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CHAPTER-1

INTRODUCTION

GENERAL

1.1 Concrete:

Concrete is defined as a mixture of sand, gravel and water which dries hard and strong & is used as a material for building. Concrete, usually **Ordinary Portland Cement Concrete**, is a composite material composed of fine and coarse aggregate bonded together with a fluid cement that hardens overtime most frequently in the past a lime-based cement binder, such as lime-putty, but sometimes with other hydraulic cements, such as calcium aluminates, cement or portable cement. It is distinguished from other non- cementitious types of concrete all binding some form of aggregate together, including asphalt concrete with a bitumen binder, which is frequently used for road surfaces, and polymer concrete that use polymers as a binder. Concrete is one of the oldest and most common construction materials in the world, mainly due to its low cost, availability, its long durability, and ability to sustain extreme weather environments. Concrete is a brittle material that has a high compressive strength, but a low tensile strength. Thus, reinforcement of concrete is required to allow it to handle tensile stresses.

1.2 WASTE BRICK POWDER:

Bricks are widely used construction and building material around the world. Bricks have been major construction and building material for a long time. The worldwide annual production of bricks is currently about 1391 billion units and the demand for bricks is excepted to be continuously rising. Since the increasing demand on building materials in the last decade, the civil engineers have been in challenged to covert the industrial wastes into useful building and construction materials. Accumulation of unmanaged wastes especially at the developing countries as a result in an increase on environmental concern. Recycling of such wastes as building material appears to be viable solution not only to solve such pollution problem but also to the problem of economic design of buildings. The increase in popularity of using environmentally friendly and low cost construction materials in building industry has brought about the need to investigate how this can be achieved by benefiting to the environment as well as maintaining the material requirements affirmed in the standards.

Brick powder is obtained from the dust of disintegrated bricks also the waste bricks are obtained from garbage of a broken building. The collected waste bricks are pulverized to get the particle passing through 4.75-micron sieve to get the grading of fine aggregate for 15%, 25%, and 30% brick powder is used as replacement for fine aggregate in the experiments.

Brick dust occurs from loading or unloading, construction sites and brick kilns. This dust is used in dumping and filling. There are thousand Tons of brick waste generated each year around the world which goes in unplanned way. Pozzolanic materials such as brick dust and other ceramics powder has been used in concrete since ancient times. In ancient times the brick dust was used according to experiences and experiments as they were unaware of the properties of brick dust. Bricks are made up of different types of clays and other materials like sand. Clay composed up of 20-30% Alumina, 50-60% Silica, and other carbonates and oxides. The waste bricks used in this study were obtained from recycled bricks. Cracked pieces of bricks were crushed by a jaw crusher. And at laboratory scale the bricks wastes were ground with an air jet mill to obtain bricks powder. The resulting powders were sieved through a 45-µm (325 mesh) sieve. The chemical compositions of brick pastes were analyzed and results obtained.

Bricks waste may come from two sources: The first source is the bricks industry, and this waste is classified as non-hazardous industrial waste, the second source of bricks waste is associated with construction and demolition activity, and constitutes a significant fraction of construction and demolition waste. Therefore, the replacement of fine aggregate by bricks wastes has the advantage of solving several environmental problems.

1.3 Scope of the Study:

The main focus of the research is to present additional information in the field of recycling clay masonry rubbles in order to explore the possible uses of these recyclable materials in structural applications. The current work concludes performance-based guidelines that are imperative from the cost and environmental aspects and that also can be recycled brick powder in concrete. Brick powder reduces weight of the concrete. With the increase in construction activities, there is heavy demand on concrete and consequently on its ingredient like aggregate also. So crushed brick waste has been used as an alternative to this demand.

- To use waste brick powder as a construction material.

- It will slightly reduce the dependency on natural sand or M sand.
- Its use will also help in protecting the environment surroundings.

1.4 Objectives:

The main objectives of present study are:

- To study the suitability of waste brick powder in concrete.
- To study the mechanical properties of waste brick powder in concrete.
- To study the durability of waste brick powder in concrete.

1.5 Organization of Thesis:

Chapter 1 includes introduction to partial replacement of fine aggregate using brick powder. It also includes scope of the study and objectives of the study.

