

USE OF PARTIAL REPLACEMENT OF OVER BRUNT BRICK AND DEMOLISH BRICK BATS AS A COARSE AGGREGATE IN FRESH CONCRETE

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Abstract - Concrete is major role in construction industry as in the world's wide used construction material. Typical ingredients of concrete mixtures are cement, coarse aggregate, fine aggregate, water and admixture. The main part of concrete volume occupy by coarse aggregate. Apart from that concrete ingredients other material replace by coarse aggregate in typical concrete. The materials are including over burn brick and demolish brick. The property of coarse aggregate and over brunt brick & demolish brick was observed which were nearly same. Therefore in research of concrete decided to partially replace the coarse aggregate by using over brunt brick & demolish brick. The over burn brick is easily available in brick manufacturing area and demolish brick are also available in huge quantity because lot of structure are in the stage of demolish. One of major problem of brick changes their nature due to the uneven temperature control in kiln. These rejected bricks and demolish structure good strength brick can also be a potential source like coarse aggregate.

This research presents checking mechanical properties of over brunt brick bat & demolish brick based concrete partially replaced over brunt brick & demolish brick to coarse aggregate in percentage of 15, 30, 45 and 60 in M35 grade of concrete and its effect on the mechanical properties of concrete matrix in wet state properties. In that research it is observed that workability decreasing with increasing percentage replacement of coarse aggregate.

Key Words: Over brunt brick, demolish brick, Workability, Kiln, Admixture etc.

1. INTRODUCTION

Now-a-days the construction sector is exploring rapidly on a large scale and also involves new techniques for rapid and comfort work on the field. The mixture of cement, fine aggregate, coarse aggregate, water and as required Admixture to make concrete that can be molded into any shape. The productions of concrete from sources of aggregates are cutting mountains or breaking river gravels or boulders these causes various environmental problems. Usage of over brunt and demolish bricks bats waste in construction industry would help in reduction of stress on environment. The uses of each waste product have its specific effect on properties of fresh concrete. The use of

waste material in concrete not only makes it commercially but also solves some of the disposal problems. From the last decade, construction industry has been conducted research and developing on the use of waste material in concrete.

This over burnt brick and demolish bricks serves as waste in construction. Hence these rejected bricks and demolish bricks can also be potential source of coarse aggregate. Utilizing these waste materials as coarse aggregate will provide a good use. Further, aggregate production from such waste bricks may be an effective use to make the most of energy and efforts spent on the production bricks. For the commercially and environmental issues have led to increasing attention and research in properties of brick aggregate and concrete made from it.

1.1 Objectives

For this experimental study main objective is to find out the properties of concrete by replacing natural occurring coarse aggregate with over brunt bricks & demolish brick aggregate.

To identify and check the effects on the properties of over brunt bricks, demolish brick concrete and effect of its salient parameters such as specific gravity, aggregate impact value, aggregate crushing value.

To check and develop a mixture proportioning process to manufacture over brunt bricks & demolish brick concrete such as mix design.

To check and identify the short-term properties of fresh concrete of over brunt bricks & demolish brick like slump value, compaction factor.

2. MATERIALS

This Chapter presents various studies that have been conducted on concrete discrepancy the sources of materials. The test carried on physical properties of fresh concrete and the materials that are required for making the concrete by use of over brunt bricks & demolish brick as a coarse aggregate such as cement, sand, over brunt bricks & demolish brick bats as coarse aggregates and the water as per design of mix proportion M35 are clearly mentioned in a tabular format.

Table -1: Mix design proportion M35

Material	Proportion by weight	Weight in kg/m ³
Cement	1	400
F.A	2.08	832.15
C.A	2.86	1138.73
W/C	0.4	160lit

2.1. Cement

Grade 53 Ultra Tech cement is use for casting cubes and cylinders for all concrete mixes. The cement is of uniform in color i.e. grey with a light greenish shade and is free from any hard lumps. Summary of the various tests conducted on cement are as under given below in Table.

