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UTILIZING WASTE BRICKS AS AGGREGATE IN CONCRETE: AN EXPERIMENTAL STUDY

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ABSTRACT:

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.

KEYWORDS:

COARSE-AGGREGATES, CONCRETE, CRUSHED OVER BURNT BRICKS, SUITABILITY.

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1. OBJECTIVES:

1) Investigate the feasible use of recycled bricks as a substitute for natural coarse aggregate in concrete.

2) To compare the compressive strength of natural stone aggregate with over burnt brick aggregate at different proportion.

3) To determine the optimum dose of alternative material such as over burnt crushed bricks as partial replacement of coarse aggregate respectively.

4) Recycling of crushed over burnt bricks could aid in sanitizing the environment.

1.1. TYPE OF CONCRETE

1.2.1 PLAIN CEMENT CONCRETE

Plain concrete is a solid mass made of a predetermined amount of cement, sand, stones, and water. These ingredients are then mixed into a plastic wrap, and then poured into a desired shape called forms. This pile of plastic hardens during the drying process, leading to PCC. The chemical reaction between the cement and the water makes the mixer stronger. PCC has high compressive strength but low durability.

1.2.2 REINFORCED CEMENT CONCRETE

The compressive strength of PCC is high, while the tensile

strength is very low. In order to increase the strength of the concrete, some reinforcement that can withstand the stress created by the structure is required. Metal braces, which are strong in stress, are the most common type of reinforcement. New concrete is poured around the reinforcing steel after it has been set to forms. This composite layer is known as reinforced concrete because it is made of concrete and reinforced steel.

1.3 PROPERTIES OF CONCRETE

After 28 days, the intensity increases. The magnitude of the rise is determined by the level and type of cement, the healing conditions and the surrounding conditions, and so on. Unless there is evidence confirming the high strength of a particular building due to age, the design should be based on the strength of the 28-day concrete feature. The actual studies should be used to determine the rate of increase in pressure with age in concrete grade M 30 and above. When members are under direct pressure during construction, they should be assessed for stress caused by a combination of direct load and bending. The modulus of elasticity is influenced primarily by the elastic properties of the aggregate and gradually by the curing conditions of the qd concrete years, the mass ratios and the type of cement. , In Concreting The modulus of elasticity of concrete can be assumed as Per IS 456 is EC= 5000√ fck Where Ec= is the short term static modulus of elasticity in N/mm2. fck = Grade of concrete The overall degradation of concrete is determined by concrete features, organ size, and environmental conditions. The complete coating of concrete is largely determined by the total amount of water present in the concrete during mixing, and, to a lesser extent, by the content of the cement at a certain humidity and temperature.

1.3.1 CONCRETE GRADE

The compressive strength of concrete is used to determine its grade. Concrete is classified into fifteen categories according to IS456:2000, as indicated in Table 1.1. M refers to the mix, and the number to the stipulated compressive strength of a 150 mm size cube at 28 days, expressed in N/mm2. For concrete with a compressive strength larger than M 55, the design parameters in the stand may not be appropriate, and the values may be derived from specialised literatures and experimental data. The typical strength of a material is defined as the strength below which no more than 5% of the test results are predicted to fall. Concrete grades are classified according to their intended function. • For RCC work – not lower than M 20 • For post tensioned works – M 35 and above • For pretension pre-stressed concrete- M 40 and above

1.2. TABLE

TABLE - GRADE OF CONCRETE

Group Grade	Designation	Specified Characteristic Compressive Strength fck (MPa)
Ordinary concrete	M 10	10
	M 15	15
	M 20	20
Standard concrete	M 25	25
	M 30	30
	M 35	35
	M 40	40
	M 45	45
	M 50	50
	M 55	55
	M 60	60
	M 65	65
	M 70	70

1.3. MATERIALS USED IN CONCRETE

Concrete's qualities are determined by the proportions and types of components used. A correctly prepared concrete mix is extremely long-lasting. The following requirements should be met by a good concrete mix:

- The concrete should be thoroughly mixed to make a homogeneous mix;
- The concrete should be adequately compacted to prevent it from becoming porous;
- Sufficient curing of concrete is required to acquire full strength.
- Considering the strength and workability standards, the w/c ratio should be adequate.
- The concrete mix should be properly designed and have all of the ingredients in the proper amounts;
- The water used for mixing should be free of all dangerous organic compounds;
- The aggregates should be hard, durable, and properly graded.
- The aggregate size of 20mm is adequate for most RCC works.
- The cement used for RCC work should be of good quality and measured by weight alone. Not in terms of volume.

1.4. SCOPE OF THE STUDY

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.

1.5. GENERAL REVIEW OF THE LITERATURE

Concrete is a material made up of cement, fine aggregate, coarse aggregate, and water. The strength and fire resistance of concrete are mostly determined by coarse aggregate, which is in short supply due to a variety of factors. Many studies have been published by researchers on the replacement of coarse aggregate with recycled aggregates. At high temperatures, the mechanical properties of such recycled aggregate concrete are still being researched. This chapter provides an in-depth examination of the use of recycled aggregate in concrete and its performance.

1.6 I.S. METHOD OF MIX DESIGN

The main goal of concrete mixing design is to determine the best concentrations of the various concrete materials, resulting in new concrete with desirable performance and strong concrete with the required compression strength and durability. Mixtures should also meet the additional condition of using the least amount of cement possible so that the cost of concrete is kept to a minimum.

- Slump test of Concrete
- Cube Test Analysis in Lab
- Compressive strength of concrete
- Split Tensile Strength
- Flexural Strength

1.6. PRELIMINARY INVESTIGATIONS

Preliminary investigations such as concrete structures, coarse aggregate, and fine-grained collection, as well as the process of various inspection processes in accordance with IS codes for the detection of these structures and the mixing parameters obtained from compounding, were discussed in this regard. chapter. This chapter also discusses experimental procedures for extensive investigations into reconstituted brick (RBA) assemblies, such as RBA repair physical and mechanical structures, the reduction and density of compacted reconstituted brick concrete (RBAC), RBAC compressive strength at room temperature, pressure, stable tensile, and RBAC flexible power at high temperatures in accordance with IS codal provisions, and RBAC flexible power at high temperatures.The properties of concrete are largely determined by the properties of the elements. Cement acts as a binding agent, building a strong bond between the particles. The properties of cement, the fine and durable material used in concrete are primarily responsible for its strength.

CONCLUSIONS:

1. The slump of grades of recycled brick aggregate concrete (BBA M20) decreases with the increase in the percentage replacement of aggregate with recycled brick aggregate.

2. The density of grade BBA M20 decreases with the increase in percentage replacement of recycled brick aggregate as the recycled brick is light in weight than granite aggregate. Hence BBA concrete can be considered as light weight concrete which results in smaller dead loads.

1. The percentage in Compressive strength increases with increase BBA in grade of concrete. BBA 50% grade concrete showed highest Compressive strength than BBA 0% grade concrete.

Fig. 1 - (a) compacting of concrete

(b) UTM Machine in Lab

2. EQUATIONS

Various equations were considered and used as per the requirements in order to get the results. Here are provided the equations used in the project for calculations regarding it. The equations are as follows:

$$\text{Fineness of cement} = \frac{\text{weight of cement passed through the sieve}}{\text{Total weight of sample taken}} \times 100$$

$$\text{Specic gravity} = \frac{W4}{W3 - (W1 - W2)}$$

$$\text{Water Absorption} = \frac{W3 - W4}{W4} \times 100$$

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