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Use Of Selected Waste Materials (Demolished Concrete and Ceramic Tiles) For Concrete Mixes

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Abstract:- **A modern lifestyle alongside the advancement of technology has led to an increase in the amount and type of waste being generated, leading to waste disposal crisis. In order to dispose of or at least reduce the accumulation of certain kinds of waste, we have decided to reuse some of the materials. The waste materials considered to be recycled in this study consists demolished concrete, ceramic tiles. Such recycling not only helps to natural resources but also helps to solve the growing waste disposal crisis. The waste materials are used to replace the up to 5%, 10% and 15% of the coarse aggregate and finally comparing it with the conventional mix design concrete.**

Keywords: **Compressive strength, Mix Proportion, Water cement ration, Ceramic Tiles.**

I. INTRODUCTION

The process of selecting suitable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of the required, strength, durability and workability as economically as possible, is termed the concrete mix design. The proportioning of ingredient of concrete is governed by the required performance of concrete in 2 states, namely the plastic and the hardened states. If the plastic concrete is not workable, it cannot be properly placed and compacted. The properly of workability, therefore, becomes of vital importance.

The compressive strength of hardened concrete which is generally considered to be an index of its other properties, depends upon many factors, e.g. quality and quantity of cement, water and aggregates; batching and mixing; placing, compaction and curing. The cost of concrete is made up of the cost of materials, plant and labour. The variations in the cost of materials arise from the fact that the cement is several times costly than the aggregate, thus the aim is to produce as lean a mix as possible. From technical point of view the rich mixes may lead to high shrinkage and cracking in the structural concrete, and to evolution of high heat of hydration in mass concrete which may cause cracking.

The actual cost of concrete is related to the cost of materials required for producing a minimum mean strength called characteristic strength that is specified by the designer of the structure. This depends on the quality control measures, but there is no doubt that the quality control adds to the cost of concrete. The extent of quality control is often an economic compromise and depends on the size and type of job. The cost of labour depends on the workability of mix, e.g. a concrete mix of inadequate workability may result in a high cost of labour to obtain a degree of compaction with available equipment.

II. THE OBJECTIVES OF PRESENT STUDY ARE

1. To conduct a mix design for M25 grade of conventional concrete.
2. To find the basic properties of cement, sand, aggregate, demolished concrete and ceramic tiles.
3. To replace aggregate by 5% to 20% and carried out their mix design.
4. To find the optimum percentage of replacement of demolished concrete and ceramic tiles.
5. To find the workability of optimum proportion and its suitability.
6. To compare the ratios of conventional mix and its designed optimum mix using selected waste materials.

III. MATERIALS AND METHOD

Cement : Ordinary Portland cement 43 grade ultratech confirming the requirement of IS 8112:1989 is use for the present experimental work.

Fine Aggregate : The sand used for the experimentation was locally produced and was confined to zone-II. The specific gravity of fine aggregate was found to be 2.58. The testing of fine aggregate was done as per IS 383:1970.

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Coarse Aggregate : The coarse aggregate used in this experimentation where 20mm and 10mm size and was confirming IS 383:1970. The specific gravity was found to be 2.82.

Water : Ordinary water of normally pH7 is use for mixing and curing concrete specimen. It should not contain any acids, oils, alkalies or other organic impurities.

Demolished Concrete : In this study the possibility of substituting waste material with natural aggregate is considered. Used waste material are limited to recycled concrete aggregate. Recycled concrete aggregate is substituted by coarse aggregate in concrete mix.

Ceramic Tiles : In this study ceramic tiles are often dumped as a waste materials after it becomes useless. But it can be recycled and can be used as a construction materials in present world which is seeking for alternative construction materials.

3.1 Experimental Program

The present study involves a series of various test performed on various materials to arrive upon certain physical properties wherever required and if not given along with the prominent test to evaluate the strength parameter. The various test that were conducted during the present study includes :

1. Determination of fineness test on cement.
2. Determination of normal consistency of cement.
3. Determination of specific gravity of cement.
4. Determination of specific gravity of sand.
5. Determination of particle size(sieve analysis for sand).
6. Determination bulking of sand .
7. Determination of specific gravity of aggregate.

Table 3.1 : To various test results for the concrete materials.

Sl. No.	Test	Result
1	Fineness Test on Cement	2.5%
2	Normal Consistency of Cement	29%
3	Specific Gravity of Cement	3%
4	Specific Gravity of Sand	2.58%
5	Fineness Modulus Coarse Agg.	7.07%
6	Bulking of Sand i) Maximum % of Bulking ii) Optimum moisture contain	 40% 8%
7	Specific Gravity of Aggregate	2.8%

3.2 Test for Hardened concrete

Compressive Strength Test : For the compressive strength test, the specimens of size 15cm X 15cm X 15cm cubes specimen where casted and tested on compressive testing machine of capacity 2000KN as per IS 516:1959.

Mix proportion and water cement ration : A constant mix proportion of 1: 1.259 : 2.9266 was used for all the sample tested. The water cement ration adopted was 0.45 and was kept constant for all the mixes.

