Experimental Investigation of Partial Replacement of Coarse Aggregate Using Jhama Bricks.

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Abstract*—The concrete is a composite material and conventional concrete is made of cement, fine aggregate, coarse aggregate and water. Since the use of concrete is very large and day by day the cost of the conventional concrete material also rises. So, it is advantageous to use the alternative materials for making the concrete. This project focuses on the coarse aggregate in concrete. In this project Jhama brick or over burnt brick is used to replace the coarse aggregate partially. This project presents the effects of Jhama class brick inclusion on the mechanical properties of Jhama class brick based concrete used partially replace, Jhama class brick to coarse aggregate ratios of 30%, 40%, 50% in M25 grade of concrete. The 25% replacement of Jhama brick is considered as the best because of strength and economy, hence we use it in enough loaded structures the result shows that the aggregate that concrete derived from Jhama brick aggregate attained lower strength than the regular concrete

Index Terms — ***Compressive strength, Jhama brick, curing.***

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.

This material was chosen because of their availability. The born brick is available from brick manufacturing area. Also in brick making, a large number of bricks are rejected due to nonconformity with the required specification. One such major nonconformity is the distorted form of brick produced due to the uneven temperature control in the kiln. These rejected bricks can also be potential source of coarse aggregate. This would not only make good use of the otherwise waste material but would also help alleviate disposal problems. This project present the effects of Jhama class brick inclusion on the mechanical properties of concrete matrix in wet and hardened state properties. For checking mechanical properties of Jhama class brick to coarse aggregate ratio 20% and 40% in M20 grade of concrete. It is observe that workability decrease with replacement of coarse aggregate. The compaction factor observed as 0.92, 0.899, 0.87 with varying percentage replacement of coarse aggregate by Jhama class brick bat as 20% and 40% respectively. concrete. It is observe that workability decrease with replacement of coarse aggregate. The compaction factor observed as 0.92, 0.899, 0.87 with varying percentage replacement of coarse aggregate by Jhama class brick bat as 20% and 40% respectively.

Advantages of Jhama Brick

- Strength and durability
- Consistency
- Water resistance
- Fire resistance
- Availability
- Durability
- Maintenance
- Eco-friendly
- Home Value

II. LITERATURE REVIEW

1) Rajeev Ranjan (June 2023)
Title : To Study the Properties of Concrete Mix on Partial Replacement of Coarse Aggregate with Burnt Bricks
To Study the Properties of Concrete Mix on Partial Replacement of Coarse Aggregate with Burnt Bricks
Burnt Bricks are used instead of Coarse Aggregate as they provide the same strength as the coarse aggregate when checked.

2) Akshay Takle (May 2022)
Title : Analysis on Partial Replacement of Coarse Aggregate by Jhama Brick in Concrete.
Analysis on Partial Replacement of Coarse Aggregate by Jhama Brick in Concrete. It is observed that partial replacement of coarse aggregate using Jhama bricks shows increase in compressive strength and workability. Journal of Partial Replacement of Coarse Aggregate by Jhama Brick in Concrete

3) Mr.N.Thirugnansambantha (2021)
Title : Experimental Study on Effect of Partial Replacement of Jhama Bricks as Coarse Aggregate in Concrete
Analysis & Compressive Strength Study of Eco-Friendly Concrete by Partial Replacement of Recycle Brick with Over-Burnt Brick Aggregate. As rejected over burnt bricks can be used as replacement of coarse aggregate and thus they can be aquired locally thus reducing the excessive cost of transport.

4) Neha Dixit (July 2021)
Title : Analysis & Compressive Strength Study of Eco-Friendly Concrete by Partial Replacement of Recycle Brick with Over-Burnt Brick Aggregate
Analysis & Compressive Strength Study of Eco-Friendly Concrete by Partial Replacement of Recycle Brick with Over-Burnt Brick Aggregate. As rejected over burnt bricks can be used as replacement of coarse aggregate and thus, they can be acquired locally thus reducing the excessive cost of transport.

