

# Use of over burn Brick as Coarse Aggregate in Concrete mix

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**Abstract:** 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 twenty fifth, 50%, seventy fifth 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 twenty fifth replacement. Performances of light-weight foamed concretes that are made of partial substitution of waste over burn brick as coarse aggregate has been investigated during this study. The analysis aims were to spot the properties and characteristic of lightweight foamed concrete victimization waste over burn brick as various materials to reduce the reduction of traditional coarse aggregate from waste over burn brick. Four completely different percentages of concrete mixtures victimization new coarse mixture are ready that comprises twenty fifth, 50%, 75%, and 100 percent waste over burn brick. Foamed were injected into concrete mixture to supply lightweight concrete with correct proportions. The samples have undergone some take a look ating as well as compression test, water absorption test, workability test and density test. From the results obtained, light-weight concrete that were created with twenty fifth substitution of waste over burn brick showed the very best compressive strength of twenty five MPa with density of 1585 kg/m<sup>3</sup>.

**Keywords:** over burn brick, coarse aggregate, concrete, light weight concrete, water absorption test.

## 1. Introduction

Concrete is second wide used construction material within the world. It principally consists of Coarse mixture, Fine mixture, Cement and Water. The Coarse mixture consumes 75-80% of the quantity of the concrete, thus dictating the strength and density relationship. the demand for the natural resources like gravel that is employed as a rough mixture and sand were accrued from recent past. The first sources of coarse mixture have gotten diminished thanks to varied reasons like excessive consumption, technological and industrial development, erosion, excessive mining, etc. On the opposite hand, the waste from industry is generating at a speedy rate and is being disposed as landfills. These wastes square measure being accumulated at bound places that cause the environmental and land fill issues. The most economical technique of managing the development and demolition waste is employment and reusing of those product in a good and economic approach. the overall quantum of waste from industry is calculable to be twelve to fourteen.7million tons every year out of that 7-8 million tons square measure concrete and brick waste. Fine and coarse mixture frame the majority of concrete mixture. Sand, natural gravel, and crushed stone square measure mainly used for this purpose. Over burn brick aggregates square measure progressively used as partial replacements of natural aggregates. Concrete may be with success

made mistreatment recycled materials. the utilization of over burn brick mixture concrete has steady accrued throughout the last 20 years and its current field of applications includes: light-weight concrete, light-weight mixture, asphalt concrete, concrete exposure to high temperatures and construction. the utilization of crushed waste as mixture in concrete has began in Europe since the 2<sup>nd</sup> world war. Crushed bricks square measure extensively employed in elements of India and Asian nation for concrete creating and therefore the performance of this concrete is found to be quite satisfactory. constant investigation has shown that the modulus of physical property of brick-aggregate concrete is regarding half-hour lower and therefore the durability regarding Martinmas higher for constant grade of the traditional concrete.

The purpose of this paper is to research the potential use of over burn bricks as a replacement for natural coarse mixture in concrete and make light weight of concrete. to attain this objective the physical and mechanical properties of Over Burn Brick mixture . the kind of waste bricks thought-about during this study is obtained throughout the development of some buildings in larger Noida site and this sort is tested to induce its mechanical properties before used. traditional concrete specimens mistreatment traditional mixture are casted and tested to match their results with Over Burn Brick mixture made of construction waste. check results obtained square measure conferred and mentioned here during this paper. Lightweight concrete composite were used with success for several years for structural members and elements in buildings and bridges. light-weight concrete may be outlined as a kind of concrete which has an increasing agent in this it will increase the degree of the mixture whereas giving further qualities like nailbility associate degree lessened the dead weight. the assembly of stable foam concrete mix depends on several factors like choice of foaming agent, methodology of froth preparation and addition for uniform air voids distribution, materials section and mixture style methods, production of froth concrete and performance with relation to contemporary and hardened state square measure of larger significance. In addition to its lighter weight, which permits saving in loading so reduces the price of each super structure and foundations, this concrete is more proof against fireplace and provides higher heat and sound insulation than concrete of traditional density. Concrete is second wide used construction material within the world. It principally consists of Coarse mixture, Fine mixture, Cement and Water. The Coarse mixture consumes 75-80% of the quantity of the concrete, thus dictating the strength and density relationship. the demand for the natural resources like gravel that is employed as a rough mixture and sand were accrued from recent past. the kind of waste bricks thought-about during this study is obtained throughout the pug mills in Greater Noida site and this sort is tested to induce its mechanical properties before used. traditional concrete specimens mistreatment traditional mixture are casted and tested to match their results with Over Burn Brick mixture made of construction waste. check results obtained square measure conferred and mentioned here during this paper. The first sources of coarse mixture have gotten diminished thanks to varied reasons like excessive consumption, technological and industrial development, erosion, excessive mining, etc.

