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ALTERNATIVE MATERIALS FOR PARTIAL REPLACEMENT OF COURSE AGGAREGATE WITH CERAMIC TILES IN CONCRETE

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ABSTRACT: *Due to the daily innovations and developments in the field of construction, the use of natural aggregates is greatly increasing and at the same time the solid waste production from building demolition is also high. For these reasons, the reuse of demolished waste such as ceramic tiles has emerged to reduce construction waste and reduce the scarcity of natural aggregates for concrete production. Ceramic tile waste is generated not only from structures, but also from construction networks. This waste must be reused to deal with the finite resources of the Natural Collection and reduce construction waste. Therefore, the reuse of this crushed tile in concrete production can be an effective measure to preserve the environment and improve the properties of concrete. In this study, twenty-four cubes with the same dimensions (150 mm x150 mm x150 mm) with four different ratios were added. The six cubes are designed and tested as a type of control ratio that is 0% ceramic residue as a partial replacement of the thick aggregate with M25 concrete grade. The design of a mixture of four types of mixtures was prepared by replacing different types of coarse and granular aggregate tiles. The concrete block was tested in compression to determine the compressive strength of hardened concrete specimens after 7, 14 and 28 days. Before the destructive test, the concrete performance is determined by a fracture test, a compressive strength test, an impact test, a compression test and an absorption test.*

I.INTRODUCTION:

Cement, sand and materials are essential requirements for any construction industry. Aggregates are the most important materials used in any construction industry. Aggregates are the main materials used for the preparation of mortar and concrete and play the most important role in the design of mixtures. Consistent with conservation efforts, research focuses on ceramic tile bins as a partial total change to prevent solid production of environmental pollution and considers elements of sustainable and high-cost construction projects, particularly the use of materials. As a developing country, the construction sector is an area that can build our economy and produce successful contractors. Despite this industry, there are many benefits to the country such as creating more employment opportunities and bringing positive economic growth, but there are also some issues that require public attention. Most of the construction and waste in our country is not used again, but the landfill eventually gets the valuable land, not to mention the cost of disposal (Wayne, 2007). However, many construction industries produce construction waste that contributes to the dumping or residual result of materials from the renovation of building stone, wood, iron, cement and other waste materials. This research will focus on ceramic waste derived from the ceramic industry. Currently, the production of the ceramic industry goes to waste, which still does not go through the recycling process.

Therefore, the potential use of this material will reduce environmental pollution. The amount of tile residue in the soil is sufficient to be used as aggregates in concrete. The tile is produced from natural materials at high temperatures. Parts of the slab are used as flooring and are also located on tennis courts, sidewalks, bike paths and gardens as ground material. The remaining slabs are stored on factory farms because of their economic value. Every year, however, around 250,000 tons of tiles come out, while 100 million tiles are used for repairs. Despite the decorative benefits of ceramic, however, its remains create many environments, among others. This waste can be recycled to save money. Traditionally, coarse materials used in the manufacture of concrete are gravel, gravel, granite, and limestone.

II. OBJECTIVES OF STUDY

With the increase in urbanization in India, the number of buildings and consequently the use of ceramic tiles will increase significantly in the near future. Therefore, the non-environmental nature of this trash can be a potential hazard. This study demonstrates an alternative method of recycling ceramic tiles by incorporating them into concrete construction. The problem is that the problem stems from urbanization and the solution that accompanies it can be appreciated.

The use of broken tiles in concrete construction is a new technique and a well-developed composite design for the amount of material is not available. Through this study, the aim is to make appropriate mixing ratios and percentage changes by partially converting naturally coarse groups with recycled coarse groups using locally available materials. Therefore, sell. The possibility of using tires as an alternative building material will be investigated. The results should be analyzed by performing several laboratory tests on the prepared samples. In addition, the advantages and disadvantages of its use will be examined by the properties of the concrete.

III. METHODOLOGY OF THE STUDY

The different methods utilized in this research include the following

I. Background Studies: The literature has been revised to review previous studies related to this dissertation.

II. Raw material collections: All the necessary materials were collected and taken to the laboratory. These are: cement, fine substances, coarse substances, broken ceramic tiles and mixtures.

III. Material Tests: Tests were performed on raw materials to determine their properties and usefulness.

IV. Mix Proportioning (Mix Design): The concrete mix designs are designed using M25 grade design mix. They are made of coarse marine surfaces of up to 20, 40 and 60% of ceramic tiles.

V Specimen preparation: Concrete samples were prepared in Mahaveer Engineering College, Department of Civil Engineering, and Materials Testing Laboratory. Final specimens consist of concrete blocks, cylinders and beams.

VI Testing of samples: Laboratory tests were performed on the prepared solid samples. The tests performed were split deceleration, unit load and compressive strength, tensile strength, impact resistance and flexible strength tests.