5) Ravi Sharma (February 2021)
Title : A Study of Effect on Mechanical Properties of Standard Concrete by Using Jhama Brick Coarse Aggregates
A Study of Effect on Mechanical Properties of Standard Concrete by Using Jhama Brick Coarse Aggregates. As the Jhama bricks are chosen as they are easily available and thus are cost effective. They give higher compressive strength as compared to Coarse aggregate

6) Sonu Kumar Gupta (2020)
Title : Partial Replacement of Coarse Aggregate by Jhama Class Brick
Partial Replacement of Coarse Aggregate by Jhama Class Brick. Concrete made by using Jhama bricks initially gives higher compressive strength for 30% & 40% replacement, after increasing the replacement to 60% & 80% there was decrease in compressive strength.

7) Mritunjay Kumar (July 2020)
Title : Partial Replacement of Coarse Aggregate by Using Recycled Coarse Aggregate and Fly Ash in Concrete by Two Stage Mixing Approach
Partial Replacement of Coarse Aggregate by Using Recycled Coarse Aggregate and Fly Ash in Concrete by Two Stage Mixing Approach. After replacement the concrete will be strong as well as cost effective.

8) Vikash Kumar (May 2018)
Title : Use Of Over Burn Crushed Brick As Coarse Aggregate In Concrete Mix
Use of over burn crushed Brick as Coarse Aggregate in Concrete mix. There is substitution of aggregate over 25%,50%,75%. Crushed over burnt bricks by volume. The crushed over burnt bricks will be used satisfactorily as coarse combination for creating strength concrete.

9) Nilesh Kumar (June 2017)
Title : Use Of Jhama Brick Dust As An Alternative Material For Fine Aggregate In Concrete
Analysis on Concrete Made from Over Burned Bricks. Compressive strength of conventional concrete at 7,14,28 & 50 days is higher when the coarse aggregate is replaced with over burnt bricks..

OVERVIEW OF LITERATURE

The study found that replacing coarse aggregate with 20% and 40% Jhama class brick increased compressive, split tensile, and flexural strengths over plain concrete. However, strengths decreased with 60% and 80% replacement levels. Workability was also reduced with higher replacement levels.It has been observed that the workability increases with increase in the percentage of replacement of Jhama Brick and Marble powder increases. The strength of concrete also increases with the Jhama Brick and Marble powder aggregate up to 20% percentage.Replacing coarse aggregate with 20–40% Jhama bricks can increase the compressive, split tensile, and flexural strengths of concrete. However, strengths decrease with 60–80% replacement levels. Workability decreases with higher replacement levels. Using Jhama bricks can decrease the cost of concrete.Jhama bricks have a low water absorption rate, which means they are less porous and have better resistance to moisture penetration. This can improve durability and prevent water-related damage.Using Jhama bricks can help solve the disposal issue of waste material from the construction industry

IV. EXPERIMENTAL WORK

Material Requirement

Replacement	Cement	Coarse Aggregate	Fine Aggregate	Jhama Brick	Water
0%	1.41 kg	3.94 kg	2.3 kg	0	0.641
10%	1.41 kg	3.54 kg	2.3 kg	0.394 kg	0.641
20%	1.41 kg	3.152 kg	2.3 kg	0.788 kg	0.641
30%	1.41 kg	2.75 kg	2.3 kg	1.182 kg	0.641
40%	1.41 kg	2.364	2.3 kg	1.576 kg	0.641
50%	1.41 kg	1.97 kg	2.3 kg	1.97 kg	0.641

