



AN PARTIAL REPLACEMENT OF AGGREGATES WITH GRANITE POWDER AND CERAMIC TILES IN CONCRETE

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Abstract: Crushed waste ceramic tiles, crushed waste ceramic tile powder, and granite powder are used in place of the coarse aggregates and fine aggregate. The proportions of the coarse aggregates that were substituted by the crushed ceramic waste tiles were 10%, 20%, 30%, 40%, and 50%. 10% of the fine aggregate was replaced with granite powder and ceramic tile powder in addition to the coarse ceramic tile. The M20 concrete grade was created and put to the test. Many other types of combinations were made by switching out the natural aggregate and fine aggregate with crushed tiles and granite powder in various ratios. It has been found that workability rises along with the replacement rate of broken tiles and granite powder.

Keywords: ceramic tiles, Granite powder, compressive strength, split tensile strength.

1. INTRODUCTION

For specific construction components, concrete with strength of more than 5000 psi was regularly used. For instance, high-rise concrete constructions with lower floor columns may use concrete with strength of 12,000 psi or greater to keep the columns' diameters modest. Long concrete beams with 10,000 psi strength may be used in bridges to lower the number of needed spans. It is occasionally necessary to use high strength concrete for structural reasons that are the opposite. Very high strength concrete-even stronger than is required to contact the service loads-may also be selected if the structure must be exceptionally stiff. Concrete having a 19000-psi strength rating was utilized for these commercial applications.

2. OBJECTIVES

The objectives of this study are as follows

- 1) Using Aggregates with Granite Powder as Effectively as Feasible.
- 2) Using aggregates with ceramic tiles is another.
- 3) To evaluate the concrete's split and compressive tensile strengths.

3. MATERIALS

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.140
2	Fineness	7.51%

3.1 Ceramic Tile Aggregate: -Broken tiles were collected from the solid waste of a ceramic manufacturing facility and a demolished building. The worn-out tiles were crushed by hand and with the aid of a machine. The requisite size of crushed tile aggregate was separated in order to partially replace the natural coarse aggregate. Waste tiles that are less than 4.75 mm in size were ignored. The crushed tile aggregate that made it through a 16.5 mm filter and was kept on the 12 mm screen is employed. In addition to using granite powder in lieu of fine aggregate, crushed tiles were also used in place of coarse aggregate in the following ratios: 10%, 20%, 30%, 40%, and 50%, respectively.

3.2 Granite Powder: Since granite powder is made by crushed granite rocks, the chemical and mineral composition of granite is similar to that of cement and natural aggregates. It was chosen in order to investigate concrete behavior and ceramic tile waste.

4. EXPERIMENTAL INVESTIGATIONS

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2.

Table2: Compressive strength of concrete with granite powder and ceramic tiles as partial replacement of cement in concrete.

Sl.no	MIX DESIGNATION	Aggregate Replacement % (CCA+GP)	7 days	28 days
1	M0	0	19.53	28.35
2	M1	10+10	20.62	29.50
3	M2	20+10	21.63	31.47
4	M3	30+10	25.59	35.65
5	M4	40+10	23.10	33.26
6	M5	50+10	21.43	31.15

4.2 Split Tensile strength results The cylindrical specimens (150 mm diameter x 300 mm height) were tested for determining the split tensile strength at ages 7 and 28 days. A cylindrical sample is placed horizontally between the loading surfaces of a compression testing machine.

Table3: Split Tensile strength of concrete with granite powder and ceramic tiles as partial replacement of cement in concrete

Sl.no	MIX DESIGNATION	Aggregate Replacement % (CCA+GP)	7 days	28 days
1	M0	0	1.88	2.74
2	M1	10+10	1.99	2.85
3	M2	20+10	2.13	3.11
4	M3	30+10	2.48	3.46
5	M4	40+10	2.21	3.19
6	M5	50+10	2.09	3.04

5. CONCLUSION

Granite powder replaced with constant percentage of 10% in fine aggregate and ceramic tiles are replaced with different percentages of 10%, 20%, 30%, 40% and 50% in coarse aggregate.

1. The compressive strength of normal concrete at the age of 7 days and 28 days are 19.53N/mm²&28.35 N/mm².
2. The compressive strength of 30% ceramic tiles and 10 % of granite powder at the age of 7 days and 28 days are 25.59 N/mm²&35.65 N/mm².
3. The Split tensile strength of normal concrete at the age of 7 days and 28 days are 1.88N/mm² & 2.74 N/mm².
4. The Split tensile strength of 30% ceramic tiles and 10 % of granite powder at the age of 7 days and 28 days are 2.48 N/mm²&3.46 N/mm².

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