

## Experimental Study on Replacement of Aggregate with Ceramic Waste and Quarry Sand

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### ABSTRACT:

This is a cheap material, concrete, infrastructure development and its allies construction materials, are widely available in the vital nature of engineering works, including world. The widespread use and rapid infrastructure development, the natural stone and aggregates, such as total fat, there is a downside. These fine gravel and coarse gravel is the waste that can be replaced with stop are available for a higher price. Through this initiative, M20 grade concrete gravel quarrying Sand and 0% in weight total fat, 10%, 20%, from 30% to be replaced with ceramic waste. Gravel and crushed stone sieve analysis must replace ceramic and quarry waste will be conducted for dust. Experience in product mix concrete terms and in comparison with traditional concrete compressive strength. 7,21 and 28 days were carried out to evaluate the ability of these tests.

### KEYWORDS:

Specific gravity test, workability test, compressive strength, ceramic waste and quarry dust.

### I. INTRODUCTION:

The development of solid waste in the construction industry for many years. Some of the burned waste products, rice bran, saw dust, waste tires have, on garbage, glass, dust lost ash, stone and ceramic. A process for using waste product offers economy and a healthy environment as the heat used in the production of concrete products was due yesterday. Content as possible and solid economic strength, durability, and the amount of options that have a solid product, as the possibilities to determine what sent as concrete mix design. Plastic and hardened concrete performance monitoring pursuing solid parts of the state. It can not be properly plastic, if practical, collect the solid. Hard concrete compressive strength, the quality and cement, the elements of water and depending on the size and mix bycg; having, compaction and treatment.

Product price, the minimum concrete structural engineer has power, who need to understand the power of the related cost of materials. Depending on the quality control measures, but it is a fact that the cost of concrete quality control. The quality control often depends on an economic trade-off, and the size and type of work. Labor costs will depend on the mix of possibilities, like, wrong result the viability of a concrete mix can lead to a degree of compaction equipment available for the high cost of labor. It is essential to take steps to structure the design mix / high strength.

### II. RELATED WORK:

#### Main aspect of this project and what we do..?

In this project the fine aggregates will replaced by quarry sand and coarse aggregate will replaced by ceramic waste accordingly in the range of 0%, 10%, 20%, & 30% by weight of M-25 grade concrete. Sieve analysis is done for Ceramic waste and Quarry dust for the replacement coarse aggregate and fine aggregate. Concrete mixtures were produced, tested and compared in terms of compressive strength to the conventional concrete. For find out the strength properties of concrete, the concrete were casted, tested to evaluate the strength properties for 7, 21, 28 days Mix design aims to achieve good quality concrete at site economically.

#### I. Quality concrete means:

- Better strength
- Better imperviousness and durability
- Dense and homogeneous concrete

#### II. Economy:

##### a) Economy in cement consumption:

It is possible to save up to 15% of cement for M25 grade of concrete with the help of concrete mix design. In fact higher the grade of concrete more are the savings.

Lower cement content also results in lower heat of hydration and hence reduces shrinkage cracks.

**b) Best use of available materials:**

Site conditions often restrict the quality and quantity of ingredient materials. Concrete mix design offers a lot of flexibility on type of aggregates to be used in mix design. Mix design can give an economical solution based on the available materials if they meet the basic IS requirements. This can lead to saving in transportation costs from longer distances.

**c) Other properties:**

Mix design can help us to achieve form finishes, high early strengths for early De-shuttering, concrete with better flexural strengths, concrete with pump ability and concrete with lower densities.

**III. DESIGN MIX CONCRETE:**

As the guarantor of quality of concrete used in the construction, the constructor shall carry out the mix design and the mix so designed (not the method of design) shall be approved by the employer within the limitations of parameters and other stipulations laid down by this standard. The mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in Table 2. The target mean strength of concrete mix should be equal to the characteristic strength plus 1.65 times the standard deviation. Mix design done earlier not prior to one year may be considered adequate for later work provided there is no change in source and the quality of the materials.

