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Analysis on Concrete Made from Over Burned Bricks

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Abstract: ***Concrete is a composite material used for the ground that all considerate designing structure is developed with concrete in an efforts to find an alternative material in concrete much work has been focused to use brick aggregates in producing normal strength or even higher strength by far the most common course aggregates used in concrete is obtained from natural rock, but type of rock suitable for concrete making is not available locally and everywhere. However, there is hardly any literature producing previous concrete using bricks chips as course aggregates. The research was conducted to study the suitability crushed over burnt bricks as alternative course aggregates for concrete production. The concrete cube beams and cylinders of M-25, M-30, and M-35 grade were thrown in this trail explore work and try to analyze different properties of concrete with crushed over burnt bricks as an alternative material. The physical properties like compressive strength, tensile strength, flexural strength and workability with alternative material was used with a dosage of 10%, 20% and 30% in concrete with the age of 7, 14, 28 and 50 days of curing. The general properties of fresh and hardened concrete were tried and the outcomes were dissected. Over Burnt bricks were casted and tested for compressive strength, tensile strength, flexural strength, and workability. The result shows that the aggregate that concrete derived from Over Burnt bricks aggregate attained lower strength than the regular concrete. More detailed and elaborated work is recommended with different mix ratio and a different proportion of Over Burnt aggregates for a better conclusion.***

Keywords: ***Over Burnt Bricks, Compressive Strength, Split Tensile Strength, Flexural Strength, and Workability.***

I. INTRODUCTION

Concrete is one of the most widely used construction materials in modern days. It has attained a status of the most preferred material in the modern constructions. Whenever there is a requirement of Strength, Fire resistance, and durability, concrete is always preferred and considered as the best material. Concrete is created by blending cement, sand, coarse aggregate and water to delivered material that can be formed into any shape. The significant volume concrete is loaded with aggregate. The consideration of aggregate in concrete decreases its drying shrinkage properties and enhances numerous different properties, for example, compressive quality and so on. In any case, it is exorbitant to transport, so neighbourhood sources are expected to decrease the cost of transport, yet because of land requirements this is not accessible at all spots, in this manner it requires finding different sources and option from nearby sources The numerous materials are utilized as an option hotspot for common coarse aggregate, for example, reused low quality smashed brick, reused coarse aggregate, coconut shell, reused plastic aggregate, well consumed brick and so on. For this work select a jhama class brick as an option hotspot for course aggregate Aggregates are the basic constituents in the concrete composite that help with diminishing shrinkage and allow the economy to concrete creation. An extensive segment of the aggregates used are ordinarily happening aggregates, for instance, squash shake, shake and sand which is for the most part misleadingly instinctive or latent when strengthened together with concrete.

Fig. 1 Over Burnt Bricks

II. LITRATURE REVIEW

A. *G. S. Patil and P. B. Autade (2015)* [1] has performed that 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. The compressive strength of Jhama Class Brick bat based concrete used with partially replacement Jhama class brick to coarse aggregate ratios 20%, 40%, increased over conventional concrete about 6.08%, 10.02% for 3 days and 9.23%, 12.08% for 7 days and 10.02%, 11.95% for 28 days. If further increased in the percentage of replacement up to 60% and 80%, the strength was decreased by 3.73% and 8.16% respectively for 3 days and 5.69%, 9.25% for 7 days and 2.72%, 6.87% for 28 days cured cube specimen respectively. The Split Tensile and Flexural Strength of this concrete increases with 5.26%, 8.68%, and 2.74%, 4.76% respectively over plain concrete for the replacement 20% and 40% and decreased with 3.94%, 12.1% and 3.16%, 7.5% for the replacement 60% and 80%.

B. *Apebo, et. al. (2014)* [2] reported the suitability of crushed over burnt bricks as coarse aggregates for concrete 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 22.8%, 28.2%, and 4.4% were obtained for aggregate crushing value, aggregate impact value and aggregate water absorption respectively. The concrete mixes were prepared using crushed over burnt bricks as coarse aggregates at water – cement ratios of 0.40, 0.50, 0.55 and 0.60. Cubes of concrete were prepared and tested to study the compressive strength. The results were compared with concrete made with river wash gravel as coarse aggregates which at present is the only coarse aggregate in Makurdi, Nigeria, and its environs. The results indicate that crushed over burnt bricks – sand concrete is medium light weight concrete having a density between 2000-2200 kg/m3 and compressive strength of up to 29.5 N/mm2 compared to grave l – sand concrete having a density between 2300-2400 kg/m3 and compressive strength of up to 30.8 N/mm2. It was concluded that by reducing the water-cement ratio from 0.60 to 0.40 the compressive strength of crushed over burnt bricks – sand concrete and gravel – sand concrete increased by more than 30%. Use of broken over burnt bricks as coarse aggregate for structural concrete was recommended when natural aggregate was not easily available, high strength of concrete was not required and the bearing capacity of the soil was low.

