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Experimental Study on Effect of Partial Replacement of Course Aggregate by Over Burnt Brink in a Concrete

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Abstract:

This project focuses on the coarse aggregate in concrete. The other material will be used to replace the coarse aggregate of rock in typical concrete. This will include burn brick. This material was chosen because of their availability. The burn brick is available from brick manufacturing area. Also in brick-making, a large number of bricks are rejected due to non-conformity with the required specifications.

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 a 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 presents the effects of over burnt brick bat inclusion on the mechanical properties of concrete matrix in wet and hardened state properties. For checking mechanical properties of over burnt brick bat based concrete used partially replacement over burnt brick bat to coarse aggregate

Keywords: - Burnt brick, Concrete, Coarse aggregate

I. INTRODUCTION:

This project focuses on the coarse aggregate in concrete. The other material will be used to replace the coarse aggregate of rock in typical concrete. This will include burn brick. This material was chosen because of their availability. The burn brick is available from brick manufacturing area

Whenever there is a requirement of Strength, Fire resistance, and durability, concrete is always preferred and considered as the best material. This compels the use of other coarse aggregates which are locally available and also cheap. Class IV bricks or over-burnt bricks are formed by uneven heating of bricks in kilns. Use of over-burnt bricks helps to preserve natural aggregates as well as reduces the waste storage.

II. OBJECTIVE:

1) To find the percentage of aggregate replacement appropriate.
2) To make mix design brick aggregate concrete.
3) To find the compressive strength properly.
4) To compare the physical properties of brick ballast aggregate with natural coarse aggregate.
5) Application and use of brick in concrete.

III. LITERATURE REVIEW:

1. **Eldin N.N., Ahmad B (1993):** Discarded vehicle tyres constitute one important part of solid waste which had historically been disposed

of into landfills. An emerging use is the production of concrete, in which tyre rubber particles partially replace natural aggregates. This has the additional advantage of saving in natural aggregates used in the production of concrete which are becoming increasingly scarce. This research investigated a wide range of physical and mechanical properties of concrete containing recycled tyre aggregates, to assess its suitability as a construction material. The influence of factors such as rubber aggregate content and size, as well as curing time was also considered. The results showed that despite a great loss in strength, this type of concrete was acceptable for various applications requiring medium to low compressive strength. The quantities of concrete produced worldwide for such applications could ensure the viability of this product. Therefore, this type of

2. concrete shows promise for becoming an additional sustainable solution for tyre rubber waste management.
4. **Muhammad Azhar Saleem, Syed Minhaj Saleem Kazmi , and Safeer Abbas (2017**): This study aims to characterize the clay bricks produced by the addition of the two agricultural waste materials i.e. sugarcane bagasse and rice husk ash. Disposing off these waste materials is a very challenging task and is a hazard to environment. The sugarcane bagasse and rice husk ash were collected locally from the cities of Peshawar and Wazirabad, respectively. These were mixed with the clay for brick manufacturing in three different proportions i.e. 5, 10 and 15% by weight of clay. Mechanical i.e. compressive strength and modulus of rupture and durability properties i.e. water absorption; freeze-thaw and sulphate resistance of these bricks were evaluated. Test results indicated that the sulphate attack resistance and efflorescence of clay bricks incorporating sugarcane bagasse and rice husk ash have been increased significantly. However, no significant effect on mechanical properties was observed. Furthermore, the additions of wastes have reduced.

3. **G. S. Patil and P. B. Autade (2015):** The effect of partial replacement of coarse aggregate by Jhama class brick in concrete. This project presents the effects of Jhama Class Brick inclusion on the mechanical properties of the concrete matrix in wet and hardened state properties. For checking mechanical properties of Jhama Class Brick bat-based concrete used partially replacement Jhama class brick to coarse aggregate ratios 20%, 40%, 60% and 80% in M40 grade of concrete. It is observed that workability decreased with the replacement of coarse aggregate. The Compaction factor observed as 0.92, 0.899, 0.88, 0.87 and 0.85 with varying percentage replacement of coarse aggregate by Jhama class brick bat as 0%, 20%, 40%, 60% and 80% respectively.

5. **Bidve Ganesh Shivkanth, G. N. Shete (2019):** concrete is considered the world's most used construction material. Typical concrete mixtures are comprised of water, sand, cement and an aggregate of rock. This project focuses on the coarse aggregate in concrete. The other material will be used to replace the coarse aggregate of rock in typical concrete. This will include burn brick. This material was chosen because of their availability. The burn brick is available from brick manufacturing area. Also in brick-making, a large number of bricks are rejected due to nonconformity with the required specifications. 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 a 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 presents the effects ofover burnt brick bat inclusion on the mechanical properties of concrete matrix in wet and hardened state properties. For checking mechanical properties of over burnt brick bat based concrete used partially replacement overburnt brick bat to coarse aggregate.

