A Partial Replacement of Ceramic Tiles Waste in Concrete

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***Abstract*- The work examines the possibility for using ceramic tiles waste as a partial replacement as 5%, 10%, 15% and for its compressive strength up to 7, 14 & 28 days of age and was compared with those conventional concrete. Leaving the waste material has been emphasized waste can be used more efficiently and the environmental problem. Hence the reuse of waste material has been emphasized waste can be used to produced new product or can be used admixture so that is natural resources are used more efficiently and the environment is protected for waste deposits. Tiles waste material is fine material obtained as by product of ceramic tiles during sawing and shaping and not recycling its cause's environmental problem in the world.**

***Index terms*- Ceramic Tiles Waste, Cement, Fine Aggregate, Coarse Aggregate, Water**

I.INTRODUCTION

Concrete is world's most widely used construction material. The utilization of concrete is increasing at a higher rate due to development in infrastructure and the construction activities all around the world. However there are some negative impacts of more production of on concrete like continuous extensive extraction of aggregate from natural resources will lead to its depletion and ecological imbalance. Researches are in search of replacing fine aggregate to make concrete less expensive and to lead sustainable development. This environmental reason has generated a lot of concern in the construction world. The uses of sugarcane bagasse, wooden chips, plastic waste, rice husk ash, rubber tyres, paper and pulp industry waste, waste glass, ceramic tiles powder, broken bricks are some example of the replacing fine aggregate in concrete. Ceramic tiles is categorized as light weight aggregate. In Asia the construction industry is at to realize the advantage of concern in high rise building. Ceramic waste is not commonly used in construction industry and often dust as an industrial waste. The aim of this spread awareness of using ceramic tiles waste as partial replacement of fine aggregate in concrete and determines its compressive strength and density. Until now, Industries by product and domestic waste has been utilize in concrete, but the use of industrial waste in concrete is at the infinity stage. Ceramic tiles are the industrial waste. Tests are as per the specified procedure of Indian standard codes.

II. EXPERIMENTAL MATERIAL

A. Ceramic Tiles

The principle waste coming into the ceramic industry is the ceramic waste. Ceramic wastes are generated as a waste during the process of dressing polishing. It is estimated that 15 to 30% waste are produced of total raw marble used, and although a portion of this waste may be utilized on-site, such as for excavation pit refill, disposal of those waste material acquire large land areas and remain scattered all around, spoiling the aesthetic of the entire region. It is very difficult to find a use of ceramic waste produced.

B. Cement

Ordinary Portland cement is the most common type of cement in general use around the world as a basic ingredients of concrete, mortar, stucco, and most non-specially grout. It is developed from limestone. It is a fine powder produced by heating material to from clinker. After grinding the clinker we will add small amounts of remaining ingredients. Many type of cement are available in the market. When it comes to different grade of cement, the 53 grade OPC cement provides consistency higher strength compared to others. As per the bureau of Indian Standards (BIS), the grade number of cement highlight the minimum compressive strength that the cement is expected to attain within 28 days. For 53 grades OPC cement the minimum compressive strength achieved by the cement at the end of the 28th day shouldn't be less than 53MPa or 530 kg/cm2.

C. Fine Aggregate

Aggregate are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is a good gradation of aggregate. Good grading implies that a sample friction of aggregate in required proportion such that the sample contains minimum voids. Sample of well graded aggregate containing minimum voids require minimum paste to fill up the voids in the aggregate. Minimum paste means less quality of cement and less water, which are further mean increased economy, higher strength, lower shrinkage and greater durability. Those frictions from 4.75mm to 150 microns are termed as fine aggregate. The river sand is used in combination as fine aggregate confirming to the requirement of IS: 383. The river sand is washed and screens, to eliminate deleterious material and oversize particles.

D. Coarse Aggregate

The frictions from 20mm to 4.75mm are used as coarse aggregate. The coarse aggregate from crushed basalt rock, confirming to IS: 383 is being use. The flakiness and elongation index were maintained well below 15%.

E. Water

Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. It's practically proved that minimum water cement ratio 0.35 is required for conventional concrete. If more water is used, segregation and bleeding takes place, so that the concrete becomes weak, but most of the water will absorb by the fibers. Hence it may avoid bleeding. If water content exceeds permissible limits it may cause bleeding. If less water is used, the required workability is not achieved. Portable water fix for drinking's required to be used in the concrete and it should have pH values range between 6 to 9. Since it helps to from the strength giving cement gel, the quantity and quality of water are required to be looked into very carefully.