Chapter 2 deals with the brief review of the available literature on partial replacement of fine aggregate using brick powder and appraisal of the reviewed literature is done.

Chapter 3 gives an overview of materials used and tests to be conducted.

Chapter 4 deals with the methodology or procedure, involved in preparation of the concrete blocks.

Chapter 5 deals with the work to be carried in phase-2.

CHAPTER-2

LITERATURE SURVEY

This chapter deals with the brief review of available literature on partial replacement of fine aggregate using waste brick powder and also about its relevant topics, to understand and analyze the latest methodologies adopted in the studies conducted by various authors.

Farid Debieb (2007):

recycling and reuse of building rubble present interesting possibilities for economy on waste disposal sites and conservation of natural resources. This paper examines the possibility of using crushed brick as coarse and fine aggregate for a new concrete. Either natural sand, coarse aggregates or both were partially replaced (25, 50, 75 and 100%) with crushed brick aggregates. Compressive and flexural strengths up to 90 days of age were compared with those of concrete made with natural aggregates. Porosity, water absorption, water permeability and shrinkage were also measured. The test results indicate that it is possible to manufacture concrete containing crushed bricks (coarse and fine) with characteristics similar to those of natural aggregates concrete provided that the percentage of recycled aggregates is limited to 25% and 50% for the coarse and fine aggregates, respectively.

J. Martina Jenifer, Et al., (2016):

Concrete is the most material being used in infrastructure development throughout the world. Sand is a prime material used for preparation of mortar and concrete and which plays a major role in mix design. Natural or River sand are weathered and worn out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-a-days good sand is not readily available, it is transported from a long distance. Those resources are also exhausting very rapidly. The non-availability or shortage of river sand will affect the construction industry, hence there is a need to find the new alternative material to replace the river sand, such that excess river erosion and harm to environment is prevented. Many researchers are finding different materials to replace sand. This study aimed to investigate the suitability of using crushed brick in concrete. Crushed brick originated from demolished masonry was crushed in the laboratory and added partial sand replacement. Three replacement levels, 15%,20% and 25%, were compared with the control. The tests on concrete showed that the mechanical properties (compressive, flexural and splitting tensile strengths) of concrete containing crushed brick were well comparable to those of the concrete without ground brick.

Diniya David, Et al., (2017):

Light weight concrete has tremendous advantages such as lower density and thermal insulation property and also strong enough to be used for structural purposes. Cellular concrete comes under the classification of this light weight concrete. Most important property of cellular concrete is low thermal conductivity. This property can be improved by decreasing the density. It will significantly reduce the dead load of structural elements. In this present experimental investigation, the cellular property is achieved by addition of aluminum metal powder in varied percentages such as 0.5, 1, 1.5, 2, 2.5, and 3%. Crushed clay brick is used as replacement of conventional fine aggregate with varied percentages such as 10, 20,23,25,27 and 30% in each percentage of cellular concrete. The cellular property is improved by increased addition of aluminum metal powder. The compressive strength will increase up to 25% replacement of crushed clay brick in cellular concrete. It is concluded that addition of 1% of aluminum metal powder along with varied crushed clay brick percentages, satisfy the light weight property and compressive strength. From these experimental results we can say that, this concrete belongs to structural light weight concrete.

Shruthi H G, Et al., (2017):

Concrete is the most important material being used in infrastructure development throughout the world. Sand is a prime material used for preparation of mortar and concrete and which plays a major role in mix design. Natural or River sand are weathered and worn out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-a-days good sand is not readily available, it is transported from a long distance. Those resources are also exhausting very rapidly. The non-availability or shortage of river sand will affect the construction industry; hence there is a need to find the new alternative material to replace the river sand, such that excess river erosion and harm to environment is prevented. Many researchers are finding different materials to replace sand. This study aimed to investigate the suitability of using crushed brick in concrete. Crushed brick originated from demolished masonry was crushed in the laboratory and added partial sand replacement. Five replacement levels, 10%,20% ,30%,40%, 50%, were compared with the control. The tests on concrete showed that the mechanical properties (compressive strengths) of concrete containing crushed brick were well comparable to those of the concrete without ground brick.

Awadhesh Chandramauli, Et al., (2018):

India is a developing country. Developing infrastructure leads to consumption of concrete.

