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Experimental study on effect of partial replacement of coarse aggregate by over burnt brick bats

Akash Vijaykumar Kankal[1]. M.S. Kariappa[2]

[1]MTech Student,Department of Civil Engineering ,M.S. Bidve Engineering College,Latur,India

[2]Assistant Professor ,Department of Civil Engineering, M.S. Bidve Engineering College,Latur,India

Abstract : Concrete is considered the world's most used construction material. Typical concrete mixtures are comprised of water, sand, cement and an aggregate of rock. This project focuses on the coarse aggregate in concrete.The other material will be used to replace the coarse aggregate of rock in typical concrete. This will include burn brick. This material was chosen because of their availability. The burn brick is available from brick manufacturing area. Also in brick-making, a large number of bricks are rejected due to non-conformity with the required specifications.Onesuch major nonconformity is the distorted form of brick produced due to the uneven temperature control in the kiln. These rejected bricks can also be a potential source of coarse aggregate. This would not only make good use of the otherwise material but would also help alleviate disposal problems. This project presents the effects of over burnt brick bat inclusion on the mechanical properties of concrete matrix in wet and hardened state properties. For checking mechanical properties of over burnt brick bat based concrete used partially replacement overburnt brick bat to coarse aggregate.

Strongly over burnt brick bat replaced with concrete can be performed in the mass concrete filling area. In environmental aspects replacement of over burnt brick bat in concrete is reduce the conservation in the natural resources Raw material utilization can be diminished which at last spare time and vitality.

These will diminish the measure of ozoneharming substance era. The blocks which are close to the fire in the oven subjected to high warmth more than1000 degree centigrade it will shrink and changes in shape, the shading ends up noticeably

Keywords : over burnt brick bats,workability,compressivestrength ,tensile strength,flexural strength

1.INTRODUCTION

Concrete is the base material for construction industries. It is strong in compression and weak in tension Concrete is produced by mixing cement, sand, coarse aggregate and water to produced material that can be molded into almost any shape. The main constituent of the concrete in cement, sand, coarse aggregate and water, replacing some of these materials makes significant changes in cost as well as performance. Coarse aggregate filled almost 70% of volume in concrete. The cost of coarse aggregate rapidly increasing also the availability of the aggregate is getting reduced. The major cost of the concrete is belonged to the aggregate.

The overburnt brick bat available in the brick manufacturing industries. The over burnt brick bat s were replaced with concrete. This OBB maintains strength and performance to the concrete also reduce the weight of the concrete.

ruddy and its appearance like rosy to blackish inclination stone.

Brick bats are one of the types of aggregate used in certain places where natural aggregates are not available. Brick bats which are made from over burnt bricks used as coarse aggregate which is hard and absorb less water.

Over burnt bricks are produced by burning the raw materials along with good quality bricks.

Due to its distorted shape, over burnt bricks are considered as wastage. But there is a scope of

using the over burnt bricks as a source of aggregate for construction. The over burnt brick aggregate can solve the problem of shortage of aggregate.

1.1Objective of the project

- Determine suitability of over burnt brick as Partial replacement of coarse aggregate in concrete
- Find the alternative basic materials which are used in construction from past many years.
- Compare the mechanical properties of over burnt bricks in concrete with control concrete.
- Study the properties of fresh and hardened concrete when coarse aggregate are partially replaced with over burnt brick
- Develop suitable mix design

1.2 Significant of the study

- To reduce the space required for landfill of over burnt brick
- To diminish the pressure on exploiting the natural resources
- To introduce the potential of overburnt brick bats as coarse aggregate

2. METHODOLOGY

2.1 MATERIAL USED

a) Cement:

Cement is a well-known building material and has occupied an indispensable place in construction work. There is a variety of cement available in market and each type is used under certain condition due to its special properties such as color and composition of cement. The function of cement is, first to bind the sand and coarse aggregates together, and second to fill the voids. Although cement constitutes only about 10 percentage of the volume of the concrete mix, it is the active portion of the binding medium and the only scientifically controlled ingredient of concrete. Locally available cement is used. Like OPC 53 grade (Ultra TechCement).

b) Fine aggregate

Fine aggregate includes the particles that all passes through 4.75 mm sieve and retain on 0.075 mm sieve. Locally available river sand will be used as fine aggregate.