IV. MATERIALS USED

1. **CEMENT:** Portland pozzolona cement of ultra tech brand was used and it was conforming to IS 1489-1991properties of cement are tabulated in Table

SR.NO	PROPARTIES	RESULTS
1	Normal consistency	28.25%
2	Specific gravity	3.15
3	Initial setting time	170 min
4	Final setting time	250 min
5	Soundness test	0.5

2. **Fine aggregate:**
Fine aggregate includes the particles that all passes through 4.75 mm sieve and retain on 0.075 mm sieve. Locally available river sand will be used as fine aggregate. The sand will first sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and then washed to remove the dust.
Fine aggregates are essentially any natural sand particles won from the land through the mining process. Fine aggregates consist of natural sand or any crushed stone particles that are ¼" or smaller. This product is often referred to as 1/4"' minus as it refers to the size, or grading, of this particular aggregate.

3. **Coarse aggregate:**
The broken stone is generally used as a coarse aggregate. Aggregate occupies most of the volume of the concrete. Locally available coarse aggregate having nominal size 20 mm was used. The aggregates were washed to remove dust and dirt. Physical properties of coarse aggregate are tabulated in table

- Specific gravity =D / C – (A - D)
- Water absorption = C – D / D

Physical properties of coarse aggregate

SR.NO	PROARTIES	RESULATS
1	Size	20mm
2	Specific gravity	2.68
3	Fineness Modulus	7.20
4	Shape	Angular
5	Bulk Density	1450kg/m3

4. **Water:**
Water is used for mixing, curing purpose should be clean, portable, fresh and free from any bacteria. Water is a key ingredient in the manufacture of concrete.

5. **Over burnt brick bat waste :**
The over burnt brick broken into pieces called as brick bats. These brick bats are mixed with cement slurry after 7days curing used as an aggregate in concrete. Physical properties of over burnt brick are tabulated in table 4.

Physical properties of over burnt brick

SR.NO	PROPERTIES	RESULTS
1	Size	20mm
2	Specific gravity	2.17
3	Fineness Modulus	7.20
4	Shape	Angular

V. Methodology:

A. Test on material

The different tests conducted were as follows:
1. for Aggregate: - Sieve Analysis, Water Absorption, Specific Gravity, Impact Test.
2. for Cement: - Cement Consistency.
3. for Concrete: - Workability, Slump Test, Compressive Strength

1. **for Aggregate**

➢ **Sieve Analysis:**
Sieve analysis helps to determine the particle size distribution of the coarse and fine aggregates. This is done by sieving the aggregates as per IS: 2386 (Part I) – 1963. In this we use different sieves as standardized by the IS code and then pass aggregates through them and

thus collect different sized particles left over different sieves.

- The apparatus used are

i) A set of IS Sieves of sizes – 80mm, 63mm, 50mm, 40mm,31.5mm, 25mm, 20mm, 16mm, 12.5mm, 10mm, 6.3mm,4.75mm, 3.35mm, 2.36mm, 1.18mm, 600µm, 300µm, 150µm,75µm.

ii) Balance or scale with an accuracy to measure 0.1 percent of the weight of the sample.

➢ **Water absorption:**

The aggregates should be weighed (Weight 'A'). iv) The aggregates should then be placed in an oven at a temperature of 100 to 110oC for 24hrs. It should then be removed from the oven, cooled and weighed (Weight 'B'). Formula used is

Water absorption = [(A – B)/B] x 100%.

Impact test

The aggregate impact test value is a measure of resistance to sudden impact or shock,which vary from its resistance to gradually applied compressive load.

- **For Cement**

  - **Cement Consistency:** The consistency test is designed to assess one necessary, but not sufficient, aspect of robustness.

- **For Concrite**

  - **Workability**: The workability tests were performed using standard size of slump moulds as per IS;1199-9199.slump test was performed for each percentage of replacement i.e. 20%, 40%, and for 60%

    Compressive strength: The cube specimen of the size 150 x 150 x 150 mm was tested after curing for period of 7and 28 days. Compressive strength is determine by using compression testing machine (CTM) of capacity 2000KN.

B) Test on blocks:

VI. RESULTS:

1) RESULTS

2) CONCLUSION:

- Based on results and observation made in experimental research study. The following conclusions are drawn. It is

observed that with increase in percentage of over burnt brick bat waste workability decreases

- Brick bat concrete is cheaper than conventional concrete.
- Concrete made by slump value 45,50,47,41.
- Mix design ratio for 0% replaced burn brick is proportion 1: 1.88:3.17
- Mix design ratio for 40% replaced burn brick is proportion 1:1.88:1.68

VII. FUTURE SCOPE:

- When burnt bricks are used in walls, they require plastering or rendering with mortar. Uses for burnt clay bricks include masonry walls, foundations, and columns.
- The findings of this research demonstrate that the addition of 10% WMP in interlocking burnt clay brick can be a potential option for sustainable masonry wall leading to more eco-friendly and economical construction.

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