A Review on the Suitability of Crushed Over Burnt Bricks as Coarse Aggregate

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***Abstract*— Concrete is a versatile engineering material consisting of cementing substance, aggregates, water and often controlled amount of entrained air. It is initially a plastic, workable mixture which can be molded into a wide variety of shapes when wet. The strength is developed from the hydration due to the reaction between cement and water. The products, mainly calcium silicate, calcium aluminates and calcium hydroxide are relatively insoluble which bind the aggregate in a hardened matrix. The primary goal of the research is to investigate and evaluate the feasibility of employing crushed over burned brick aggregate as an alternative to costly traditional stone aggregate in concrete in order to minimize production costs, construction costs, and dead weight of a building structure. The research was conducted to study the suitability of crushed over burnt bricks as alternative coarse aggregates for concrete production. Tests were carried out to determine the physical properties of the crushed over burnt bricks aggregates. Values of 0%, 25% 50%, 75% and 100% were obtained for aggregate crushing value, aggregate impact value and aggregate water absorption respectively.**

Keyword: Coarse-aggregates, Concrete, Crushed over burnt bricks, Suitability.

I. INTRODUCTION

Cement, water, coarse and finely ground, and mortar are added to make concrete (if needed). The great advantage of concrete is that it can be built to withstand extreme conditions. The goal is to assemble these components in precise proportions to produce concrete that is easy to transport, stand, assemble, and finish, and that will set and harden to produce a solid and durable product. The amount of each component (cement, water, and aggregates) affects the properties of the solid concrete. Concrete mixes are intended to produce concrete that can be easily installed at very low cost. In order to produce strong and durable concrete, the concrete must work and harden if it is plastic, then set and firm. The design of the mix should take into account the location where the concrete will be used, such as exposure to seawater, trucks, vehicles, forklifts, pedestrians, or hot and cold temperatures. Concrete is made up of Cement, Water, Solid and Fine Joints, and composite materials. The proportions of each component in the mixture influence the final properties of the solid concrete. Weight is a very accurate measure of weight. Volume measurement is not so bad, yet it is enough for small projects.

Concrete is a flexible engineering material made up of cement, scales, water, and a controlled part of the air inlet. It has risen to the point of being in demand in modern architecture. Concrete is always selected and considered suitable wherever energy, fire resistance, and durability are required. When wet, it becomes plastic, a functional substance that can be molded into a variety of shapes. The mixture between cement and water produces hydration, which leads to the formation of energy. The raw materials used to make it, cement and mortar, have an impact on both quality and construction costs. Aggregates are usually less expensive than cement and cost more than 70% of the concrete volume. Construction costs are also affected by the availability and proximity of the total construction site. The immature materials used to make cement, sand, and composites have an impact on both quality and construction costs. Aggregates are usually less expensive than cement and cost more than 70% of the concrete volume. Construction costs are also affected by the availability and proximity of the total construction site. However, when quantity is scarce and there is an urgent need to conserve natural resources for long-term growth and to conserve resources for the benefit of future generations, this involves the use of some of the rigid components provided locally. The bat or brick kiln found in the making of bricks is one of

the rough collections. Heat-treated concrete such as rough clusters have applications such as lightweight concrete, lightweight mixtures, load reduction for buildings with large structural features, PCC function, and floors. Burnt bricks cannot be used in road construction if they fail impact and abrasion tests.

II. STATE OF DEVELOPMENT

Cement, fine aggregate, coarse aggregate, and water make up concrete. Coarse aggregates are primarily responsible for the strength and fire resistance of concrete; nevertheless, a variety of conditions might cause coarse aggregate qualities to surpass expectations. The replacement of coarse aggregate with recycled aggregate has been the subject of several published research investigations. Research is still ongoing to determine the characteristics of recycled materials at high temperatures. Examining recycled materials' use in concrete and its byproducts is the focus of this section.

R. Kasi and P. Malasani (2016) The suitability of crushed compounds to investigate the replacement of granite in concrete production was investigated. The RBA concrete mixes are made by changing the GA by 25 percent, 50 percent, 75 percent, and 100 percent crushed by volume bricks. As a result, RBA concrete may be used to build lightweight concrete, leading to a reduction in dead loads. The reduction in concrete density at high altitudes may be due to the reduced density of the reconstituted brick mortar in both concrete stages. He also concluded that the compressive strength of both types of concrete decreased as the percentage change increased. Test results have shown that it is possible to make RBA concrete with structures similar to GA concrete with a 25% change.