Sand have big value in concrete. But natural sands are limited resources. River sand is most common fine aggregates in concrete. Due to excessive production of the river sand, it is banned by the government of India. Thus replacement of sand becomes need in last decays and the partially replacement will contribute to a good point to the research area. Number of researcher doing work on the replacement of sand by number of material like waste glass powder, crushed fir bricks and etc. Fire bricks are used to prevent the heat transfer in industries, lining furnace and fire places. The waste material of fire bricks can be used as fine aggregates. Properties of fire bricks are increases the strength of concrete. This research able to reduce the dependency on sand and open a new option to dispose of waste fire bricks. Partial replacement is done at 0%, 22%, 25%, 28% and 31% in this project. The test result says the 28% replacement gives the maximum tensile strength.

R. Veerakumar, (2018):

Concrete is the most material being used in infrastructure development throughout the world. Fine aggregate is a prime material used for preparation of mortar and concrete and which plays a major role in mix design. Fine aggregates are weathered and worn out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-adays fine aggregate is not readily available, it is transported from a long distance. Those resources are also exhausting very rapidly. The non-availability or shortage of fine aggregate will affect the construction industry, hence there is a need to find the new alternative material to replace the fine aggregate, such that harm to environment is prevented. Many researchers are finding different materials to replace fine aggregate. This study aimed to investigate the suitability of using brick debris in concrete in place of fine aggregate. Brick debris originated from demolished masonry walls crushed in the laboratory and added in partial fine aggregate replacement. Four replacement levels, 5%, 10%, 15%, and 20%, were compared with the control. The tests on concrete showed that the mechanical properties (compressive strength test) of concrete containing brick debris were well comparable to those of the concrete without ground brick.

Awadhesh Chandramauli, Et al., (2018):

Developing infrastructure leads to consumption of concrete. Sand have big value in concrete. But natural sands are limited resources. River sand is most common fine aggregates in concrete. Due to excessive production of the river sand, it is banned by the government of India. Thus replacement of sand becomes need in last decays and the partially replacement will contribute to a good point to the research area. Number of researcher doing work on the replacement of sand by number of material like waste glass powder, crushed fir bricks and etc. Fire bricks are used to prevent the heat transfer in industries, lining furnace and fire places. The waste material of fire bricks can be used as fine aggregates. Properties of fire bricks are increases the strength of concrete. This research able to reduce the dependency on sand and open a new option to dispose of waste fire bricks. Partial replacement is done at 0%, 22%, 25%, 28% and 31% in this project. The test result says the 28% replacement gives the maximum tensile strength.

Juntao Dang, Et al., (2018):

In order to solve the problem existing in the utilization of fine recycled aggregates from crushed bricks (RCBA), the replacement of natural fine aggregate (NA) by RCBA to produce a new green recycled mortar is an important technology to develop renewable resource products and realize waste resources recycling. In this paper, in order to deeply understand the mechanism of RCBA, macroscopic and microscopic tests are carried out to study the influence of RCBA with different replacement ratios, particle sizes and additional water contents on the flow ability, compressive strength and flexural strength of mortar. And the physical properties, chemical composition, mineral composition and microscopic morphology of RCBA are analyzed. The results show that the porous structure of the waste clay bricks together with the secondary mechanical crushing treatment result in the decline of the physical properties of RCBA. The fully additional water content in RCBA is beneficial to improve the flow ability of mortar, but the partially additional water content in RCBA has an adverse impact. In addition, the RCBA with partially additional water content and particle size of 0–5 mm is beneficial to the improvement of mortar strength. However, the RCBA with fully additional water content and particle size of 0.15–5 mm is detrimental to the development of mortar strength. The microscopic test indicates the rough surface and pozzolanic activity of RCBA produce relatively stable and dense interfacial transition zone between the RCBA and cement paste.