The sand will first sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and then washed to remove the dust.

c) Coarse aggregate

The broken stone is generally used as a coarse aggregate. Aggregate occupies most of the volume of the concrete. Locally available coarse aggregate having nominal size 20 mm was used. The aggregates were washed to remove dust and dirt.

d) Water:

Water is used for mixing, curing purpose should be clan and portable, fresh and free from any bacteria and desire matter confirming to IS 3025-1964 is used for mixing. Water is a key ingredient in the manufacturer of concrete.

e)Over burnt brickbat :

The over burnt brick broken into pieces called as brick bats. these brick bats are mixed with cement slurry after 7days curing used as an aggregate in concrete

2.2 Physical Properties of all materials

Physical Properties of all materials are following :

a)Cement

Table 1 :Physical Properties of cement

Sr. No.	Item	For1m^3 Concrete	MixRatio
1	Cement	500kg	1
2	FineAggregate	644kg	1.28
3	CoarseAggregate	985kg	1.97
4	Water	200lit	0.40

Sr. no.	Properties	Test results
1	Normal consistency	31%
2	Specific Gravity	3.15
3	Initial setting time	150
4	Final setting time	210
5	Soundness Test	1.00

b)fine aggregate

Table 2: Physical Properties of fine aggregate

Sr.no.	Properties	Results
1	Specific Gravity	2.63
2	Fineness modulus	3.75
3	Grading zone	II
4	Bulk density: loose , Compact	1450Kg/m^3, 1710Kg/m^3

c)coarse aggregate

Table 3 :Physical properties of coarse aggregate

Sr. no.	Properties	Results
1	Specific Gravity	2.68
2	Fineness modulus	7.13
3	Grading zone	2
	Bulk density: loose	1350kg/m^3
	Compact	1600kg/m^3

d)water

Table 4 :Physical properties of water

Sr. No.	Properties	Result
1	Hardness	62mg/L
2	Turbidity	4TU
3	PH	6.14

e)over burnt brick

Table 5 :Physical properties of over burnt brick

Sr. No.	Properties	Result
1	Strength	28N/mm^2
2	Water absorption	10%
3	Specific gravity	2.17

2.3 Material quantity for 1 m^3 :

Table 6 : Mix proportion of concrte

2.4 Casting of Specimen

Test specimens of Cubes of size 150mm x 150mm x 150mm, beam with 700mm x 150mm x 150mm will prepared using the standard moulds. The samples are cast. The samples are remoulded after 24hrs of casting and kept in a water tank for 7 and 28 days curing. A total of 48 specimens cast for testing the properties such as compressive strength, and flexural strength. 24 cube samples of size 150mmx150mmx150mm for different percentages of Over Burnt Brick Bats in partial replacement of coarse aggregate will casted. The concrete mixes are 0%, 10%, 20%, 30% crushed Over Burnt Brick Bats with partial replacement of coarse aggregate. All cubes will casted in one lift and consolidated using machine vibrator. After final setting of cubes, the cube moulds will be removed and cubes will kept in water tank for curing up to 7 and 28 days. All specimen beams size 700mm × 150mm × 150mm will casted with optimum compressive strength for the specific mix in single lift and consolidated using tamping rods. After setting, the beams will covered with wet gunny bags. The burlap will be kept for 3days. At the end of the third day, the forms will stripped and beams will kept for curing to7 days and 28 days.

Fig. -1 Over burnt brick bats added to concrete

Hence Specimens are casted for 7 days and 28 days.

2.5 Testing of Specimen

After 24 hours, the specimens were removed from the mould and subjected to water curing for 7 days and 28 days. After curing, the specimens were tested for compressive strength and flexural strength. Using a Compression Testing Machine of capacity 2000 KN in accordance with the provision of the Indian Standard specification IS:516-1959, strength of specimens were tested at 7 days and 28 days.