K. Praveen et al., (2016) Concrete is created by combining the required amounts of cement, sand, aggregate, water, and aggregates that form a large part of the volume. The addition of aggregates to concrete enhances its features. They found that natural resources were declining rapidly, that their use should be limited to sustainable development, and that it was important to increase waste use. Because of their unusual shape and black color, many burning bricks are disposable materials that cannot be used directly in construction. The use of overheated bricks contributes to the conservation of natural resources. As part of the cement is expected to be converted into rock covered with high-grade fired bricks, their study focused on the effects of various micro-silica. Solid concrete machinery structures are investigated and tested, including strong separation strength, elasticity, and compression strength.

G. H. Qoja and Y. Z. Dinkha (2017) It was investigated whether it was possible to use crushed clay bricks instead of aggregate (stone blocks) in concrete mines. Four ordinary concrete mixes, as well as four additional mixtures for a mixture of crushed brick bricks, formed and tested. Scales of crushed clay bricks are created by units of crushed bricks (locally sourced and manufactured in Iran) and collected in a specified size (20 mm). According to the results, the unit weight of the crushed brick ranged from (1685-1760) kg / m3, and its compression strength was about 61 percent of the natural composite concrete, while its bending strength was 70 percent of the natural composite concrete. In addition, the lightweight concrete produced has a similar relationship between compression strength and flexibility in conventional concrete. In addition, the results suggested that composite concrete bricks were suitable for use in buildings.

N. Kumar et al., (2017) Physical properties such as compressive strength, durability, flexibility, and performance were tested using other materials that were leased in 10%, 20%, and 30% concrete for 7, 14, 28, and 50 days days. He also concluded that the flexibility and flexibility of burnt bricks have decreased compared to conventional concrete. Compared with ordinary concrete, the rate of deterioration or efficiency has decreased. At the M25, M30, and M35 concrete distances, the rate of degradation or efficiency decreases as the heat exchange rate increases.

Buddhi Raj Joshi et. al. (2020) The research was conducted to study the possibility of utilizing the crushed over burnt brick as an aggregate that can be used in the place of natural stone aggregate. The compressive strength of the concrete is the major concern of this study by replacing the natural aggregate through crushed over-burnt brick aggregate. Trial mixes were prepared using the crushed over burnt bricks in place of coarse aggregates for M20 concrete to study the compressive strength parameters. The result of 28 days compressive strength of natural stone aggregate concrete at 0.45 and 0.5 water-cement ratio has 21.9 MPa and 20.2 MPa respectively. Similarly, the result of 28 days compressive strength of crushed over-burnt brick aggregate concrete at 0.45 and 0.5 water-cement ratio has 24.9 MPa and 22.4 MPa respectively. The result of partial replacement of natural stone aggregate by crushed over-burnt brick

aggregate indicates that there has the significant increment on compressive strength of concrete. The result also specified that due to the decrement of water-cement ratio there have the increment in compressive strength of concrete. Based on the research data the use of crushed over burnt brick coarse aggregate for structural concrete has strongly recommended.

Vikash Kumar Gautam et. al. (2018) The study during this paper is administered to check the practicability of exploitation crushed over burn bricks to alternate the coarse mixture (gravel) in concrete. 2 kinds of concrete intermixture are ready. the primary one may be a mixture of 1:2:4 while not crushed over burn bricks and is employed as a reference mixture .The other is formed of various weight of crushed over burn bricks (as a proportion from the load of the coarse aggregate). a complete of thirty numbers of concrete specimens are casted with and while not crushed over burn bricks and tested below compression and split tension as per relevant to British commonplace specifications. Take a look at results indicated that mistreatment crushed bricks reduces the strength of concrete. Also, the proportion of water to cement magnitude relation will increase for constant slump once the proportion of crushed bricks augmented. The results indicate that the crushed over burn brick are appropriate to switch the granite mixture in concrete production. Trial mixes of crushed over burn brick concrete were ready by substitution the Granite Aggregate with 25%, 50%, 75% and 100 percent crushed over burn bricks by volume. M20 grade of each Granite aggregate and crushed over burn brick concretes were ready and tested to match the compressive strength. The take a look at results showed that it's doable to provide crushed over burn brick concrete with characteristics like those of Granite aggregate concrete with 25% replacement.

