Concrete Mixed with Jhama Bricks in Place of The Coarse Material

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Abstract— Concrete is used extensively, and the price of conventional materials is rising daily as well. Thus, when making concrete, it makes sense to use the optional materials. The study focuses on the coarse aggregate in concrete. This study examines the use of Jhama brick, or crushed brick aggregate, in place of coarse aggregate. One optional source of coarse aggregate is Jhama brick. Bricks known as Jhama are made by overfiring. Because of their irregular shape, bricks can be used as coarse material in some areas where it is expensive or impossible to find stone aggregate. There's a chance that these abandoned bricks are a secret source of fine aggregate. It either totally or mostly takes the place of the conventional substance. In m35 grade of concrete, we substituted coarse aggregate in ratios of 0%, 5%, 10%, 20%, 30%, and 100%. Eighteen concrete samples are cast, eight of which have crushed jhama bricks in them. Both fresh and hardened cement concrete are subjected to testing, such as compressive strength tests, following seven and twenty-eight days of curing. Its 20% replacement is the best due to its strength and economy, which is why sufficiently loaded structures employ it. The results show that the aggregate made from Jhama brick aggregate in concrete had a higher strength than that of regular concrete.

Index Terms— Cement, Coarse Aggregate, Jhama brick or Crushed brick aggregate.

I. INTRODUCTION

In the ultramodern world of today, concrete is one of the most often utilized building materials. The raw materials needed to prepare it, cement and aggregates, affect the cost and caliber of construction. More than 70% of the volume of concrete is composed of aggregates, which are usually less expensive than cement. In ultramodern design, it is currently the most favored material.Organization The material of choice when strength, fire resistance, and endurance are needed is always considered to be concrete. The availability and accessibility of aggregate at the construction site has an impact on building costs. Bricks are a durable, adaptable building material that can support a large weight. Brick porosity, permeability, and absorption have all been the subject of numerous studies.

There are claims that natural coarse aggregate in concrete is partially replaced with shattered bricks. Furthermore, a study employing crushed brick aggregate has been carried out experimentally to generate concrete with increasing strength. Reclaimed brick has been found to function as a substitute for the grit in the concrete. It has shown that recycled aggregates from demolition and construction waste may be used to make concrete with success. Because the demand for housing is not equal to supply in many countries, this cannot be emphasized.

One potential remedy to this problem is low-cost volition construction. materials. This material was given priority because, during the brick-making process, a large percentage of costly conventional building materials are rejected due to nonconformity—a distorted shape of brick caused by the high temperature regulation in the kiln—as well as a decrease in the availability of traditional building materials. These rejected bricks represent another potential implicit supply of coarse aggregate. Since the basic description of concrete indicates that it is a composite material, some of the natural coarse aggregate can be replaced by using the concrete when jhama brick aggregate is utilized.

Thankfully for the general public, this paper outlines the research conducted. The goal of the study is to independently determine the ideal amount of Jhama bricks to utilize in the mix proportioning process while making concrete from Jhama bricks.

Although we are aware that there will always be a supply of stone aggregate, daily quarrying operations are depleting the supply of stone aggregate. When natural rock deposits become limited after a few decades, burned clay bricks will provide a substitute source of coarse aggregate. Crushed brick concrete is frequently used in the construction of buildings up to six storeys high, small-to medium-span bridges, culverts, and rigid pavement structures.

Large-scale production of bricks is feasible in Nepal, and they are a far more dependable resource than crushed stone aggregate. Brick aggregate concrete has been claimed to be substantially lighter than stone aggregate concrete due to its lower unit weight. The dead load on columns and foundations can be significantly reduced by using brick aggregate rather than stone aggregate in various building construction components. Therefore, it may be more affordable to make concrete structures by substituting brick aggregate for stone aggregate, either whole or in part.

II. MATERIALS AND METHODOLOGY

This study's goal is to assess the compressive strength of concrete made with various ratios of stone and over-burned brick aggregate, which are readily available locally in Nepal. The preparation of the design mix complies with conventional procedures for M20 (1:1.57:2.93) concrete. The concrete compressive strength test now uses the cube test. In accordance with standards, over-burnt brick aggregate in varying sizes and proportions has replaced some or all of the stone aggregate. The percentages of stone aggregate substitution have been set at0%,10%,25%,50%,75%, and 100%. For this, each proportion needs to have at least nine concrete cubes produced. Every proportion's mechanical and physical characteristics ought to be investigated and tested.

Examine the Jhama bricks' size, density, water absorption rate, compressive strength, and other mechanical and physical characteristics. Determining how these bricks will interact with M35 grade concrete will need the use of this data.

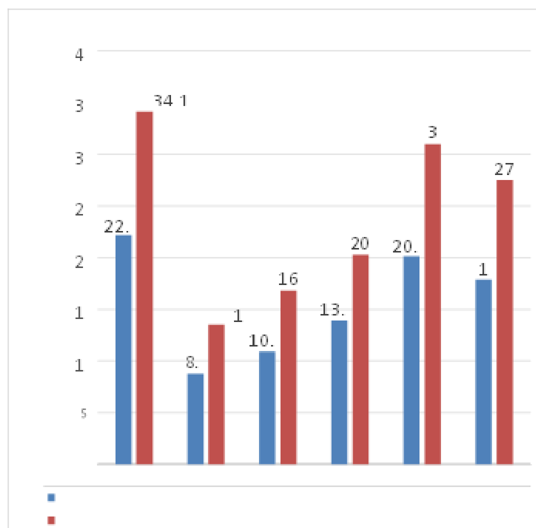
To evaluate the relationship between Jhama bricks and M35 grade concrete, conduct compatibility tests. To make sure the materials function effectively together, this entails looking at elements like bond strength, shrinkage, and thermal expansion/contraction characteristics.