3. WORKABILITY

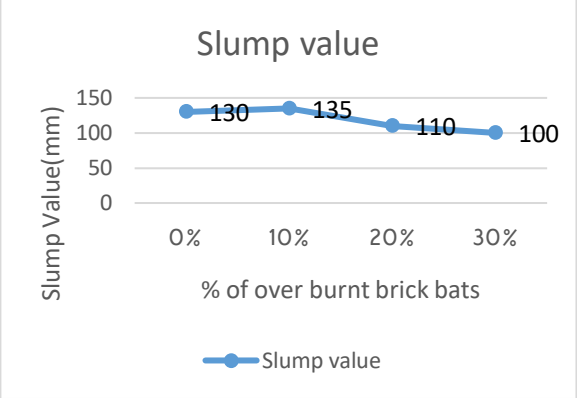
The workability of M30 grade of concrete is measured by widely used empirical test i.e. slump test with w/c ratio 0.40 for addition of different percentage Over Burnt Brick Bats .

Values obtain for different percentage mix is as show in following

Table -7: Slump values for different percentage of mix

% of Over Burnt brick bats	Slump Value(mm)
0	130
10	135
20	110
30	100

Graph 1 : Slump Value



4.EXPERIMENTAL METHODOLOGY

4.1 Compressive Strength Test

The result of compressive strength After 7 days and 28 days are recorded. Result indicate that as we increase percentage of Over Burnt Brick Bats from 0% to 10% it's compressive strength increases after further increment in percentage of Over Burnt Brick Bats there is loss in compressive strength. That means we can replace up to 10% natural coarse aggregate by Over Burnt Brick Bats.

4.2 Tensile Strength Test

The result of tensile strength After 7 days and 28 days are recorded. Result indicate that as we increase percentage of Over Burnt Brick Bats from 0% to 10% it's tensile strength increases after further increment in percentage of Over Burnt Brick Bats there is loss in tensile strength. That means we can replace up to 10% natural coarse aggregate by Over Burnt Brick Bats.

4.3 Flexural Strength Test

Testing of all beam specimens with two points loading for flexural strength. The results of flexural strength were plotted in below table for 28 days. Result indicate that if we increase percentage of Over Burnt Brick Bats from 0 to 10% will give us good results and help to increase flexural strength of concrete.

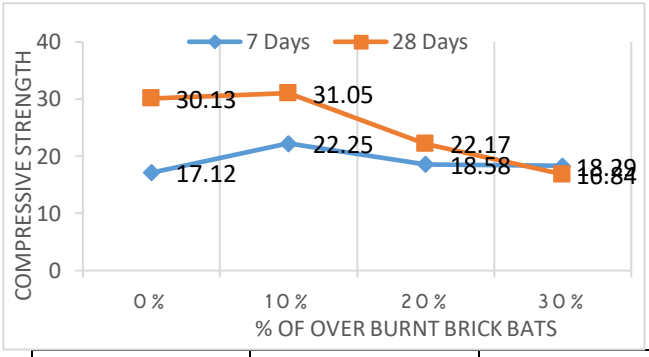
$$F_r = \frac{P \times L}{b \times d^2}$$

5. EXPERIMENTAL RESULTS

5.1 Compressive Strength Test

Table -8: Results of Compressive Strength

% of Over Burnt brick bats	Compressive strength(N/mm^2)	
	7 Days	28 Days
0	17.12	30.13
10	22.25	31.05
20	18.58	22.17
30	18.29	16.84

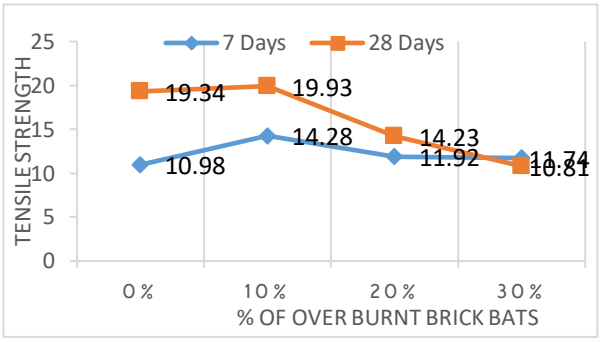


Graph 2: Compressive Strength at 7 and 28 days

5.2 Tensile Strength Test

Table -9: Results of Tensile Strength

% of Over Burnt brick bats	Tensile strength(N/mm^2)	
	7 Days	28 Days
0	10.98	19.34
10	14.28	19.93
20	11.92	14.23
30	11.74	10.81