Sajid Saleem et. al. (2017) The main objective of the study is to explore and assess the possibility of using crushed over burnt brick aggregate (industrial waste) as an alternative for the costly conventional stone aggregate in concrete hollow blocks (masonry in fills) to reduce their production cost, construction cost, and in addition dead weight of a building structure. The study has been carried out at 0%,20%, 40%,60%,70%, 80% and 100% replacement levels of normal crushed stone aggregate with crushed over burnt brick aggregate by Arbitrary standards method. Cube specimens of sizes 150mm with different percentages by weight of normal stone aggregate to over burnt brick aggregate were casted and tested after 7 & 28 days. Whereas hollow block specimens of size 200×200×150mm were tested only after 28 days, as per IS standards. For the purpose of current study, batching operation by weight approach (Arbitrary standards method) has been adopted. Nominal mix of 1:8 (1 cement: 8 combined aggregates) or 1: 4: 4 has been investigated with water/cement ratio of 0.55. The constituents used in the mix were Portland pozzolana Cement (PPC) with 25% fly ash, fine aggregate (natural sand), coarse aggregates (locally available crushed stone aggregates 10 mm maximum size) and (crushed Over burnt brick aggregate of 10 mm maximum size), and potable water as per IS 456-2000.Comparative study among strengths of mixes, prepared at different replacement levels reveled that, crushed Over burnt brick aggregates can be confidently used upto 69% replacement level of normal crushed stone aggregate with crushed over burnt brick aggregate, with compromising with strength.

S.U. Azunna et. al. (2021) Using shattered bricks, make more affordable and environmentally friendly concrete to stop the depletion of water sand and lessen the risk associated with waste disposal. In this experiment, the performance of concrete created using natural coarse aggregate vs concrete manufactured with crushed burnt brick as aggregate was examined. Experimental study on the production of wet and dry materials by measurements of concrete's density, compressive strength, and water absorption. As a consequence of curing for 28 days, the water absorption of the coarse-mix burned stone concrete was 7.83%, greater than that of the 2.83% mixture, according to the findings of the water absorption test. According to the strength test, the concrete has a 28-day strength of 22.96N/mm2, which is more than the strength of crushed burned bricks, which had a 28-day strength of 15.45N/mm2. However, the strength of pulverised burned bricks is still limited. Additional tests conducted to assess the appropriateness of explosives include the Analysis of Value (ACV) with a value of 23.36% and the Analysis of Average Value (AIV) with a value of 15.68%. Additionally assessed were the characteristics and calibre of the crushed brick aggregates.

Nilesh Kumar et. al. (2017) Stone is a composite material that is utilised for flooring; therefore, in order to locate a substitute material, stone was employed for all design requirements. The majority of the stones used in concrete are naturally occurring stones, although not all types of stones are readily available in every area. Nevertheless, not much has been known in the past about

using brick as an addition in concrete building. Investigating the appropriateness of crushed brick as a substitute aggregate in concrete construction is the goal of this project. The present study employed crushed stone as a secondary material to examine the various characteristics of the rock through the testing and investment of lines and rollers of the M-25, M-30, and M-35 levels. Concretes that were 7, 14, 28, and 50 days old had their data altered by 10%, 20%, and 30% employing physical forces including work, bending strength, tensile strength, and compressive strength. We conducted tests on both fresh and hardened concrete and analysed the outcomes. Test the bricks' workability, tensile, bending, and compressive strengths after casting them. The findings demonstrated that baked concrete yielded a composite concrete with a lesser strength than regular concrete. It is advised to conduct a thorough and efficient analysis utilising various combinations and proportions of overburned aggregates in order to get better findings.

Dr. Shreenivas Reddy Shahapur et. al. (2022) This work investigates concrete structures using folded and fixedly attached dismantled bricks. Using burned brick serves the primary goal of avoiding the need to remove or cut natural stones. This study's primary goal is to investigate how steel fibre reinforced concrete affects both freshly laid concrete and concrete that has hardened. There are big gaps in the building because of the charred stone's uneven surface. This experiment substituted overbaked brick bars fastened with 2% crimped steel fibres for coarse aggregate in various quantities, such as 15%, 20%, 25%, and 30%. In order to create M60 class concrete, it must pass many tests including the slump test on fresh concrete, the pressure, tensile, and bending strength of hard concrete, and it must cure for 7, 14, and 28 days. Research has shown that workability declines and compressive, tensile, and bending strengths increase by up to 20% when the proportion of overfired bricks rises. Then, the density falls as the OBB proportion rises. The application of chemical additions lowers moisture content and enhances performance. The exam involved tossing 45 cubes, 45 prisms, and 45 cylinders.