Table -2: Test on Cement

Sr. No	Characteristics	Values	Standard values
1.	Normal Consistency	31 %	-
2.	Initial Setting Time	52 min	Not be less than 30 min
3.	Final Setting Time	245 min	Not be greater than 600
4.	Fineness	5.4	<10
5.	Specific Gravity	3.11	-

2.2 Fine Aggregate

The natural sand used for the experimental study is locally procured and conformed to Indian Standard Specifications IS: 383-1970. The sand is first sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and then washed to remove the dust. The aggregates are sieve through a set of sieves to obtain sieve analysis. The fine aggregated belonged to grading zone II.

Table -3: Properties of fine aggregates

Sr. No.	Characteristics	Value
1.	Type	Uncrushed (Natural)
2.	Specific Gravity	2.66
3.	Total Water Absorption	1.04%
4.	Fineness Modulus	2.602
5.	Grading Zone	II

2.3 Coarse Aggregate

The material which is retained on BIS test sieve no. 480 is called as a coarse aggregate. The broken stone is generally used as a coarse aggregate in concrete. The nature of work depends to use of the maximum size of the coarse aggregate. Locally available coarse aggregate having the maximum size of 20 mm was used in our experiment. The aggregates are washed to remove dust and dirt and were

dried to surface dry condition. The coarse aggregates are tested as per Indian Standard Specifications IS: 383-1970.

Table -4: Properties of Coarse aggregates

Sr. No	Characteristics	Value
1.	Type	Crushed
2.	Maximum Size	20 mm
3.	Specific Gravity (20mm)	2.86
4.	Total Water Absorption	3.243%
5.	Fineness Modulus (20mm)	7.68

2.4 Over Brunt Brick

The brick manufacturing industries are generally near to the source of required raw materials. From the raw material traditional clay bricks are produce by manual method by pressing clay with mixture of certain amount of sand in the wooden mold. Then the wet bricks are first dried in the sun and air laid in layer and then transported to the brick kiln for following burning process. The good quality bricks are burnt in clinker up to temperature of 800-900C. If the temperature in the brick clinker is not in controlled or excess then the bricks are burnt excessively up to the temperature 1100-1200C. Because of this the bricks becomes change their shape, size and are cost is cheaper in market or construction industry or sometimes has no value. However, these brick has possessed more strength than the normal clay burnt bricks. Hence one of the cheapest alternatives for brick foundation, floors, roads etc. because of the fact that the over burnt bricks has a good strength and hence they are sometimes found to be stronger than even the first class brick. In brickwork using these bricks required 35%-40% of more mortar than traditional brickwork. Because of that price over burnt bricks is less and are easily available.

2.5 Demolish brick

The demolish brick bats are collected from the source demolished structures. Now a day demolish structure are available in huge amount everywhere. The brick debris were collected locally from different sources and broken these bricks into the pieces of approximately 12.5 to 20 mm size with the help of hammer. Investigating the suitability of demolish waste brick as alternative source of coarse aggregate in concrete is very important for these experiment convince people that brick waste material can be reused in the construction industry. The investigating of the test is necessary to identify the result whether it is satisfactory requirement or not. This is because of result from the test will show that whether demolish waste brick can achieve the minimum requirement of compressive strength test and even higher. However they have in very poor size and shape. Brick work not done by these bricks, so it can be used in concrete. The compressive strength will be present for age 7, 14 and 28 days, respectively. To determine physical and mechanical properties of demolish brick concrete is vital role to improvisation the properties of coarse aggregate by demolish brick alternative in concrete production.



Fig -1: Demolish Bricks

Table -5: Comparison of Course Aggregate to Over Brunt Brick and Demolish Brick

Properties	Coarse Aggregate	Over Brunt Brick	Demolish Brick
Specific gravity	2.86	2.65	2.63
Aggregate Impact Value	6.56%	19.93%	23.34%
Aggregate crushing Value	15.24%	30.89%	34.55%
Water absorption	3.243%	09.98%	13.67%

2.6 Water

Water is the important ingredient for the strength of cement concrete gets mainly from the binding action of hydrated cement paste. The requirement of water shall be reduce to that requirement of hydration of cement content as the excess water will end up in only formation of undesirable voids present in hardened cement paste in concrete. Water confirming to the requirements of IS-456: 2000 is suitable for production of concrete. In the present research work, available tap water is used for concreting.

