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To Study the Properties of Concrete Mix on Partial Replacement of Coarse Aggregate with Burnt Bricks

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ABSTRACT- These days, materials such as over-burned bricks blast are employed as an alternative to coarse aggregates. This paper investigates the physical features of concrete formed with burned bricks blast. Natural rock is by far the most common coarse aggregate used in concrete, however not all types of rock appropriate for concrete production are available everywhere. Due to a paucity of aggregate from natural sources in India's north-eastern states, brick aggregate concrete is commonly utilised for ordinary concrete. Due to advancements in concrete technology and to meet the requirements for durability, As a result of the need to utilise standard concrete, which only uses stone aggregate, construction costs have increased as materials are carried from other states. Making good quality concrete with the finest sand (grading zone – IV as per Indian code IS:383-1970) is difficult enough, but the natural coarse aggregate is scarce locally. Burnt brick aggregate has a high-water absorption rate (12 to 20% by mass), which makes it difficult to utilise in practical work. As a result, an attempt has been made to provide a viable solution for real-world use. To test various strength characteristics, an experimental investigation was done. In our project, waste material was employed as a coarse aggregate while simultaneously keeping the strength of the concrete. The effects of a percentage replacement of stone aggregates with burn brick aggregates on the compressive strength of concrete are presented in this study. Concrete cubes of M25 grade samples containing various percentages of brick aggregate, such as 0%, 10%, 20%, and 30%, are made 7-, 14-, and 28-days tests were performed.

I. INTRODUCTION

Concrete is made by combining cement, sand, gravel, and water in order to create a material that can be moulded into any shape. Coarse and fine aggregate make up the majority of the volume of concrete. Aggregates make up around 70% of the entire volume of concrete, and their strength is also determined by them. The cost of concrete and its qualities are closely tied to the aggregates used in aggregates; the majority of coarse aggregate, i.e. stone or gravel, is obtained naturally either from river beds or by mechanically crushing rocks to the desired size. Concrete is required for all construction activities. Recycled resources can be successfully used to make concrete. Over the last two decades, the utilisation of recycled aggregate concrete (RAC) has steadily increased. Because transportation is expensive, local sources are required. However, due to geographical limits, local sources are not always available, necessitating the search for alternate sources. Many materials, such as marble fragments, destroyed debris, coconut shell, and burnt bricks, are utilised as coarse aggregate substitutes. As a result, selected over burned brick is used as an alternate supply of coarse aggregates in this project.

II. OBJECTIVE OF THE STUDY

- Establish a mixed proportioning procedure for the production of Jhama class brick-based concrete.
- Determine and investigate the impact of key parameters on the qualities of Jhama class brick-based concrete.
- Investigate the short-term engineering properties of Jhama class brick-based concrete, both fresh and hardened.

AIM- The purpose of this study is to determine the compressive strength of concrete with jhama or burnt brick aggregate added. The following events are listed in chronological order to achieve the study's goal-

- For the M25 combination, the compressive strength of typical or conventional concrete must be determined.
- The compressive strength of burnt brick replacement concrete (10%, 20%, 30%) must be determined for M25.

III. LITERATURE REVIEW

- Buddhi Raj Joshi (2020) investigated the use of over-burned brick as a coarse aggregate in concrete. The study aimed to see how crushed bricks are compared to burnt bricks as coarse aggregate in traditional concrete. The results of 28 days of compressive strength of natural stone aggregate at 0.45 and 0.5 Water-cement ratios were 21.9Mpa and 20.2Mpa, respectively, for M20. The compressive strength of crushed over burnt brick aggregate after 28 days was 24.9 Mpa and 22.4 Mpa, respectively, at 0.45 and 0.5 Water-cement ratios.
- Prof. G.N. Shete and Bidve Ganesh Shivkanth(2019) described the usage of OVER BURNT brickbats as coarse aggregate for concrete. The study aimed to see how crushed brick bats compared to burnt brickbats as coarse material in conventional concrete. With 7 and 28 days of OVER BURNT brick bat waste, the

compressive strength increases from 0% to 20%, but after subsequent increases in the percentage of over-burnt brick bat waste, compressive strength decreases.

IV. THEORY AND FORMULATION

This section discusses the parameters and methodology adopted for the study.

The components needed to make Jhama class brick bat-based concrete include coarse aggregates, sand, and Jhama class brick coarse aggregate according to the M25 mix percentage design.