Crushed Zhama Brick

Dry Mixing

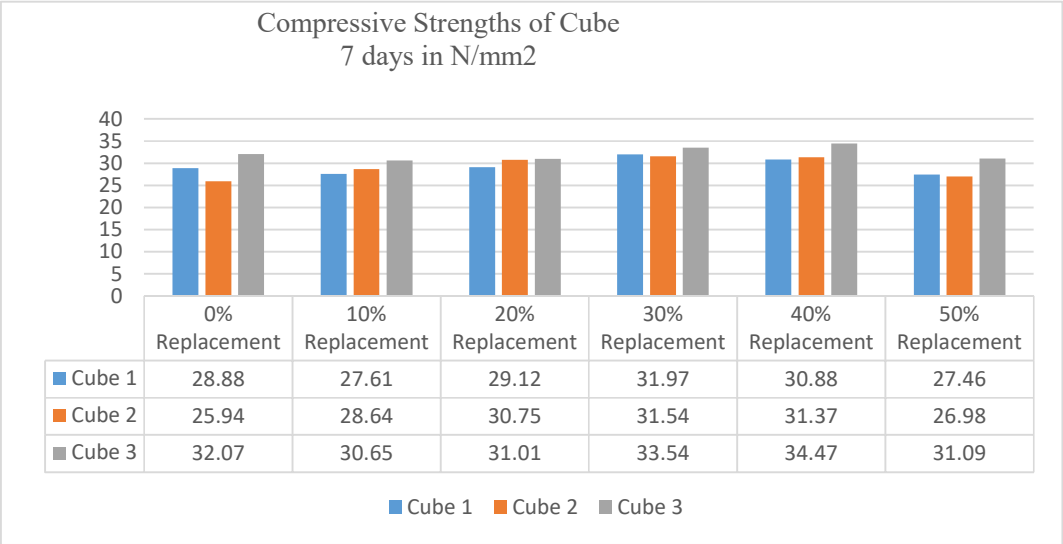
Concrete cube filling

Well finished cubes

IV. TEST RESULTS AND DISCUSSION

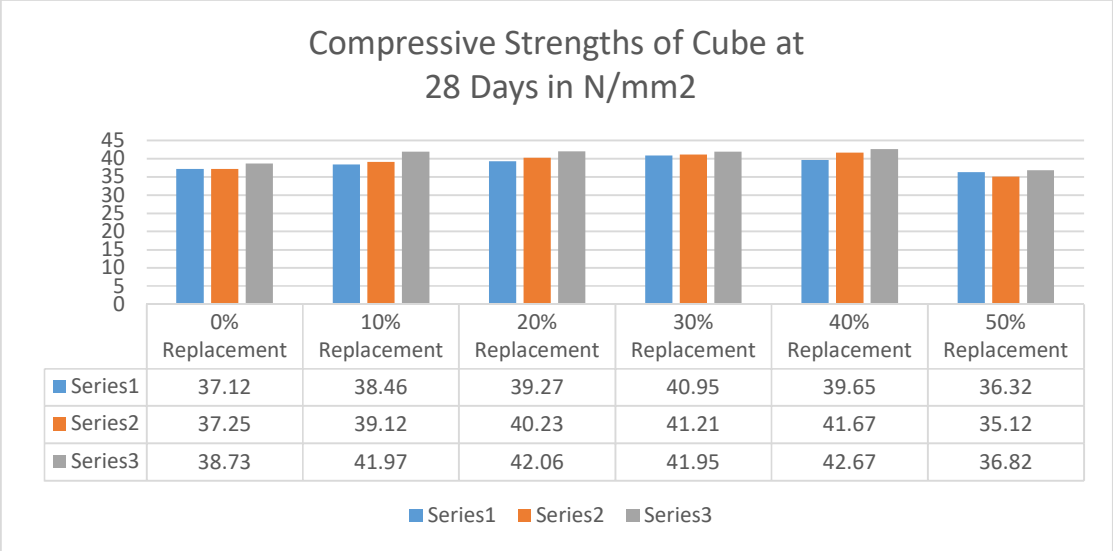
The result discusses about Compressive strength of the cubes tested on 7 & 28 days of curing. Compressive Strength can be defined as the capacity of concrete to withstand loads before failure.

