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PARTIAL REPLACEMENT OF NATURAL SAND BY WASTE BRICK DUST: A REVIEW

[1]Mayuri Lembhe, [2]Prof. D. N. Kakade

[1]M-Tech Student, Department of Civil Engineering, PES college Chh. Sambhaji Nagar, Maharashtra, India
[2]Assistant Prof., Department of Civil Engineering, PES College Chh. Sambhaji Nagar, Maharashtra, India

Abstract: **-** As shelter is one of the fundamental needs of human beings infrastructures are constructed accordingly. For making infrastructure we require natural resources such as sand, aggregates, etc. These materials are the prime material used for preparing concrete and mortar. Nowadays, river sand is scarce and has a higher cost. This will affect the economy of the construction industry as well as the environment. However, to save the environment and to achieve economy we have to find an alternative material that can partially or completely replace natural sand without harming the properties of concrete. This research review will discuss the partial replacement of natural sand with waste brick dust. Also, it will reduce the dumping problem of brick debris into the environment as we are reusing the waste material. Sand will be replaced by brick dust in some percentages such as 5%, 10%, 15%, and 20%. In such a way we are replacing natural sand and checking its strength such as compressive strength, and split tensile strength. After this replaced concrete strength is compared with conventional concrete.

IndexTerms **- Brick dust, economy, environment, compressive strength, split tensile strength**

I. INTRODUCTION

Nowadays, we see construction sites everywhere, leading to increasing concrete use and thus finding a shortage of natural resources such as sand. Sand is the most used material in the world after water. It is globally not only used in construction but also in glass manufacturing. The report suggests that consumption has almost tripled in the past two decades. It has reached 50 billion tonnes a year or about 17 kilograms per person each day. This overconsumption has harmed rivers and coastlines and even wiped out small islands. Due to the rapid growth of construction activity the availability of the naturally available material getting exhausted. Hence conservation of naturally available material is very important. Since the construction activity cannot be diminished, there is only one way to search the alternative material to replace parts with easily available materials. Brick dust or Surkhi is an alternative material that can be effectively used in construction as a partial replacement of natural sand. This is the waste produced on construction sites or brick kilns.

Bricks are made in different shapes & sizes and from different materials. But clay is the fundamental and commonly used material on an industrial level. Also, fly ash is one of the materials used to make bricks since 2007. Crushed brick aggregates are the fine aggregates made from debris obtained in brick kilns. As natural sand is a limited material we can replace it with brick dust or brick aggregates which have a good compressive strength of up to 15% replacement of natural sand. But it is found that strength decreases up to 40% replacement.

NEED OF THE STUDY.

River sand is the best-suited material for making concrete. But due to the over-exploitation of river sand, it is banned by the government of India. Thus it needs to replace river sand with some other material. Because natural sand is a limited resource, we found the need to replace it with another alternative that gives similar properties as natural sand.

OBJECTIVES

1. To estimate the suitability of brick dust as a partial replacement of natural sand in concrete.
2. To compare and study the performance of concrete using brick dust with conventional concrete.
3. To understand the effectiveness of brick dust in the concrete mix as strength enhancement.
4. Effective disposal of brick dust as debris to protect the environment.

II. RESEARCH METHODOLOGY

M. Usha Rani & J. Martina Jenifer (2016), studied the strength analysis of concrete by performing compression, split tension, and flexure test on concrete. They have a replacement of sand as 15%, 20%, and 25% in the M25 mix. Compressive strength and split tensile strength increased initially at 15% & 20% replacement, but after increasing the percentage of sand to 25% compressive

strength get reduced. Flexure strength was increased at 10% & 20% replacement, but after increasing percentages up to 30% flexure strength get reduced.

Manoj Kumar et al., (2018), experimented with the partial replacement of fine aggregates with fired brick aggregates. They did the replacement in various percentages as 0%, 22%, 25%, 28%, and 31%, and performed a split tensile test for 7 days & 28 days. They said that the properties of fired bricks increase the strength of concrete and reduce the dependency on natural aggregates. This research gave increased split tensile strength when 25% to 31% replacement was done and optimum split tensile strength was achieved at 28% replacement.

R. Veerakumar & R. Saravanakumar (2019), detail studied the partial replacement of fine aggregates with brick debris from demolished masonry. They have done four replacement levels 5%, 10%, 15% & 20%, and tested for compressive strength. The compressive strength test results showed the optimum replacement was achieved at 10% replacement. Also, replacement concrete gains early strength and shuttering costs would be reduced.

Mohd Ishaq Hassan & Sandeep Nasier (2020), studied the partial replacement of sand with an equal percentage of brick dust and sawdust as 10%, 20%, and 30%. This research concluded that the use of brick dust and sawdust is feasible as it increases strength and resistance to abrasion. Compressive strength results are optimum at 10% replacement and it is higher than conventional at 20% replacement, also after 20% replacement strength decreases. Abrasion resistance is optimum at 20% replacement and shows higher resistance at 10% than at 30% replacement.

A. Siva et al., (2017), have done an experimental investigation on the partial replacement of fine aggregates using crushed spent fire bricks with varying percentages of 10%, 15%, 20% & 25%, and the optimum percentage was made, and split tensile strength was studied. Also, they have studied the workability pattern of various percentages. They concluded that the optimum replacement of fine aggregates is achieved at 20%. And as the percentage of replacement increases the workability of concrete decreases compared to conventional concrete.

III. CONCLUSIONS

Based on the pieces of literature that we had studied brick dust is the best material to replace natural sand or fine aggregates. Following are the conclusions that we made from the study:

1. To find the optimum percentage of replacement we have to study compressive strength, split tensile strength, and flexural strength of concrete.
2. We get eco-friendly concrete as it subsidizes the stagnation of demolished brick dust and the cost of concrete will be saved.
3. According to the literature, that we have studied optimum strength will be achieved at 15% replacement of sand.
4. After 20% replacement of sand compressive strength will reduced.

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