VII. Data collection: Data collection was mainly based on tests performed on samples prepared in the laboratory.

IV. MATERIALS USED

The properties of different materials made of concrete are discussed in the following sections.

A. Cement

Grade 43 ordinary Portland cement was used in the construction of concrete slab panels and concrete in experimental work, which meets all the requirements of IS 8112-1989. See table 1.

B. Natural sand (river)

The natural sand with a 2.78 fineness module and according to IS Zone II: 383-1970, was used for use after washing with clean water. The specific gravity of this natural sand was 2.55. The values of water absorption and moisture content obtained for the sand used were 6% and 1.0%, respectively

C. Thick group (broken tiles)

Groups of stone and broken tiles obtained at the local quarry were used. The nuances of the course groups found a specific weight of module 2.76, which were 2.5% and 0.5% of the water absorption and moisture content values for the sand used, respectively.

TABLE I. Typical properties of Cement 43 grade IS 8112-1989

Physical properties	Values of OPC used
Standard	32.5%
consistency	
Sp gravity	3.15
Initial setting time	>30 min's
Final setting time	<600 min's

TABLE II Properties of Aggregates

Properties	Natural sand	Course aggregate
Specific gravity	2.74	2.77
Fineness module	2.78	-

D. properties of ceramic coarse aggregates

Ceramics is one of the oldest industries on the planet. The word ceramic comes from Greek word ceramics, which means "pottery "clay. According to Mustafa et al., 2008, partial size analysis of course aggregates of ceramic residues provides a wide verity of particles with normal crushed concrete. An important description of course gravel is considered to be more delicate then ordinary crushed stone gravel. surface texture and mining science affect the relationship between aggregates and past , as well as the level of stress at which micro cracking begins , the overall strength in the case of high strength concrete . Ceramic waste has properties suitable for used as a pozolanic material and is suitable for use in the construction of concrete. (Jomlit Alnette)

Fig. 1 ceramic tiles

V. Previous research of coarse aggregates replacement material

1. Recycled tires

In our study, compressed power decreased 32% with 10% change in obese group and fell further with higher conversion levels. In only two compounds, this result fulfill the compact strength requirement of class P concrete at age 10 with 10% tire chips in the coarse group. Both the cement content has low compressive strength. As the total volume of rubber increased regardless of the cement content, the unit weight decreased.

Fig. 2 waste rubber tyre

2. Coconut shell

Prepare three different mix designs for m20, m35 and m50 grit concrete. The percentage change through the coconut shell is 0%, 10%, 20%, 30%, and 40% respectively. The study found that converting cs groups to 30% of m20 grade concrete kiosks gave 23MPa strength in 28 days. The concrete cube buzz, 30% conversion of cs groups, delivered 42 MPa to the m35 in 28days. For calf buzz m50 grade concrete the strength of 51 MPa was changed with 30% CS groups in 28 days.

Fig 3 crushed coconut shell

3. Pumic stone

To this end, volcanic pumice stone has conducted experimental experiments on the properties of light group, forming two groups of light groups (thick groups with naturally coarse concrete) and their physico-mechanical and stable. The angle was studied. The results of compressive strength, tensile strength and drying shrinkage indicate that they can meet the light weight concrete requirements of light weight structural structures.

Fig. 4 Pumice Stone

4. E-Plastic

Recycled e-plastic is one of the new waste materials used in concrete industry. For the disposal of large amount recycled plastics, recycling of plastics is considered to be the most practical application in the solid industry. Recycled plastics can be used as a coarse mass in concrete. However, it is important to note that recycling waste is not an economic benefit to the high cost of transportation in this effect on the total cost of production. In addition, it is important not to set aside other costs, directly due to the type of trash, the need to measure gas emissions, especially during burning, and the presence of toxic and pollutants.

Fig 5 plastic

VI. Types of Mixes

A. Nominal mixture

Previously, the will for concrete determined the ratio of cement, fine, and coarse groups. These compounds of constant cement-mass ratio are called small compounds that ensure sufficient strength. They provide lubrication and, under normal conditions, the margin strength is greater than some. However nominal concrete mixing for a given crew varies strongly due to the variability of the material.

B. Standard mixture

The nominal mixture (in terms of volume) of a fixed cement-mass ratio varies widely in strength and as a result-or

C. Design mix

The performance of the concrete in these mixtures is determined by the designer, but the ratio of the mixtures is determined by the concrete manufacturer, except that the minimum content of cement is maintained. It is a very rational approach to select proportions mixed with specific materials, taking into account more Or less specific properties. This approach leads to the production of concrete with economically adequate properties. However, the projected mixture does not function as a guide because it does not guarantee the correct mixing ratio for a given performance.