Anayat Ali, Et al., (2019):

The widely used material in infrastructure development and construction throughout the world is concrete and mortar. A significant role in the mix design is played by fine aggregate and coarse aggregate which are the prime material used for the preparation of mortar and concrete. River sand is becoming a scarce commodity nowadays. Hence the manufactured sand is playing a major role in the construction industry nowadays. The natural resources due to excessive use are also exhausting very rapidly. Shortage of fine and coarse aggregate may affect construction industry directly, therefore there is a need to find an alternative material which can replace fine aggregate or coarse aggregate fully or partially so that the damage due to excessive erosion to the environment is prevented. Thus, the replacement of fine aggregate and coarse aggregate became a necessity in the recent times and this partial or complete replacement will contribute a lot to nature and environmental problems created due to excessive use and dumping of brick debris or construction waste. This research review will discuss the partial replacement of fine aggregate with brick dust and how to reduce the dependency on the natural resources such as sand used as fine aggregate and provide a new way to dispose of waste brick debris. Different replacement levels 10%, 15%, and 20%, will be checked. Different tests showed that the compressive strength is enhanced by using optimum percentage replacement of natural fine aggregate with brick debris compared to conventional mortar and concrete.

Khairunisa Muthusamy, Et al., (2020):

Environmental pollution caused by disposal of by-product from local industries namely fly ash from coal power plant and palm oil clinker generated by palm oil mills needs to be resolved. This research examines the effect of palm oil clinker as partial sand replacement on properties of fly ash cement sand brick. Five brick mixes were prepared using fly ash blended cement as the binder. Other mixes were produced by varying the quantity of pulverized palm oil clinker ranging from 0%, 10%, 20%, 30% and 40% by weight of sand. All specimens were water cured for 28 days. The specimens were subjected to compressive strength, flexural strength and water absorption test. Utilization optimum amount of clinker of 30% enhances the brick strength owing to the pozzolanic effect of fine clinker. The chemical reaction between calcium hydroxide and silicon dioxide forms extra CSH gel that contributes to pore refinement and higher strength of brick.

S.M. Basutkar, Et al., (2020):

With the evolvement of construction practices, Construction and Demolition (C and D) waste disposal is of greater concern as it poses negative impact on the environment. Major constituents of C and D waste are concrete and masonry accounting up to 60%. In this present investigation, paver blocks for pedestrian traffic are produced using C and D brick waste aggregates as a replacement for fine aggregates (MSand). The crushed brick masonry waste (fine aggregates between 150m and 4.75 mm) was used as replacement for fine aggregates at 25%, 50% and 75%. The fines content (fine aggregates < 150m) in the mix composition were varied at 10%, 20% and 30%. The compressive strength test for Recycled Aggregate Paver Blocks (RAPB) was evaluated at 7, 14, 21, 28 and 90 days of curing. Flexural strength and water absorption tests were also performed on RAPB. It was observed that brick masonry waste aggregates with 25% and 50% replacement for conventional fine aggregates is adoptable with no compromise of desired compressive strength value. The percentage replacement can be increased to 75% provided that the fines content is limited to 10%. Replacement of conventional fine aggregates by brick waste by 50% can be adopted in making RAPB as it leads to greater utilization of C and D waste and also provides flexibility in the presence of percentage fines content i.e., up to 30% fines content can be present. The control of fines content in the RAPB mix, aids in better packing of concrete. Variation in the density of paver blocks was found to be

Juntao Dang, Et al., (2020):

To tackle the shortage of natural sand and to reduce the construction waste from clay bricks, the use of recycled bricks to replace sand as fine aggregates to produce more sustainable concrete is explored. This paper studied the effect of replacement levels of sand aggregates (SA) by recycled brick aggregates (RBA) at 0%, 50%, and 100%, and the additional water included in the mix proportion to represent the different moisture states of RBA (oven-dry, partial-dry, saturated-surface-dry) on the microstructure and durability of the concrete. The results show that the replacement of SA by RBA reduces the chloride migration but increases the water absorption, water sorptivity, drying shrinkage and carbonation. The water absorption, water sorptivity and carbonation can be minimized by reducing the additional water content. The microscopy results show that the pore structure of concrete deteriorates with the increase in the replacement because of the porous structure of RBA. Due to the pozzolanic reactivity of the RBA, the Ca(OH)2 crystals in concrete were consumed to generate hydration products, resulting in denser interfacial transition zone and enhanced adhesion between the RBA and the cement matrix.