## 2. LITRATURE REVIEW

**Husain M (1995)** studied the use as coarse aggregate of bricks untreated or treated with cement syrups of various consistency. They found that, the compressive strengths of crushed brick concrete are 75-80% of that of normal concrete at 28 days while the splitting tensile strength are higher than that of normal concrete and the modulus of elasticity is lower than that of normal concrete.

**Khalaf .F .M and Devenny A.S.** carried out a study to evaluate the physical and mechanical properties of new and over burn crushed brick as aggregate for use in Portland cement concrete. The author stated that the impact value of brick aggregate increases as the compressive strength of the parent brick decreases. The results showed that the over burn crushed brick aggregates can be used for producing concrete for low level civil engineering applications.

**Farid Debib and Said Kenai** studied the effect by partially replacing the fine and coarse aggregate with over burn crushed brick in concrete. The compressive, flexure and split tensile tests were conducted on concrete at the replacement levels of 25, 50, 75 and 100%. The authors reported a relatively low density for crushed brick concrete than normal concrete. The substitution levels of 25% for coarse aggregate and 50% for fine aggregate were reported from the test results.

### 3. MATERIAL USED

**3.1 Cement:** The cement used was Portland Pozzolana cement with twenty eight days compressive strength of sixty two.4 MPa. a similar cement was wont to study the performance of each Over burn brick and GA concretes.

**3.2 Fine Aggregate:** regionally out there natural sand is employed as fine mixture. The sieve analysis distributed in accordance with IS 2386 (Part 1)-1963.

**3.3 Granite and Brick Aggregates:** Natural crushed twenty millimeter single sized granite mixture was utilized in the investigation so comparisons might be created with the over burn brick crushed brick mixture. The collected over burn brick area unit crushed to twenty millimeter and 10mm mixture manually.

**3.4 water:** water is available in the college campus (IEC College Greater Noida)

### 4. EXPERIMENTAL WORK

#### 4.1 prepration of sample

Raw materials that are used in this analysis were normal Portland cement, granite as coarse aggregate, waste over burn brick and fine combination. different vital materials were organic foaming agent and suitable water content. during this study, a complete of fifty concrete cubes with dimension 150 mm x 150 mm x 150mm are created. All samples were created victimisation customary steel molds and were clean to avoid any impurities hooked up to concrete mixtures. One set of concrete specimens were additionally been created as controls. After traditional commixture of between granite, waste over burn brick, cement, sand and water, foamed were injected into the cement mixer throughout commixture method. The volumes of foamed required during this study made up our minds based mostly from targeted density at day 28. Foames area unit made of a combination of water and natural organic chemical compound. Functions of those bubbles area unit to assist entrapped air into the mixture and consummated the area. The samples are tested for 7, 14 and 28 days severally.



**Fig 1-** sample of over burn brick aggregate

#### 4.2 Sieve Analysis of Aggregates

Sieve analysis was carried out on sand, granite and recycled brick aggregate before using them in concrete. The set of sieves used for the analysis was in accordance with IS: 2386 (Part I) – 1963 for grading the aggregate. the particle size distribution of sand shows the particle size distribution of GA & OBBA together with the corresponding grading limits set out in IS 383-1970 for natural aggregates of same size.