Figures and Tables

Table 4.1 : Cumulative Compressive Strength Result

	5% Demolished Concrete		10% Demolished Concrete		15% Demolished Concrete	
	7 Days	28 Days	7 Days	28 Days	7 Days	28 Days
Compressive Strength	17.75 N/mm^2	27.77 N/mm^2	19.55 N/mm^2	29.88 N/mm^2	15.88 N/mm^2	32.215 N/mm^2

	5% Demolished Concrete		10% Demolished Concrete		15% Demolished Concrete	
	7 Days	28 Days	7 Days	7 Days	28 Days	7 Days
Compressive Strength	16.104 N/mm^2	24.28 N/mm^2	15.775 N/mm^2	28.88 N/mm^2	16.99 N/mm^2	25.88 N/mm^2

	5% Demolished Concrete		10% Demolished Concrete		15% Demolished Concrete	
	7 Days	28 Days	7 Days	7 Days	28 Days	7 Days
Compressive Strength	20.665 N/mm^2	32.770 N/mm^2	25.770 N/mm^2	27.440 N/mm^2	20.880 N/mm^2	29.995 N/mm^2

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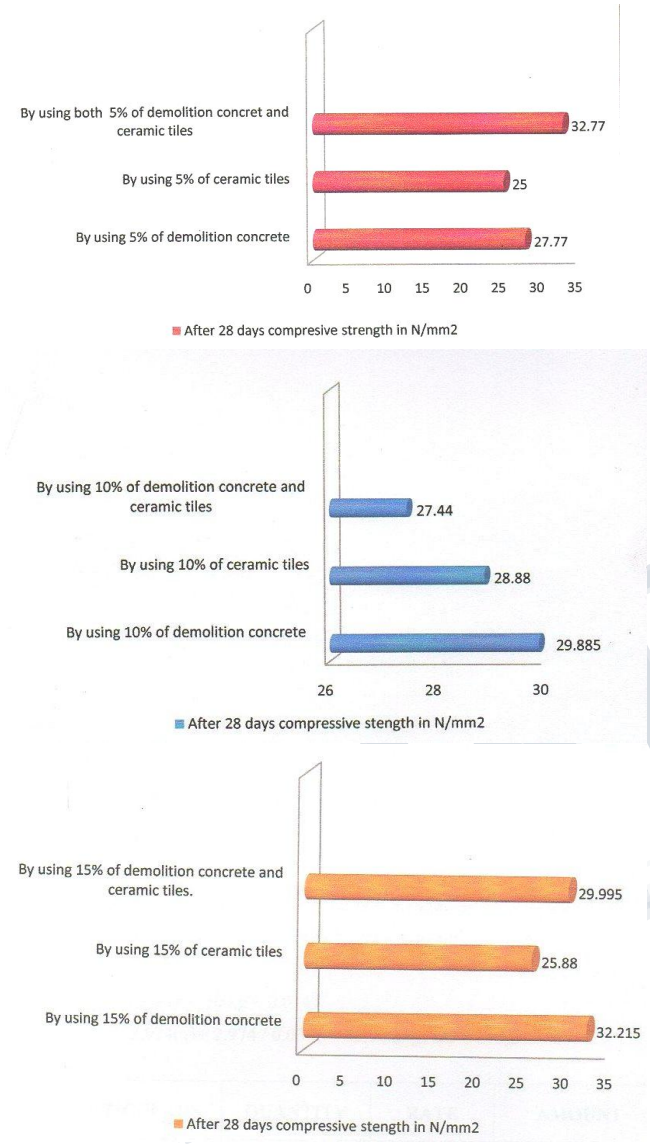

Fig 4.1 Comparision of Compressive Strength for 7, and 28 days

IV. CONCLUSION

By the mix design we had carried out for the M25 grade of concrete by replacing the coarse aggregate by demolished concrete and ceramic and ceramic tiles, we have come to the conclusion that.

1. The result obtained by the replacement of aggregate by both demolished concrete and ceramic tiles by 5%, 10% and 15% was 30 N/mm^2 which is more than the conventional mix design 28.66 N/mm^2.
2. It is environmental friendly as the waste materials are recycled in this study.
3. The use of Natural aggregate is reduced by partially replacing the demolished concrete and ceramic tiles.
4. By using the recycled waste materials the disposal crisis is reduced.
5. It helps to conserve (preserve) natural resources.

Feture Scope

By the mix design we had carried out for the M25 grade of concrete by replacing the coarse aggregate by demolished concrete and ceramic tiles, we have come to the conclusion that.

1. The replacement of the aggregates can be done above 15%.
2. For the crushing of the concrete cubes the suitable machinery method has to be adopted, so as to crush the demolished concrete in proper sizes.

REFERENCES

[1] Mahmoud Nili, Nader Biglarijoo, Sayed Mehdi Hosseinian, Siavash Ahmadi "Disposing waste demolition in concrete as aggregate replacement".

[2] Punit Malik, Jatin Malhotra, Arjun Verma, Piyush Bhardwaz and Akhil Dhoundiyal "Mix design for concrete with crushed ceramic tiles as coarse aggregate".

[3] Concrete Technology 2nd edition by M. L. Gambhir.

[4] Concrete Technology by M S. Shetty.