Create an M35 grade concrete mix design that is optimal while taking into account the usage of Jhama bricks. To get the required strength, workability, and durability, this may need modifying the ratios of cement, aggregates, water, and additives.

III. RESULTS AND DISCUSSION

Table 1 Compressive strength of cubes for7 & 28 days

S. No.	% of jhama brick	Compressive strength in Nmm2	
		7 days	28 days
1	0%	22.16	34.1
2	100%	8.78	13.5
3	5%	10.92	16.8
4	10%	13.92	20.3
5	20%	20.15	31
6	30%	17.87	27.5



Graph 1 Graphical Representation of compressive strength of cubes for 7 & 28 days

CONCLUSION

- Interesting new information on the connection between replacement rates and compressive strength in concrete is provided by the data analysis.
- At first, with a substitution rate of 0%, the compressive strength seems to be a reference value

for concrete made completely of natural stone aggregate.

- This baseline is necessary for comparison and acts as a point of reference when assessing the effects of using alternative materials in place of natural aggregates.
- The trend of increased compressive strength is evident and continuous as the substitution rate rises from 5% to 20%.
- The observed increase in strength indicates that the addition of crushed, over-burned brick aggregate enhances the mechanical qualities of the concrete mixture as a whole.
- The efficient incorporation of the substitute aggregate material into the concrete matrix is demonstrated by the steady improvement in compressive strength within this range.
- But the compressive strength pattern unexpectedly changes beyond the 20% substitution point.
- Further increases in replacement rates result in diminishing returns in compressive strength, in contrast to the earlier reported rise.
- At greater substitution rates, like 30% and 100%, where the compressive strength starts to steadily decrease, this behavior is very noticeable.
- This observed decrease in compressive strength at greater replacement rates could be caused by a number of variables.
- The alternate aggregate material's shape, surface texture, and particle size distribution are a few of its physical attributes that could provide a good explanation.
- Reduced interlocking and cohesiveness amongst the aggregates may result from over-incorporating the substitute aggregate, which could upset the ideal particle packing inside the concrete mixture.
- Furthermore, changes in the alternative aggregate's inherent characteristics, such as its porosity, absorption capacity, and mechanical strength, may have an impact on how well it functions within the concrete matrix and cause differences in compressive strength.
- In conclusion, the data emphasizes the necessity of careful optimization and control of substitution rates, even as it also shows that crushed over-burnt brick aggregate has the potential to be a competitive substitute for natural stone aggregate in the manufacturing of concrete.
- Consideration must be given to a number of elements, including material qualities, mix design parameters, and performance requirements, in order to weigh the advantages of increased compressive strength against the possible disadvantages of excessive substitution.
- Through comprehension and utilization of these variables, scholars and professionals can proficiently leverage the advantages of substitute aggregate materials while guaranteeing the structural soundness and efficiency of concrete in diverse constructing contexts.

REFERENCES

[1] Apebo, N.S., Lorwua, M.B., Augunwamba, J.C. (2013)." Comparative analysis of the compressive strength of concrete with gravel and crushed over burnt bricks as coarse aggregates" Nigerian Journal of Technology (NIJOTECH) Vol. 32, No. 1, pp. 7–12.

[2] Kesegic, I., Netinger, I. and Bjegovic, D. (2006) "Recycled Clay Brick as an aggregate for concrete". Technical Gazette, 15(3), pp.35-40.

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

[4] Khaloo, A. R., (1994).“Properties of Concrete Using Crushed Clinker Brick as Coarse Aggregate”, ACI Materials Journal, Vol.91, No.2, pp.401-407.

[5] Hasan, M. K., Khan, M. M. U., and Uddin, M. S. Uddin, (2007)“Properties of Concretes Obtained Replacing Stone Chips by Brick Aggregates”, B. Sc. Engineering thesis, Department of Civil Engineering, Dhaka University of Engineering & Technology (DUET), Gazipur, Bangladesh.

[6] Neville, A. M. (1995)."Properties of Concrete". (Fourth and Final Edition), Pearson Educational Limited, Delhi.

[7] Apebo, N. S., Agunwamba, J. C., Ezeokonkwo, J. C. (2014).”The suitability of crushed over burned bricks as course aggregates for concrete”, International Journal of Engineering Science and Innovative Technology (IJESIT). When

referencing Jhama bricks in coarse aggregate replacement for M35 grade concrete, it's essential to consult a variety of sources to gather comprehensive information. Here are some potential references you might consider:

[8] Mazumder, A., Kabir.A., and Yazdani, N.,(2006). "Performance of overburnt Distorted Bricks as Aggregate in Pavement Works." J. Mater, Civ. Eng. 10.1061/(ASCE)08991561(2006)18:6(777), 777-785.