The fineness modulious were found to be 3.07, 7.10 and 7.06 for sand, granite aggregate and over burn brick aggregate respectively. Figure.2 indicates that the Sand used in this investigation confirms with the grading limits of Zone II. indicates that both the aggregates used have grading values within the limits for 20-mm single-sized aggregate.

### 4.3 specific gravity

The specific gravities of Sand, GA and waste Over Burn Brick Aggregate were determined in accordance with IS 2386 (Part III)–1963. The specific gravity of sand and GA area unit employed in the look calculations of concrete combine. the precise gravities of each the GA and waste Over Burn Brick Aggregate were shown in Table.2. the precise gravity of sand is a pair of.65. WOVB but, had a coffee relative density of two.25 most likely owing to the low strength and density of the parent brick from that it's made. additionally according low values of relative density for brick mixture.

### 4.4 aggregate Impact value

Aggregate impact worth offers a relative live of the resistance of an mixture to explosive shock or impact. The impact values were confirm by victimization IS 2386 for each granite mixture and over burn brick mixture. The impact worth is found by permitting a regular hammer to fall freely on to the sample of mixture and measurement the load of the fines ensuing from the impact. The magnitude relation of the load of fines shaped to the whole sample weight is expressed as a share. The results of mixture impact worth take a look at for over burn brick mixture is thirty four.02%. Table a pair of additionally shows that the recycled brick aggregates, in general, aren't as robust as granite mixture owing to low crushing strength of brick compared to granite.

### 4.5 Water Absorption

The water absorption take a look at was administrated for each OVB and GA in accordance with IS 2386 (Part3) – 1963. The water absorption of mixture is decided by measurement the rise in mass of AN oven-dried sample once immersed in water for twenty-four hours. The magnitude relation of the rise in mass to the mass of the dry sample, expressed as a share, is termed as absorption<sup>7</sup>. The water absorption results were shown in Table.2. The water absorption in OVB was found to be 5.47%. This worth was abundant beyond that of GA, of that absorption was solely zero.25%. the upper water absorption was owing to the presence of a lot of pores in OVB

### 4.6 aggregate Crushing value

The aggregate crushing values of each the aggregates were determined as per IS: 2386 (Part IV) – 1963. The crushing worth is found by permitting a regular hammer to fall bit by bit onto a sample of mixture and measurement the load of the fines ensuing from gradual load application. The results illustrates that the crushing values of OBB is 29.72% are in allowable limits started out by IS 383: 1970 30%. The price the worth is among most prescribed value of 30% for concrete aside from for sporting surfaces

### 4.7 Slump test

The slump check was conducted to see the workability of recent concrete created with each OBB and GA. completely different OBB concrete mixes were ready by commutation GA with twenty fifth, 50%,75% and 100% volume of OBB to assess the result of proportion replacement of OBB on workability. The slump made up our minds with the assistance of slump cone equipment in accordance with IS1199- 1959.

### 4.8 Compressive strength

The compressive strength of concrete was tested at the age of twenty eight days, on 150X150X150 millimeter cube specimens employing a 2000kN compression testing machine in accordance with IS 516-195910. The results of the compressive strength of each Granite combination Concrete (GAC) and waste Over Burn Brick combination Concrete (WOBBAC) created with replacement of granite combination by OBBA in several percentages of twenty five, 50,75 and one hundred were bestowed in Table 1.