3. METHODOLOGY

3.1 Mix Design for Grade of Concrete-M35

The mix proportion of the concrete for laboratory investigation was arrived by using Indian Standard Code method. After the mix design obtained, the mix proportion is 1:2.08:2.85 with the W/C ratio 0.4. The details of mix specimen and percentage of replacement 15, 30, 45 and 60 of coarse aggregate used in this research work is given below.

Table -6: Quantity of material required per 50kg cement

Material	Cement	F.A	C.A	W/C
Mix Proportion	1	2.08	2.86	0.4
Weight in Kg/m ³	50	104	142	20Lit

3.2 The preliminary laboratory work includes the following

A) Mixing-

At the primary stage mixing was platform cleaned. Take the suitable proportion of mixture of the ingredients of the concrete by weigh batching. Spread the fine aggregate on the mixing platform, next spread the coarse aggregate as well as over brunt brick-bats & demolish brick on that, next spread cement on it platform and add the water in required quantity. And start continues the wet mixing for another four minutes. It is observed the over brunt brick & demolish brick-bats based concrete is cohesive and is dark in color.



Fig-2: Mixing of Concrete

B) Casting-

In the casting procedure the fresh prepared concrete mix are casted in nine standard cube moulds of dimension 150mm and three cylindrical moulds of dimension 150mm x 300mm and 3 beams of dimension 100mm x 150mm x 1200mm. After pouring a single layer, 25 strokes with a standard tamping rod are forced on poured concrete, after that moulds were vibrated on a vibrating table machine to force out the entrapped layer in the mix. The top surface of the fresh concrete is level with the help of a trowel and is left for 24 hours allowed the fresh concrete to set. Note that over brunt brick & demolish brick ballast aggregate concrete did not pose any difficulties in terms of finishing. The specimens were demolded after 24hours for next step.

C) Curing-

In this step, the entire concrete specimen is cured by immersing in a curing tank in the laboratory. The concrete specimens are left out from water approximately 24 hours before testing and kept concrete specimen at room temperature before testing.

D) Tests on over brunt brick & demolish brick-bats fresh concrete:-

To determine the mechanical properties of over brunt brick & demolish brick based concrete, the tests are conducted in laboratory on over brunt brick & demolish brick based concrete as follows:-

- Workability Test
- Compaction Factor Test
- Slump Cone Test

4. RESULTS

4.1 Workability Test

For determining the workability test, while mixing the over brunt brick & demolish brick bat with varying percentage (15%, 30%, 45% and 60%) in the M35 grade of concrete.

4.2 Compaction Factor Test

During the compaction factor test the percentage of over brunt bricks and demolish structure bricks increases then value of compaction factor is decreases. From that the workability of concrete is decreases. The result had shown that as follows.

Table -7: Result of Compaction Factor Test

Percentage of Replacement	Compaction Factor	Trial No.
00%	0.91	I
15%	0.901	II
30%	0.89	III
45%	0.86	IV
60%	0.84	V