Mane Rainia, Et al., (2020):

Construction and demolition waste (CDW) valorization in a new production process has been widely studied. However, up to now, valorization has been limited to use one type of waste. Hence, the environmental and economic benefits remain quite narrow, particularly in countries with high waste production. This paper aims to determine the feasibility of using waste from rejected concrete specimens by civil engineering laboratories combined with waste brick, as an alternative of natural fine aggregate in the production of cement mortar. Natural fine aggregate (NFA) has been replaced by recycled fine aggregate (RFA), at 0%, 15 %, 30 %, 45 %, and 90 %, by weight. In this study, RFA from concrete and brick wastes were firstly characterized and compared to the NFA. Then several tests were carried out in order to evaluate the effect of RFA on mortars. The RFA' physical, mineralogical and microstructural properties prove to be different from those of NFA. Nevertheless, the results have shown that the incorporation of these RFA at 15 % do not have any negative effect on the mechanical performance of the mortars. Besides, the microscopic analysis has revealed that the addition of RFA doesn't compromise the microstructural properties of the mortars at low substitution rates. As a whole, this study shows that the use of RFA is possible.

Qian Huang, Et al., (2020):

The waste clay brick (WCB) was crushed and used as the fine aggregates to produce recycled mortars with sufficient workability (i.e. high water-cement ratio of 0.6). Two curing conditions (air and standard) and two statuses of WCB (dry and pre-soaking) were considered in this study. It was found that the recycled mortars with the dry WCB had relatively higher mechanical properties and lower water absorption but a converse tendency for pre-soaking WCB mortars, regardless of the curing conditions. Although the internal curing effect of WCB was more pronounced under the air condition, the overall performance of recycled mortars cured in the standard condition was better. Microstructural changes were then investigated through X-ray diffraction (XRD), thermos gravimetric-differential scanning calorimetry (TG-DSC), scanning electron microscopy (SEM), and mercury intrusion porosimetry (MIP) to support the macro property changes of recycled mortars. As evaluated by TG-DSC, the hydration degree of cement in the recycled mortar with dry WCB were greater than that of reference group without WCB, and the hydration degree further increased when the natural aggregates were replaced by the pre-soaking WCB. Regardless of the curing conditions, the WCB aggregate were tightly bonded by cement paste in the recycled mortar with dry WCB, and the interfacial transition zone (ITZ) between them was more compact. Conversely, the interval between pre-soaking WCB and cement matrix was observed. The incorporation of dry or pre-soaking WCB increased the porosity of recycled mortars. The recycled WCB mortars could be used for producing the cleaner building materials.

Arivalagan, Et al., (2021):

Concrete is the most widely used construction material today. The constituents of concrete are coarse aggregate, fine aggregate, coarse aggregate and water. Concrete plays a major role in the construction industry and a large quantum of concrete is being utilized. River sand, which is one of the constituent used in the production of conventional concrete, has become expensive and also a scarce material. In view of this, the utilization of demolished aggregate which Isa waste material has been accepted as building material in many countries for the past three decades. The demand of natural sand in the construction industry has increased a lot resulting in the reduction of sources and an increase in price. Thus an increased need to identify a suitable alternative material from industrial waste in place of river sand, that is eco-friendly and inexpensive construction debris i.e. fresh concrete being extensively used as an alternative to the sand in the production of concrete. There is an increase in need to find new alternative materials to replace river sand so that excess river erosion is prevented and high strength concrete is obtained at lower cost. One such material is building construction debris: a by-product obtained during construction and demolition waste. An experimental investigation is carried out on M25 concrete containing debris during construction in the different range of 20%, 30% & 40% by weight of sand. Material was produced, tested and compared with conventional concrete in terms of workability and strength. These tests were carried out on standard cube of 150×150×150 mm and beam of 700×150×150 mm for 28 days to determine the mechanical properties of concrete.

CONCLUSION OF LITERATURE REVIEW:

A comprehensive review of literature covering papers from Journals and conferences was carried out: papers reviewed were predominantly based on Waste brick powder. The literature review indicates that very few publications are available on the waste brick powder, Variables such as aspect ratio, different grades of concretes and different percentages of brick powder are simultaneously not covered in papers reviewed. No work is reported in the development of mathematical models and their validation using own experimental values and values from other researches. Considering parameters like compressive strength and Flexural Strength for partial replacement of fine aggregate using brick powder.