**4.9 Density** The density of each recent and hardened concrete is very important because it will offers a plan associated with concrete durability, strength and resistance to porousness. Hardened concrete density is decided either by easy dimensional checks, followed by advisement and calculation or by weight in air/water buoyancy ways. during this analysis easy methodology to work out the density of light-weight concrete sample was victimization the formula given below:

$$\text{density} = \frac{\text{Average Weight Of Samples (kg)}}{\text{volume of sample (m}^3\text{)}}$$

## 5. RESULT AND DISCUSSION

The check results obtained from concrete cube and cylinder specimens with and while not crushed Over Burn bricks. The results rumored square measure average of three specimens at age of twenty eight days. The over burn crushed bricks in concrete reduces its strength in compression and tension and also the reduction in compression strength is quite that of split tension specially once the proportion of crushed bricks square measure (75% and 100%). The reduction in strength is also attributed to 3 reasons:

- (i) The crushed bricks didn't develop correct / adequate bond with concrete and cement matrix.
- (ii) Because of high consistence of the surfaces of the crushed bricks, the mixture want a lot of water to induce the specified slump.
- (iii) The crushed bricks created the mixture impracticable due to roughness of the surfaces of crushed bricks aggregates poignant the compaction distribution upon the concrete layers. the connection between water to cement quantitative relation and crushed over burn bricks to coarse combination quantitative relation. From the take a look at that has been conducted the very best water adsorption was for sample that contained 100 percent of waste over burn brick with 19.26%. Meanwhile, all-time low water surface assimilation was for twenty fifth waste over burn brick usage regardless the water surface assimilation noninheritable by controlled sample. this is often as a result of the upper proportion of waste over burn brick applied in every mixture, the whole voids distributed within the samples are going to be multiplied. this can result in higher of water absorption capability since samples square measure capable to soak up additional water once additional voids square measure distributed in it. that water absorption capability was multiplied once the percentage of waste over burn brick usage was multiplied. 100 percent of waste over burn brick shows the very best water absorption followed by seventy fifth, five hundredth and in conclusion twenty fifth of waste over burn brick.

Table.1. Compressive Strengths of M15 and M20 grades of concrete at various replacements

MIX	Compressive strength at 28 days (N/mm <sup>2</sup> )				
	OBBA 0	OBBA 25	OBBA 50	OBBA 75	OBBA 100
M15	21.85	21.78	14.40	8.85	5.90
M20	25.40	25.25	17.75	10.95	7.85

Table no. 2 comparison Granite Aggregate and Over Burn Brick Aggregate

Property	Granite Aggregate	Coated Recycled Brick Aggregate
Specific Gravity	2.69	2.25
Fineness modulus	7.10	7.08
Impact Value (%)	18.29	34.02
Crushing value (%)	26.33	38.30

Table 3. The density of lightweight concrete after curing 28days

Sample	Average density (kg/m <sup>3</sup> )
WCB 0	1565
WCB 25	1585
WCB 50	1595
WCB 75	1618
WCB 100	1632

## .6 CONCLUSION

This study has found that waste over burn bricks will be used satisfactory as coarse combination for creating concrete of acceptable strength characteristics. In this study I conclude the over burn brick is light in weight and it is helpful to making light weight concrete structure. the most optimum proportion of waste over burn brick to be additional into light-weight concrete combine is 25th. This is as a result of twenty fifth of waste over burn brick up light-weight concrete offer higher properties of light-weight concrete (compressive strength and durability). Workability of light-weight concrete increase once waste over burn brick is applied in light-weight concrete combine. however decrease of the share of waste over burn brick light-weight concrete will be creating higher of compressive strength. Waste over burn brick able to offer high porosity and absorption on the sturdiness performance of light-weight concrete. The similar procedure of blending GA concrete will be adopted for the assembly of waste over burn bricks. however ever the waste over burn bricks is coated with cement suspension before it's utilized in the concrete. each the aggregates shall be utilized in the SSD condition. . the utilization of crushed bricks as coarse combination decreases the compressive strength of concrete regarding (11-87)% at age of twenty eight days per the quantitative relation of crushed bricks that used. The impact and crushing values of OBBA square measure above the GA however at intervals the appropriate limits as per counseled by IS code. The density of OBBA is a smaller amount than that of GA and thence it will be classified as light-weight combination. The recycled brick combination concrete created with this OBBA will be used wherever concrete of tenuity is needed. The workability of the crushed over burn bricks concrete is less than that of traditional concrete.

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