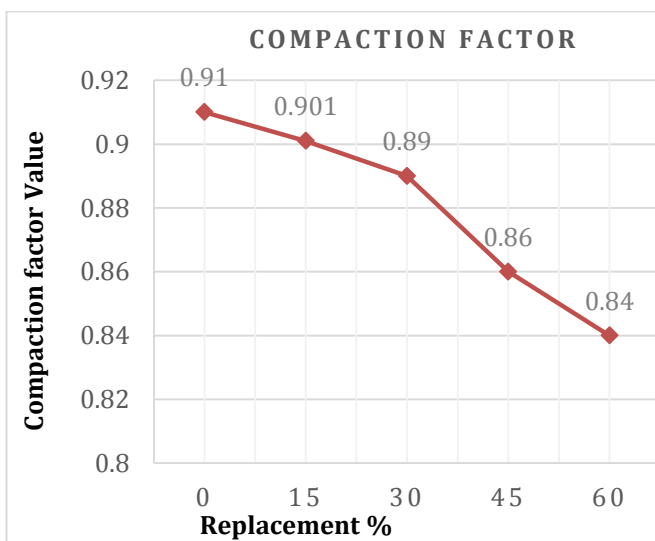


Chart-1: Compaction factor V/s replacement percentage

4.3 Slump Cone Test

The slump cone tests is carried out at over brunt brick and demolish brick concrete at a replacement of percentage of 0, 15, 30, 45 and 60. For determining the consistency of

concrete mix prepared at the construction site during the progress of concrete work. The concrete slump cone test performs the workability of fresh concrete. The slump values of replacement of over brunt brick and demolish brick concrete are as follows.

Table -8: Result of Slump Value Test

Sr. No.	Replacement %	Slump Value in mm
1	0	107
2	15	103
3	30	109
4	45	112
5	60	119

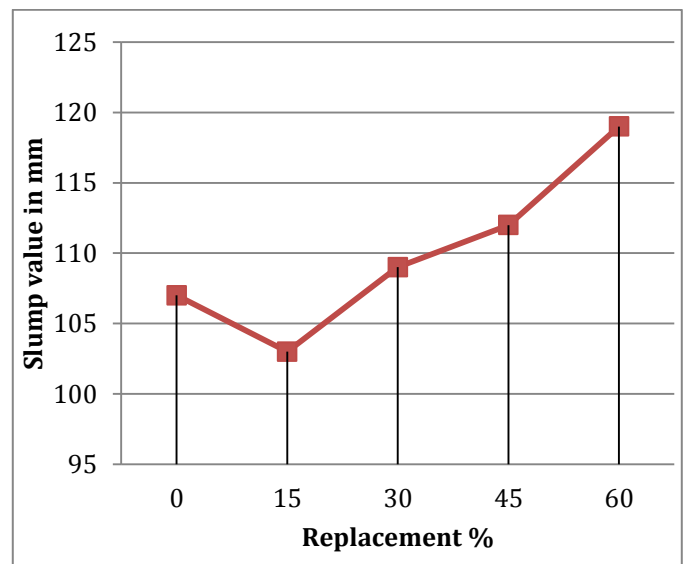


Chart-2: Slump Value V/s replacement percentage

5. CONCLUSIONS

From the present investigation results obtained on fresh concrete during the replacement of percentage of over brunt brick and demolish structure waste brick in concrete, following conclusions were drawn,

A) The workability of concrete decreases as percentage of replacement of over brunt brick and demolish brick in concrete.

B) The compaction factor decreased gradually as the percentage of replacement of over brunt brick & demolish brick increases over the conventional concrete.

C) The slump value of 15% replacement of over burnt brick and demolish brick concrete is decreases and 30%, 45% and 60% increases gradually.

REFERENCES

- [1] Veera R.M., (2010), "Investigation on stone dust and ceramic scrap as aggregate replacement in concrete.", International Journal of Civil And Structural Engineering.,Vol.1,Issue-3.
- [2]Gopinandan Roy, Jayanta pal, (2012), "Use of Brick Aggregate in Standard Concrete and Its Performance in Elevated Temperature.", International Journal of Engineering and Technology, Vol. 5, No.4.
- [3] Md. Siddikur R., Md. Bellal Hossain, (2012), "Strength behavior of recycled concrete with partial replacement of conventional aggregate." International journal of environment. Vol-2., Issue-2., pp80-86.
- [4] Chi-Sun Poon, Dixon Chan.,(2005), "Effects Of Contaminants On The Properties of Concrete Paving Blocks Prepared with recycled concrete aggregate.", Construction And Building Materials.,pp.164-175.
- [5] Mansur, M. A., Wee, T. H., and Lee, S. C. (1999). "Crushed bricks as coarse aggregate for concrete." ACI Mater. J., 96(4), pp.478-484.