

# Study of Behavior of Concrete When Brick Aggregate is used as Coarse Aggregate in Cement Concrete

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**Abstract**— Word recycles means to reproduce any waste product and aggregate is used in concrete to supply force and together it means an aggregate made with waste material which is going to be applied in concrete. Brick aggregate is derived from demolished concrete structures. When any concrete structure is demolished, the parts demolished of concrete structure can be used as brick aggregate. In this research project properties of brick aggregate are determined and also brick aggregate is used in concrete of M40 grade, as well. Then a comparative study is also made out of brick aggregate with natural crushed stones.

**Key words:** Brick Aggregate, Properties, Concrete, Structure

## I. INTRODUCTION

Amid the most recent decades, it has been perceived with developing worry that squanders from a development are of extensive volume and that this volume is expanding year by year. The issue of waste collection exists around the world. The majority of waste materials are left as a landfill material or unlawfully dumped. Ecological effect can be decreased by making more reasonable utilization of this waste. Waste administration is one of the needs of each group and it has gotten to be apparent that great waste administration can improve the personal satisfaction. A guideline of a quality waste administration is in bringing down the large scale manufacturing of new, discovering approaches to reuse and reuse existing, and safe and naturally satisfactory storing of unused waste. Reusing is the reprocessing of old materials into the new items, keep the misuse of possibly helpful materials, diminishing the utilization of crude materials. At along these lines, it is conceivable to decrease the issue of development and devastation waste stockpiling, furthermore, to decrease the utilization of common materials. The usage of stone work waste and of pulverized block as an total in mortar and cement would have a positive impact on the economy moreover. In particular, a safeguarding of normal materials is noteworthy for a biologically capable and economical building that would be cost viable moreover. This sort of building infers a use of lowcost materials that can be utilized with no negative effect on the earth. In this fast growing world, fashion changes every week and trends change, need of human is also increasing and along with need humans want to grow or change with latest trends, due to this building renovated or rebuild. If any building rebuild so the waste which is collected from their demolish structure is basically used for landfills but now waste collected from concrete structures can be used as an aggregate in concrete. Brick aggregate is waste product of demolished brick masonry, the main objective of this article is to show the utilization of brick aggregate in concrete.

## II. METHODOLOGY

### A. Material Used:

Ordinary Portland Cement of Grade 43 is used, which conforming to IS 12269. The physical properties of the cement obtained in conducting appropriate tests as per IS: 269/4831, Specific gravity of the cement is determined in the laboratory is 3.15 with fineness modulus of 3.21. Water used in the concrete is conforming to the specification of IS 456: 2000. Water used for mixing is free from injurious amount of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete. Brick Aggregate is the waste material from demolished brick masonry, Brick aggregate is a waste material collected from demolished concrete structure, for this project brick aggregate is collected from a demolished concrete structure situated in Bhopal. Specific gravity of brick aggregate is 2.45 with fineness modulus of 5.61. These totals are used after strictly passing through 20mm IS sieve. Natural river sand conforming to Zone III as per IS 383:1987 is used. The fineness modulus of sand used is 2.50 with a specific gravity of 2.62.

Crushed Naturally occurred stones are utilized as coarse aggregate conforming to IS: 383:1987 is employed. Coarse aggregate of size 20 mm down having the specific gravity of 2.71 and fineness modulus of 5.20 was applied.

### B. Mix Proportion and Casting

M40 Concrete is designed according to specification given under IS 10262:2009, conventional concrete mix and concrete mix containing Brick aggregate as partial replacement of coarse aggregate upto 100% at an interval of 20% concrete mix are prepared. All these mixes are castes in 150mm \* 150mm \* 150mm cubes and after 24 hours these cubes are demolded and placed for curing, curing is done in clean water and in room temperature, these cubes are tested after 7 and 28 days of curing.

### C. Experimental Program

To determine the properties of brick aggregate and brick aggregate concrete the test performed are given below:

#### 1) Test on Aggregate:

To find out the mechanical properties of natural aggregate and brick aggregate, test performed on the brick aggregate and natural aggregate specified by IS code are given below:

- Aggregate Crushing value:
- Aggregate Impact Value
- Aggregate Abrasion value

#### a) Workability

Workability of concrete means the ease of work of concrete. There are many test by which workability is determined but Workability of concrete in this project is determined by slump cone test.

b) Compressive Strength

Compression test is the most commonly test used to perform on the hardened concrete. The load of the concrete specimens with different part of recycled aggregate replacement can be suggested through the compression test. The specimens used in the compression test are of 150X150X150mm size. Specimen are placed in compression testing machine and load is applied on it. Compressive strength of concrete is determined by maximum load taken by specimen by bearing area.