**3.1 Concrete Grades: The concrete shall be in grades designated as per Table 2.**

The characteristic strength is defined as the strength of material below which not more than 5 percent of the test results are expected to fall. The minimum grade of concrete for plain and reinforced concrete shall be as per Table 5. Concrete of grades lower than those given in Table-5 may be used for plain concrete constructions, lean concrete, simple foundations, foundation for masonry walls and other simple or temporary reinforced concrete construction.

**Table: 3.1.1 Grades of concrete:**

Group	Grade designation	Specified characteristics compressive strength of 150mm cube at 28 days in N/mm <sup>2</sup>
Ordinary concrete	M10	10
	M15	15
	M20	20
Standard concrete	M 25	25
	M30	30
	M35	35
	M40	40
	M45	45
	M50	50
	M55	55
High strength concrete	M 60	60
	M65	65
	M70	70
	M75	75
	M80	80

**3.2 Minimum Cement Content:**

Minimum cement content been given in design to the increased risk of cracking. Cement content not including fly ash and ground due to drying shrinkage in thin sections, or to early granulated blast furnace slag in excess of 450 kg/m<sup>3</sup> thermal cracking and to the increased risk of damage should not be used unless special consideration has due to alkali silica reactions. Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size.

**Table: 3.2.1 Minimum Cement Content:**

Sl no.	Exposure	Plain concrete			Reinforced concrete		
		Minimum cement content Kg/m <sup>3</sup>	Maximum free water-cement ratio	Minimum grade of concrete	Minimum cement content Kg/m <sup>3</sup>	Maximum free water-cement ratio	Minimum grade of concrete
1)	Mild	220	0.60	-	300	0.55	M20
2)	Moderate	240	0.60	M15	300	0.50	M25
3)	Severe	250	0.50	M20	320	0.45	M30
4)	Very severe	260	0.45	M20	340	0.45	M35
5)	Extreme	280	0.40	M25	360	0.40	M40

**Table: 3.2.2 Adjustments to Minimum Cement Contents for Aggregates Other Than 20 mm Nominal Maximum Size**

Sl no.	Nominal maximum aggregate size (mm)	Adjustments to minimum cement contents (kg/m <sup>3</sup> )
1)	10	+40
2)	20	0
3)	40	-30

**IV. Workability of concrete:**

The concrete mix proportions chosen should be compacted with the means available. Suggested such that the concrete is of adequate workability for ranges of workability of concrete measured in the placing conditions of the concrete and can properly accordance with IS 1199 are given below.

**Table:4.4.1 Workability of concrete:**

Placing conditions	Degree of workability	Slump (mm)
Blinding concrete; Shallow sections; Pavements using pavers	Very low	Compacting factor will be more appropriate than slump. compaction factor value 0.75 to 0.80 is suggested
Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings	Low	25-75
Heavily reinforced sections in slabs, walls, beams, columns;	Medium	50-100

Slip form work; Pumped concrete		
trench fill	High	100-150
In-situ piling Tremie concrete	Very high	In the very high category of workability measurement of workability by determination of flow will be appropriate.

## V.CONCLUSION:

In this project work fine aggregates will be replaced by quarry sand and coarse aggregate will be replaced by ceramic waste accordingly in the range of 0%, 10%, 20%, & 30% by weight of M20 grade concrete. From the experiments conducted, replacement of ceramic waste as coarse aggregate and quarry dust as fine aggregates in concrete can be optimized. At 10% and 30% replacement of coarse aggregates with ceramic waste and fine aggregate with quarry dust the strength properties were decreased linearly when compared with conventional concrete. At 20% replacement of coarse aggregates with ceramic waste and fine aggregate with quarry dust the strength properties were marginally increased when compared with conventional concrete. So 20% replacement of ceramic waste as coarse aggregate and quarry dust as fine aggregate (sand) by conventional aggregates content in concrete can be optimized and it can be used as construction purpose.

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