- Testing to determine physical qualities of materials such as cement and aggregate specific gravity, normal consistency, and compressive strength.Characterization of materials such as cement, sand, aggregate, and so on. The term "characterization" refers to the material we employed.
- Concrete cubes of conventional dimensions (150*150*150 mm) are cast and tested. After casting the concrete cube, it is left for one day in the air to set and compact before being placed in water for 7, 14, and 28 days to cure properly.
- The compression testing machine is used to test the concrete cube. Because of variations in concrete manufacturing quality, the overall strength of a concrete cube cannot be determined by a single cube.
- Compressive strength of burn brick aggregate added concrete compared to referral or conventional concrete.

The properties considered for the study are shown in Table 1 i.e., impact value test, Table 2 i.e., crushing value test, Table 3 i.e., properties of cement and Table 4 i.e., compaction factor test results.

Table 1: Impact Value Test Result

Nomenclature	**Coarse Aggregate**
W1	500 gm
W2	70 gm
Impact Value(W2/W1)*100	14 %

Table 2: Crushing value test result

Nomenclature	**Coarse Aggregate**
W1	2.82 gm
W2	0.489 gm
CrushingValue(W2/W1)*100	**17.34%**

Table 3: Properties of Cement

Sr. No.	**Properties**	**Value Obtained**	**Limits**
1	Initial Setting Time	42 minutes	>30 minutes
2	Final Setting Time	290 minutes	<10 hours
3	Standard Consistency		
	28%	25-35%	
4	Sp.Gravity	3.12	3.1-3.16g/cc
5	Fineness	4.8%	<10%

Table 4: Compaction factor test result

Replacement in %	10	20	30
Compaction factor	0.89	0.87	0.85

V. RESULTS AND DISCUSSION

After the analysis from E-TABS, the results of 6 structures are noted. Results like maximum storey displacement, maximum storey drift, shear force, bending moments and storey stiffness are noted and compared among the 6 structures. The results obtained are discussed below:

Table 5 shows the compressive strength for 0% replacement, Table 6 shows the compressive strength for 10% replacement, Table 7 shows the compressive strength for 20% replacement and Table 8 shows the compressive strength for 30% replacement.

Figure 1 shows the graphical overview of compressive strength at 0%, Figure 2 shows the graphical overview of compressive strength at 10%, Figure 3 shows the graphical overview of compressive strength at 20% and Figure 4 shows the graphical overview of compressive strength at 30%.

Table 5: Compressive Strength (MPa) For 0% Replacement

S. No.	**No. of Days**	**Cube 1**	**Cube 2**	**Cube 3**	**Average**
1.	7 DAYS	16.45	16.25	16.05	16.25MPa
2.	14 DAYS	22.22	22.85	22.685	22.585 MPa
3.	28 DAYS	32.25	31.825	31.650	31.908MPa

Table 6: Compressive Strength For 10% Replacement

S. No.	**No. of Days**	**Cube 1**	**Cube 2**	**Cube 3**	**Average**
1.	7 DAYS	15.80	15.75	16.050	15.866MPa
2.	14 DAYS	21.75	22.250	21.625	21.875MPa
3.	28 DAYS	31.50	32.150	31.820	31.823MPa

Table 7: Compressive Strength For 20% Replacement

S. No.	**No. Of Days**	**Cube 1**	**Cube 2**	**Cube 3**	**Average**
1.	7 DAYS	15.050	15.200	15.150	15.133MPa
2.	14 DAYS	21.25	20.950	21.520	21.24MPa
3.	28 DAYS	30.85	31.250	30.950	31.016MPa

Table 8: Compressive Strength For 30% Replacement

S. No.	**No. Of Days**	**Cube 1**	**Cube 2**	**Cube 3**	**Average**
1.	7 DAYS	14.650	14.520	14.725	14.631MPa
2.	14 DAYS	20.250	20.650	20.425	20.441MPa
3.	28 DAYS	29.550	30.650	30.050	30.083 MPa