III. MIX DESIGN

Cement concrete mix design means, determination of the proportion of the ingredients i.e. cement, water, fine aggregate, coarse aggregate which would produce concrete possessing specified properties such as workability, strength and durability with maximum overall economy.

A mix M20 grade was designed as per Indian Standard method (IS 10262-2009) and the same was used to prepare the test samples. The design mix proportion is in the table below

Grade	M-20
Cement (kg)	1.293
Water (liters)	0.640
White Sand (kg)	2.703
Coarse Aggregate (kg)	3.671
Water Cement Ratio	0.5

IV. EXPERIMENTAL SETUP

Sr.No	Concrete Type	Aggregate replacement with ceramic waste
1	A0	Conventional concrete
2	A1	5% replacement
3	A2	10% replacement
4	A3	15% replacement

Sr. No	Concrete Type	Concrete Design Mix Proportion				
		W/C ratio	C	F.A	C.A	C.W
1	A0	0.5	1.293	2.703	3.671	-
2	A1	0.5	1.293	2.568	3.671	0.135
3	A2	0.5	1.293	2.433	3.671	0.2703
4	A3	0.5	1.293	2.298	3.671	0.405

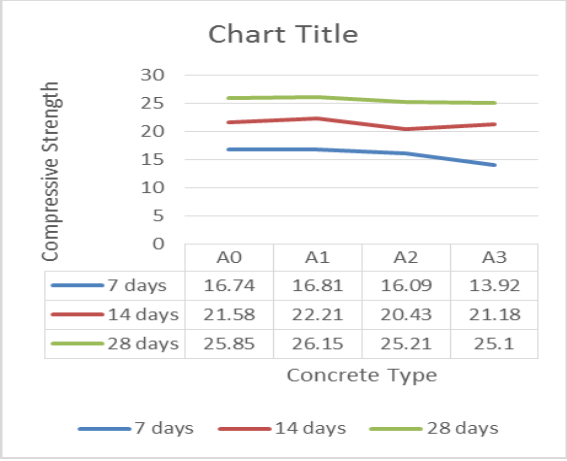
EXPERIMENTAL METHODOLOGY

Concrete contains cement, water, fine aggregate, coarse aggregate, and grit. With the control concrete i.e. 5%, 10% and 15% of the aggregate is replaced with ceramic waste and the data is compared with the conventional concrete without ceramic waste. Three cube sample were cast for each percentage of content as per concrete mix design with partial replacement of aggregate with w/c ratio as per design. After 24h the cube were de-moulded and water curing was continued till respective cube were tested after 7, 14 and 28 days for compressive strength test.

Compressive Strength

Compressive strength tests were performed on compression testing machine using cube sample per batch were tested with the average strength values reported in this paper. The loading rate on the cube is 35 N/mm2 per min. The comparative studies were made on their characteristics for concrete mix ratio as per design with partial replacement of aggregate with ceramic waste as 5%, 10% and 15%

Concrete Type	Average Compressive Strength(MPa)		
	7 days	14 days	28 days
A0	16.74	21.58	25.85
A1	16.81	22.21	26.15
A2	16.09	20.43	25.21
A3	13.92	21.18	25.10



V. CONCLUSION

Conclusion made on based of experimental investigation on compressive strength considering the environmental aspects also, the strength of concrete increases at 5% and at 10% and 15% minor difference with increase in tile waste replacement with the aggregate.

- As per compressive strength we conclude that replacement of 5% ceramic waste in concrete give 26.15 MPa at 28 days for M20 grade of concrete.
- With the 10% replacement of ceramic waste in concrete the compressive strength is 25.21 MPa at 28 days for M20 grade of concrete.
- At 15% replacement of ceramic waste in concrete strength is 25.10 MPa at 28 days for M20 grade of concrete.

Concrete obtain compressive strength at 5% replacement of aggregate with ceramic waste then by replacing more percentage strength is decreasing So, it is economical where ceramic waste is easily available and have minimum transportation charge. The property of concrete is further changed with performing different type experiment. The percentage of addition of ceramic waste may be changed for further experiment. In other experiment condition may be satisfied or will not.

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