D. Factors that influence the choice of mixing ratio

- Compressive Strength(CS)
- Workability-The performance of concrete for satisfactory placement and compression is related to the size and shape of the part, the amount and distance of strength and technique used for transport and placement and compression.
- Durability
- General nominal size of the aggregates-The maximum nominal size of the aggregates used in the concrete can exceed the limit established by IS 456:2000.
- Quality Control-Cement material should be limited to shrinkage, cracking and cracking.

TABLE Ill Test data for materils

Table head	Table column head
Cement used	OPC 43 grade conforming to IS 8112
Specific gravity of cement	3.15
Specific gravity of coarse aggregate (CA)	2.74
Specific gravity of fine aggregate (FA)	2.77
Water absorption coarse aggregate	0.5 %
Water absorption fine aggregate	1.0 %
Sieve analysis coarse aggregate	Conforming to table 2 of IS: 383
Sieve analysis fine aggregate	Conforming to zone I of IS: 383

VII. Design Mix (Based on BIS method)

1) Target Mean strength for Mix proportion

$f'_{ck} = f_{ck} + 1.65xS$

Where f'_{ck} = Target average compressive strength at 28 days,

f_{ck} = Characteristic compressive strength at 28days

S= Standard deviation from table1 of IS 456 (S=4) Therefore, target strength25+1.65x4 =31.6N/mm^2

2) Calculation of Cement Content

Water cement ratio = 0.44

Cement content = 182/0.44 = 413.63 kg/m^3 =414 kg/m^3

From Table 5 of IS: 456, minimum cement content for severe exposure condition = 414 kg/m^3> 300 kg/m^3, hence OK.

3) Calculation for CA and FA

Volume of concrete = 1 m^3

Volume of cement = 414 / (3.15 X 1000) = 0.1301 m^3

Volume of water = 182 / (1 X 1000) = 0.1820 m^3

Total weight of other materials except coarse aggregate = 0.1301 + 0.1820 = 0.3121 m^3

Volume of coarse and fine aggregate = 1 – 0.3121 = 0.6879m^3

Volume of F.A. = 0.6879 X 0.33 = 0.2332 m3 (Assuming 33% by volume of total aggregate)

Volume of C.A. = 0.6879 – 0.2334 = 0.4335 m^3

Therefore weight of FA = 0.2334 x 2.55 x 1000 = 595.17 kg/m^3

Say weight of F.A. = 595 kg/ m^3

Therefore weight of C.A. = 0.4335 X 2.76 X 1000 = 1196 kg/m^3

Say weight of C.A. = 1196 kg/ m^3

Weight of water =178.542 kg

Water: cement: F.A.: C.A. = 0.44:1: 1.43: 2.88

4) The compressive strength for 7 days and change in strength with reference mix

After curing of cubes for 7 days, the concrete moulds of 150x150xl50 mm is tested with a compressive testing machine or universal testing machine. Apply the load gradually without shock and continuously at the rate of 140kg/cm^2/minute till the specimen fails. The results are shown in Table IV

TABLE IV The compressive strength for 7days. (N/mm^2)

Ceramic tiles	Compressive strength N/mm2	Change in Strength with reference mix
0%	20.57	-
20%	22.54	+1.97
40%	23.96	+3.39
60%	22.42	+1.85

5) Compressive Strength for 28 days

After curing the cubes for 28 days, the concrete moulds of l 50xl 50x150 mm are tested with a compressive testing machine. Apply the load gradually without shock and continuously at the rate of 140kg/cm^2 minute till the specimen fails. The result is shown in table V.

TABLE V The compressive strength test results for 28days (N/ mm^2)

Crushed tiles	Compressive strength N/mm2	Change in Strength with reference mix
0%	33.18	-
20%	38.5	+5.32
40%	39.5	+6.32
60%	34.12	+0.94

6) The split tensile strength obtained by testing the cylindrical specimen for M25 grade of concrete to all the mixes designed for various replacements are given below.

TABLE VI the Spilt tensile strength for 7days &28days. (N/mm^2)

Ceramic tiles	Split tensile strength for 7 days (Mpa)	Split tensile strength for 28 days (Mpa)
0%	1.67	2.56
20%	1.69	2.615
40%	1.69	2.59
60%	1.67	2.52

VIII. Conclusions

The following strengths are taken based on experimental tests on elastic strength, which are considered to differentiate combat strength, stress and environmental factors:

- The practicality of concrete increases with the increase in the replacement of the tile compound.

• The properties of the concrete increased as the ceramic aggregate increased to 20% replacements after it is reduced linearly.

• In the case of compressive strength, divide the tensile strength by 20% of the concrete mixture and compared to other mixtures.

• Mixtures of up to 20% of coarse ceramic aggregate can be used.

• The split tensile strength of the ceramic tile aggregate is much higher than the conventional grade of the concrete tile.

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