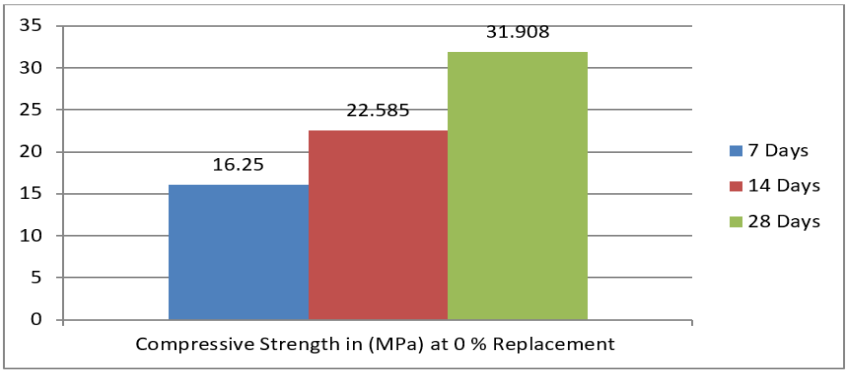

Figure 1: Graphical Overview of Compressive Strength At 0%

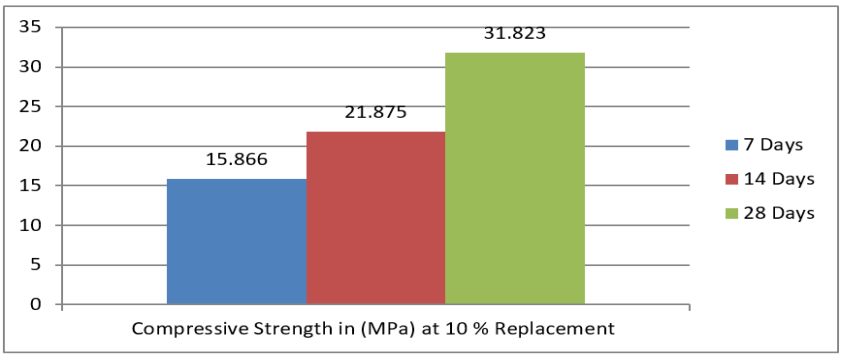

Figure 2: Graphical Overview of Compressive Strength At 10%

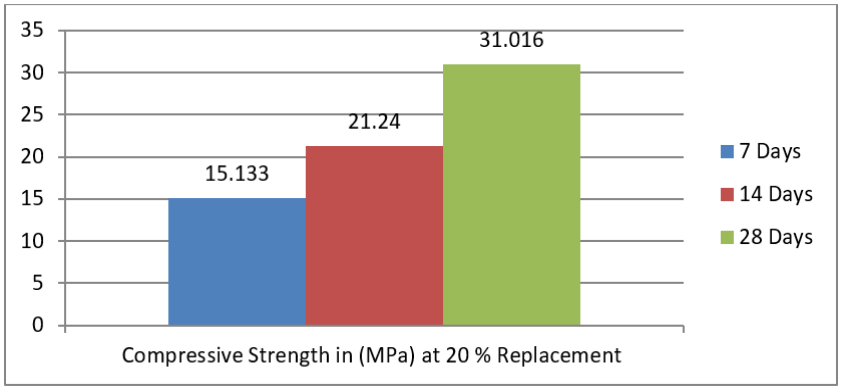

Figure 3: Graphical Overview of Compressive Strength At 20%

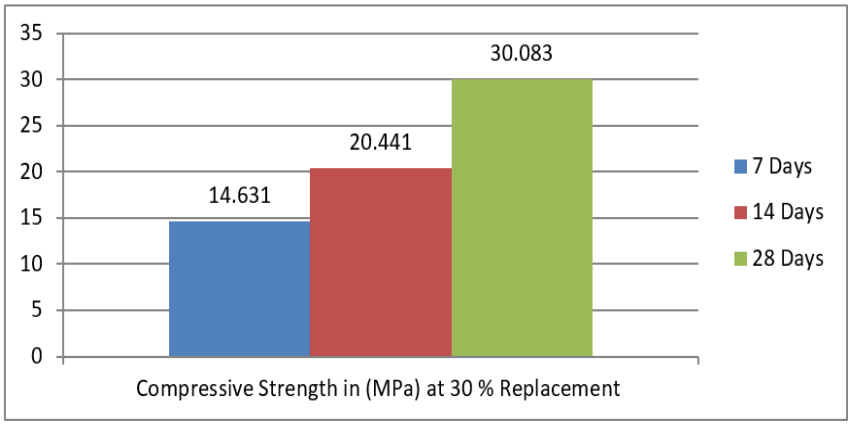

Figure 4: Graphical Overview of Compressive Strength At 30%

VI. CONCLUSION

The following observations are provided based on the results of an experimental inquiry into the qualities of crushed over burnt bricks as coarse aggregate for concrete:

- The ballast of such bricks is utilised in lime concrete and road metal for foundation and flooring.
- In the manufacturing of concrete, crushed overburned bricks can be utilised instead of river gravel.
- They are crushed and used as aggregates in concrete production.
- Crushed over-burned bricks can be utilised as an alternative to natural aggregate to some extent.
- Crushed-over burnt bricks can also be used to make concrete, but only for light applications because the compressive strength was reduced when natural aggregate was replaced.
- Why because burned bricks are considered waste, sustainable development can be achieved.
- The results reveal that when the percentage of over-burnt bricks is raised, the aggregate formed from over-burnt bricks has a higher strength than conventional concrete.
- The results of compressive strength after 7,14 and 28 days of burnt brick bat waste from 0% to 20% it is increasing but after further increments in the percentage of over-burnt brick bat waste, there is a loss in compressive strength.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest

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