III. RESULT AND DISCUSSION

To check the mechanical properties of aggregate the main test which performed on brick aggregate and natural aggregate and it has been observed that natural aggregate remain better than brick aggregate because value all three test are in natural aggregate as compare to brick aggregate but value of brick aggregate are also in permissible limit so these aggregate can also be used. Result of crushing value, Impact value, Abrasion Value are given in table 1.

Test	Brick Aggregate	Natural Crushed Stone
Crushing Value	24.52%	14.17%
Impact Value	18.18%	9.42%
Abrasion Value	27.60%	14.78%

Table 1: Aggregate crushing, Abrasion and impact value

Workability of concrete is determined by slump cone test and it has been observed that by the addition of brick aggregate workability of the concrete is goes down. Workability test result are given in table 2 and Graph 1.

Percentage Brick Aggregate	Mix Name	Slump (mm)
0%	CC	98
20%	BA1	86
40%	BA2	83
60%	BA3	75
80%	BA4	64
100%	BA5	51

Table 2: Slump value of brick aggregate

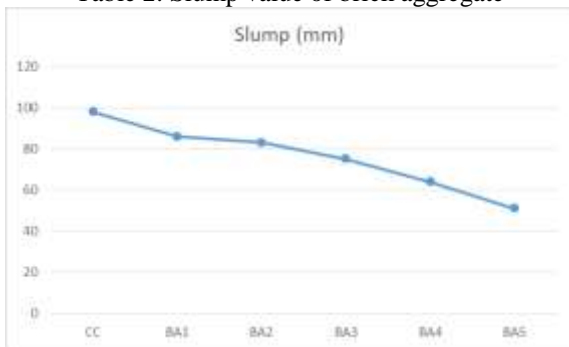


Fig. 1: Graph 1: Slump value of brick aggregate

When brick aggregate is added to concrete it has been observed that, brick aggregate decreases the compressive strength of the concrete. result of compressive strength are given in table 3 and graph 2-3.

Percentage Brick aggregate	Mix Name	Compressive Strength (MPa)	
		7 Days	28 Days
0%	CC	37.52	49.53
20%	BA1	35.57	45.63
40%	BA2	34.46	44.09

60%	BA3	26.33	43.23
80%	BA4	23.64	38.53
100%	BA5	21.91	35.43

Table 3: Compressive Strength of Brick aggregate

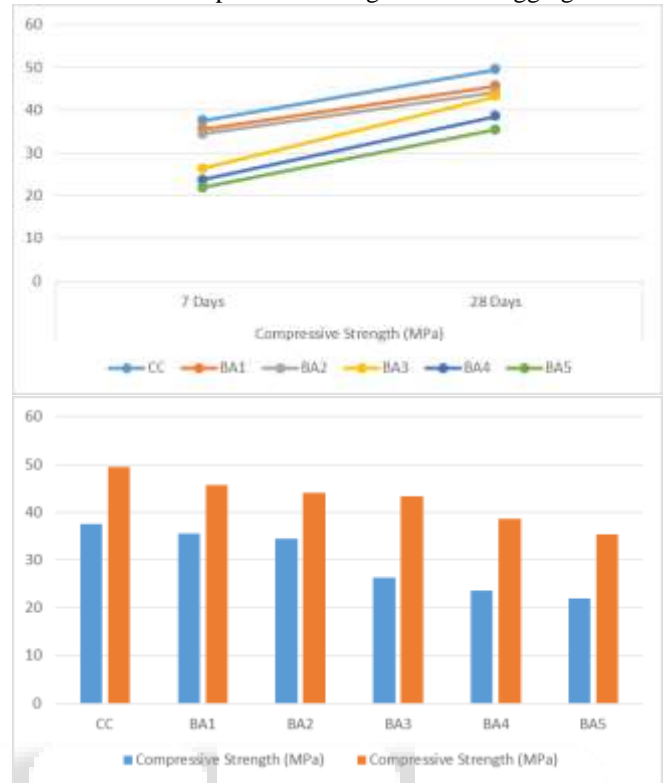


Fig. 2: Graph 2 and Graph 3: Compressive Strength test result.

IV. CONCLUSION

From present investigation we observe that, Increase in the rate of brick aggregate, lesser the compressive strength yet utilization of block total in cement concrete is limited to 60%. Present investigation also shows that Workability is diminished when we utilized brick aggregate as a part of cement concrete and brick aggregate Impact value, abrasion value and crushing value is higher than common natural crushed stone however it is in reasonable breaking points so that these block totals are useable.

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