N.S. Apebo et. al. (2018) The purpose of this study was to determine if it would be feasible to use leftover bricks as construction aggregates for the typical structures found in Benue State's Gwer-West Local Governments, particularly in Naka, the local government's seat. The raw materials for the mixture include water-washed gravel from the Benue River, crushed stone (sometimes called brick stick) as aggregate, and a combination of crushed stone and water for stone washing. To investigate compressive strength, concrete samples were made and put through testing. The findings indicated that the stone with a density of 2000–2200 kg/m3 when mixed with stone brick is referred to as medium-light stone. Concrete aggregate takes less water than brick aggregate concrete to get the same performance. Use of broken over burnt bricks as coarse aggregate for structural concrete is recom-mended when natural aggregate is not easily available, high strength of concrete is not required and the bearing capacity of the soil is low.

Akash Vijaykumar Kankal et. al. (2018) In the globe, concrete is regarded as a substance that is often utilised. The ingredients of a concrete mix include aggregate, cement, sand, and water. The coarse aggregate in concrete is the project's main emphasis. Concrete can contain other components in place of the coarse aggregate. And burning bricks is part of this. The selection of these goods was based on their availability. The Brick Factory is the source of fire bricks. Furthermore, a lot of bricks are rejected throughout the brickmaking process since they don't match criteria. One of the irregularities is the way the kiln's uneven temperature causes the bricks to take on a distorted form. Additionally, these abandoned bricks could serve as a source for assembly. This helps lessen waste issues in addition to guaranteeing the efficient use of other resources. This experiment shows how overfired brick bar residues affect the concrete matrix's mechanical characteristics in both its wet and hardened states. Its purpose is to test the composition of stone based on ashlar and to substitute coarse aggregate for some of the ashlar.

Satish R.Parmar et. al. (2019) The burned bricks have a deeper colour and an uneven form. Because the construction was robust and could not be designed ahead of time, short fragments of stone were employed as aggregate. The kilns are filled to the brim with fire bricks. Using Super Electric Brick to Cut Concrete Costs Examined was the potential for replacing some of the natural aggregate in concrete with crushed super electric brick and the 5% cement with silica powder. This study substituted weight crushed short bricks for 5% of the natural aggregate and weight cement for 5% of the silica powder. In order to assess the many qualities of concrete, including slump, compression factor, compressive strength, splitting tensile strength, flexural strength, and durability, concrete is examined in both its fresh and hardened states. Crushed stone replaces the initial set of

aggregates at a rate of 0%, 10%, 20%, 30%, and 40%, in that order. The concrete procedure in this study was accepted after 7 and 28 days of testing, and after 56 days of approval. Outcomes in contrast to white stone.

III. GAP IDENTIFICATION

The reconstituted composite's compressive strength, according to the authors, was on par with that of natural composite concrete at all conversion rates other than 100% replacement. The overall density of employing plain bricks by merely aggregating them might be the reason for the authors' finding that the density of recycled concrete decreased with increased water-cement exchange at all levels at all levels of the study. Thus, burned bricks are combined with cement slurry and allowed to dry for two to three days in order to be examined. Use it in its place.

IV. CONCLUSION & FURTHER STUDY

This paper focuses only on the literature review of previously published studies. Concrete is the most commonly used building material in the world. Typical concrete mixtures include water, sand, cement, and a rock aggregate. Burn brick is available from brick manufacturing areas. A large number of bricks are rejected in the brick-making process due to non-conformity with the required specifications; these rejected bricks can also be a potential source of coarse aggregate. This would not only make good use of the otherwise waste material, but would also aid in the reducing of disposal issues. We know that the source of stone aggregate is constant, but the materials are being quarried on a daily basis, resulting in a decrease in stone aggregate. When natural rock deposits become limited after a few decades, burnt clay bricks will be an alternative source of coarse aggregate. The use of brick aggregate rather than stone aggregate in various components of a building structure can result in significant reductions in dead load on columns and foundations. As a result, replacing stone aggregate (partially or entirely) with brick aggregate may result in cost-effectiveness in the construction of concrete structures.

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