1. Compressive Strengths of Cube 7 days



	0% Replacement	10% Replacement	20% Replacement	30% Replacement	40% Replacement	50% Replacement
Cube 1	28.88	27.61	29.12	31.97	30.88	27.46
Cube 2	25.94	28.64	30.75	31.54	31.37	26.98
Cube 3	32.07	30.65	31.01	33.54	34.47	31.09

2. Compressive Strengths of Cube 28 days



	0% Replacement	10% Replacement	20% Replacement	30% Replacement	40% Replacement	50% Replacement
Series1	37.12	38.46	39.27	40.95	39.65	36.32
Series2	37.25	39.12	40.23	41.21	41.67	35.12
Series3	38.73	41.97	42.06	41.95	42.67	36.82

V. CONCLUSIONS

1. Concrete mixture by replacing the coarse aggregate by using Jhama bricks initially gives the result, as there is increase in the compressive strength for the replacement till 40%. After increasing the replacement percentage the compressive strength decreases.

2. Jhama bricks can't be replaced for more than 40% of aggregate. There is gradual increase in compressive strength for 10%,20%, 30% and 40%. It is eco-friendly and can be used rather than throwing the Jhama bricks. It is cost effective.

3. The partial replacement of coarse aggregate using Jhama bricks can be a viable option under certain circumstances, but thorough evaluation and testing are essential to determine its suitability for a specific project.

4. This study has found that crushed bricks will be used satisfactorily as a coarse combination for creating concrete of adequate strength characteristics. Before the recommendation for use in the field, several tests should be conducted for the concrete with replaced coarse aggregates of different proportions.

REFERENCES

1. Mr. G. S. Patil, (2014) , “Effect Of Partial Replacement Of Coarse Aggregate By Jhama Class Brick In Concrete” , international journal of engineering research and general science ,Volume 3, issue 4.

2. Ashit Kumar (2015) “Use Of Jhama Brick Dust As An Alternative Material For Fine Aggregate In Concrete.” International Journal of Advanced Technology in Engineering and Science .Volume 4, Issue 11.

3. Vikash Kumar Gautam (2018) “Use Of Over Burn Crushed Brick As Coarse Aggregate In Concrete Mix” International Journal for Research in Engineering Application & Management (IJREAM).

4. Mritunjay Kumar, Soni Kumari, etal,”Partial Replacement of Coarse Aggregate by Using Recycled Coarse Aggregate and Fly Ash in Concrete by Two Stage Mixing Approach”. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 . Volume: 07 Issue: 07.

5. Sonu Kumar Gupta,(2020) “Partial Replacement of Coarse Aggregate by Jhama Class Brick” IJSRD - International Journal for Scientific Research & Development. Vol. 8, Issue 4.

6. Ravi Sharma, Mr. Sanjeev Sipani, etal. (February 2021),”A Study of Effect on Mechanical Properties of Standard Concrete by Using Jhama Brick Coarse Aggregates”. World Journal of Research and Review (WJRR) ,ISSN: 2455-3956, Volume-12, Issue-2.

7. Buddhi Raj Joshi (2021), " Analysis of Over-burned Brick in Concrete as a Coarse Aggregate”International Journal of Research in Engineering and Science (IJRES) ISSN (Online): 2320-9364, ISSN : 2320-9356, Volume 8, Issue 1.

8. Neha Dixit, etal.”Analysis & Compressive Strength Study of Eco-Friendly Concrete by Partial Replacement of Recycle Brick with Over-Burnt Brick Aggregate” (July 2021),International Journal of Engineering Research in Current Trends (IJERCT),
   ISSN: 2582-5488, Volume-3 Issue-4.

9. Mr.N.Thirugnansambantha,(2021) “ Experimental Study on Effect of Partial Replacement of JHAMABricks as Coarse Aggregate in Concrete “IJSRD - International Journal for Scientific Research & Development.

10. Akshay Takle,(2022), “Analysis on Partial Replacement of Coarse Aggregate by Jhama Brick in Concrete.”Journal of Partial Replacement of Coarse Aggregate by Jhama Brick in Concrete.