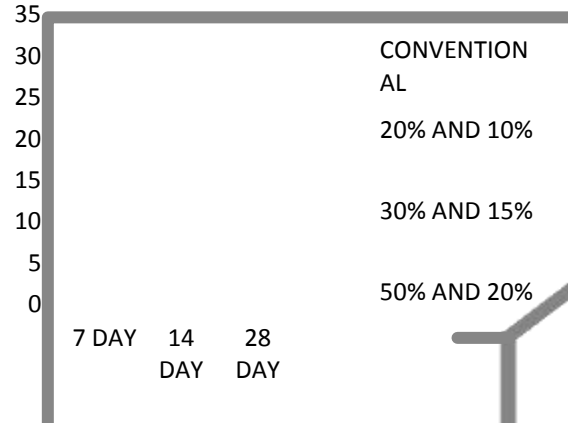
COMPRESSIVE STRENGTH OF REPLACEMENT OF GRANIT WITH TILES UNIT OF Pascal

S.NO	REPLACEMENT OF GRANIT WITH TILES	7 DAY	14 DAY	28 DAY
1	CONVENTIONAL	16.67	25.77	33.34
2	20%	15.44	22.37	26.38
3	30%	14.67	20.86	25.44
4	50%	12.44	19.10	22.89



COMPRESSIVE STRENGTH OF REPLACEMENT OF GRANIT WITH TILES AND CEMNT FOR RHA UNIT OF Pascal

S.NO	REPLACEMENT OF BOTH TILES AND RHA	7 DAY	14 DAY	28 DAY
1	CONVENTIONAL	16.67	25.77	33.34
2	20% AND 10%	13.24	22.67	26.87
3	30% AND 15%	12.47	19.10	21.07
4	50% AND 20%	11.55	18.55	20.41



V. CONCLUSIONS

Following are the conclusions can be made based up on the studies made by various researchers:-

- Waste tiles can be used to replace some of the aggregates in a concrete mixture. This contributes to reducing the unit weight of the concrete. This is useful in applications requiring nonbearing light weight concrete, such as concrete panels used in facades, foot bath.
- For a given w/c, the use of tiles in the mix lowers the density, compressive strength and of concrete.
- The effect of water-cement ratio of strength development is not prominent in the case of RHA concrete. It is because of the fact that the TILES aggregates reduce the bond strength of concrete. Therefore, the failure of concrete occurs due to failure of bond between the cement paste and TILES aggregates.
- Introduction of Tiles in concrete tends to make concrete ductile, hence increasing the ability of concrete to significantly deform before failure. This characteristic makes the concrete useful in situations where it will be subjected to harsh weather such as expansion and contraction, or freeze and thaw.
- The inclusion of tiles aggregates in the concrete of the buildings under investigation has been

shown to be advantageous from an energy point of view. The use of tiles aggregate shelled in keeping the interior cooler, when the outside temperature is raised, as compared to the corresponding control concrete.

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