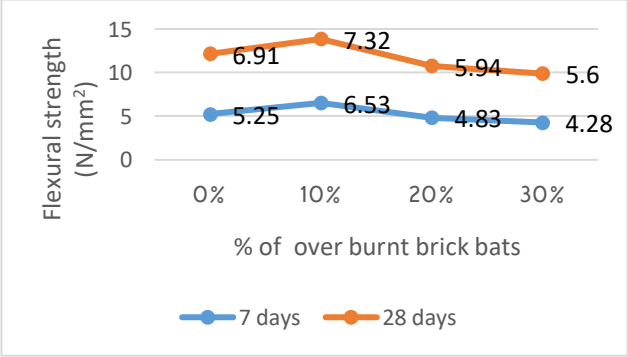


Graph 3: Tensile Strength at 7 and 28 days

5.3 Flexural Strength Test

Table -10: Results of Flexural Strength

% of Over Burnt brick bats	Flexural strength (N/mm^2)	
	7 days	28 days
0	5.25	6.91
10	6.53	7.32
20	4.83	5.94
30	4.28	5.6



Graph 4: Flexural Strength at7 days and 28 days

5. CONCLUSION

Based on results and observation made in experimental research study. The following conclusions are drawn.

1. It is observe that with increase in percentageof Over Burnt Brick Bats i.e. for 10% workability increases by 3.7%and further increment in percentage of Over Burnt Brick Bats i.e. for 20% and 30% ,workability decreases by 15.38% and 23.07% respectively.

2. 3.05% increment in the compressive strength is found for 10% replacement of coarse aggregate by Over Burnt Brick Bats ; the strength decreases by 26.41% when the 20% of coarse aggregate is replaced by Over Burnt Brick Bats andstrength decreases by 44.10% when the 30% of coarse aggregate is replaced by Over Burnt Brick Bats , by using and water cement ratio (W/C) is 0.4

3. 3.05% increment in the tensile strength is found for 10% replacement of coarse aggregate by Over Burnt Brick Bats ; the strength decreases by 26.41% when the 20% of coarse aggregate is replaced by Over Burnt Brick Bats andstrength decreases by 44.10% when the 30% of coarse aggregate is replaced by Over Burnt Brick Bats , by using and water cement ratio (W/C) is 0.4

4. 5.93% increment in the flexural strength is found for 10% replacement of coarse aggregate by Over Burnt Brick Bats ; the strength decreases by 14.03% when the 20% of coarse aggregate is replaced by Over Burnt Brick Bats andstrength decreases by 18.95% when the 30% of coarse aggregate is replaced by Over Burnt Brick Bats , by using and water cement ratio (W/C) is 0.4

5.It is to be feasible in mass concrete filling area.

6. Use of over burnt brick bats helps to preserve natural aggregate source.

7. Current study concluded that Over Burnt Brick Bats can replace coarse aggregate up to 10%.

8. The use of Over Burnt Brick Bats in concrete is possible to improve its compressive strength, tensile strength and flexural strength.

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References

[1] G. S. Patil and P. B. Autade, "Effect of Partial Replacement of Coarse Aggregate by J hama Class Brick," in Concrete, International Journal of Engineering Research and General Science, Volume 3, Issue 4, Part-2, July-August 2015.

[2] Apebo N. S., Agunwamba. J. C, "The suitability of crushed over burnt brick as coarse aggregate," in International Journal of Engineering Science and Innovative Technology, Vol. 3, 2014.

[3] Tariq Ali, Nouman Iqbal, Md. Zeeshan, Md. Zulfiqar Ali Khan, Evaluation of the Compressive strength of Concrete for partial replacement of Over Burnt Brick Ballast Aggregate," in International Journal of Science and Modern Engineerin, December 2013.

[4] Chong C. V. Y, "Properties of Materials," Mac Donald and Evans Publishers, London 1981.

[5] Rashid. M. A, Hossain. T and Islam M. A, "Properties of Higher Strength Concrete made with crushed brick as aggregate," in Journal of civil Engineering, Vol. 37(1), pp. 43 -52, 2009.

[6] Rashid, M. A., Hossain, T. and Islam M. A, "Properties of higher strength concrete made with crushed brick as coarse aggregate," Journal of Civil Engineering, 37(1), pp. 43-52, 2009.

[7] Kesegic, I., Netinger, I. and Bjegovic, D. "Recycled Clay Brick as an aggregate for concrete," Technical Gazette, vol. 15, no. 3, pp. 35-40, 2008.