CHAPTER-3

MATERIALS

3.1 Cement: 53 Grade ordinary Portland cement conforming to IS 12269.

A **cement** is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produces concrete. Concrete is the most widely used material in existence and is behind only water as the planet's most-consumed resource.

3.2 Aggregate

a) **Coarse Aggregate** - 20mm size

Coarse aggregates refer to irregular and granular materials such as sand, gravel, or crushed stone, and are used for making concrete. In most cases, Coarse is naturally occurring and can be obtained by blasting quarries or crushing them by hand or crushers.

b) **Fine Aggregate** - Passing through 4.75mm sieve.

A good concrete mix must include aggregates that are clean, hard, strong and free of absorbed chemicals or coatings of clay and other fine materials. Ignorance of these characteristics can cause the deterioration of concrete, thus regulatory authorities have decided **grading zone of fine aggregate,** where each zone defines the percentage of fine aggregate passed from the 600 microns' sieve size.

3.3 Waste Brick powder: Bricks are widely used construction and building material around the world. Brick powder is obtained from the dust of disintegrated bricks also the waste bricks are obtained from garbage of a broken building. The collected waste bricks are pulverized to get the particle passing through 4.75-micron sieve to get the grading of fine aggregate 15, 25, and 30% brick powder is used as replacement for fine aggregate in the experiments. The waste bricks used in this study were obtained from recycled bricks. Cracked pieces of bricks were crushed by a jaw crusher. And at laboratory scale the bricks wastes were ground with an air jet mill to obtain bricks powder. The resulting powders were sieved through a 4.75-μm (325 mesh) sieve. The chemical compositions of brick pastes were analyzed and results obtained.

3.4 MIX PROPORTON OF CONCRETE

- The mix proportion is designed for M20 concrete conforming IS codes.

3.5 TESTS ON MATERIALS

Tests on Materials	Results obtained	Standard values as per IS
1. Cement:		
➢ Initial Setting Time	Yet to be Conducted	30 minutes
➢ Final Setting Time	Yet to be Conducted	600 minutes
➢ Specific gravity	Yet to be Conducted	<10hrs
2. Coarse Aggregate:		
➢ Impact Value	Yet to be Conducted	<30%
➢ Specific Gravity	Yet to be Conducted	2.5-3.0
➢ Flakiness	Yet to be Conducted	<15%
➢ Elongation	Yet to be Conducted	<15%
3. Fine Aggregate:		
➢ Sieve Analysis	Yet to be Conducted	2.65-2.67
➢ Specific Gravity	Yet to be Conducted	2.7
➢ Bulking of fine aggregate	Yet to be Conducted	5-8%

CHAPTER-4

METHODOLOGY

Methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. This chapter deals with the study of procedure on partial replacement of fine aggregate using brick powder.

- Determination of Physical properties of cement, aggregates.
- Collect the waste brick powder and crush the waste brick into aggregates using jaw crusher.
- Flow the brick powder into ball grinder mill to form a powder of aggregate. sieve the brick powder in 4.75µ sieve. Fresh properties of concrete are determined using Slump cone test.
- Calculate the total quantity of cement, fine aggregate and coarse aggregate for M20 grade concrete. And calculate the amount of water cement ratio as per IS standards.
- Replace the fine aggregate with brick powder for 0%, 15%, 25%, &30%.
- Prepare a dry mix of cement, fine aggregate and coarse aggregate with 0% of brick powder for 1st trail.
- Replace the fine aggregate with 15% of brick powder for 2nd trail and mix the cement, fine aggregate, brick powder & aggregates without water.
- Add required amount of water into the dry mix sample and mix it thoroughly to form a concrete paste.
- Place the concrete in a cube and allow it to dry for 24hrs.
- Repeat the same procedure for 25%,30% replacement of fine aggregate with brick powder.
- Conducting the tests on the prepared sample.

CHAPTER-5

WORK PROCESS FOR PHASE- II

- Conduction of tests on aggregates to determine the desirable properties ofAggregates.
- Conduction of tests on waste brick powder to determine the desirable properties of waste brick powder.
- Conduction of tests on concrete to determine the desirable properties of concrete.
- Testing of concrete cubes against compressive load on 7, 14 and 28 days.
- Comparing of test results on concrete manufactured using waste brick powder over concrete manufactured without waste brick powder.

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