C. *Tariq Ali, et. al. (2013)* [3] generated a study on concrete which incorporated Over Burnt Brick Ballast Aggregate partially due to their abundance. 5%, 10%, 15%, and 20% (M05, M10, M15, M20) incorporation was used as partial replacement of natural coarse aggregate in concrete. Analysis of incorporated concrete was done in fresh state as well as hardened state to evaluate different properties of a concrete i.e. slump, compaction factor test, unit weight, and compressive strength are evaluated. From all the results and experimental approach, it was concluded that concrete formed with over burnt brick ballast aggregate showed beneficial performance as compared with the concrete made up of natural aggregate obtained from local resources. The over burnt brick ballast aggregate showed 14.75% increase in compressive strength for 20% replacement. The investigation discovered decline in the unit weight, the adequate gain in compressive strength. Therefore Split Tensile strength and Flexural Strength of concrete incorporating over burnt brick ballast aggregate need to be evaluated. The incorporated concrete was not required any particular attention regarding mixing, placing, and finishing. It serves economically to the

constructor without compromising on the strength and behaves light in weight because of less unit weight. After the thorough study, it was proved that to use incorporated concrete to such structures.

III.OBJECTIVE

The key goal of this work was to create concrete blends, utilizing pounded bricks dirt items squander as a halfway swap for Coarse aggregates, which display adequate properties practically identical to that of auxiliary course aggregates:

- To decide the properties of consumed/over consumed and covered smashed bricks.
- To configuration concrete blends utilizing mud items squander chips as aggregates.
- To build up the accessibility and monetary attainability of the utilization of mud items squander chips as aggregates.
- To determine the optimum dose of alternative materials such as burnt/ over burnt Crushed bricks as partial replacement of coarse aggregate respectively.

IV.MATERIALS USED & TESTS CONDUCTED

The materials used in this work are fine aggregates (stream sand), 10 and 20 mm coarse aggregates (OVER BURNED BRICKS) which is available locally. Portland-pozzolona cement 43 grade as per IS 4031-1968.

Tests were conducted after partial replacement of coarse aggregate with the over burned bricks on properties of concrete. The different tests conducted were as follows:-

- For Aggregate: - Sieve Analysis, Water Absorption, Specific Gravity, Impact Test.
- For Cement: - Cement Consistency.
- For Concrete: - Workability, Slump Test, Compressive Strength, Flexural Test, Split Tensile Strength.

V. CONCRETE MIX DESIGN

The concrete mix was designed as per IS-10262, 2009 and for designed purpose. We used ACI method and determine the physical properties of the entire gradient such as fine aggregate, coarse aggregate, cement.

TABLE I. M-25 MIX DESIGN

Cement	Water	FA	CA
435.220	216.41	640.316	1165.391
1	0.48	1.471	2.677

TABLE II. M-30 MIX DESIGN

Cement	WATER	FA	CA
437.945	: 217.498	: 639.36	: 1163.65
1	:0.496	: 1.459	: 2.657

TABLE III. M- 35 MIX DESIGN

Cement	Water	FA	CA
469.5	: 221.3	: 618.23	: 1144.76
1	:0.471	: 1.3	: 2.45

VI. MATERIALS USED & TESTS CONDUCTED

A. Conventional Concrete and Material Properties

TABLE IV. INITIAL AND FINAL SETTING TIME

Type of Cement	Initial Setting Time			Final Setting Time		
			Test time			Test Time
Portland-Pozzolona Cement 43 grade	As per IS (IS 4031: PART 5)		54 min	As per IS (IS 4031: PART 5)		495 min
	Minimum	Maximum		Minimum	Maximum	
	30 min	52 min		190 min	600 min	

1) Fine Aggregates: Locally accessible stream sand going through 4.75mm IS Sieve was utilized. The particular gravity of the sand was found as 2.65 & affirming to zone III of table 3.15 of IS 383-1970.

2) Coarse Aggregate: Crushed shake aggregate accessible from nearby sources has been utilized. The measure of coarse aggregate was 20mm and 10mm. its particular gravity is 2.65.

3) Over Burnt Bricks: The over burnt bricks are of an Irregular shape and dark colour. These bricks are used as aggregate for concrete in the foundation, floors, roads, etc. because of the fact that the over burnt bricks have compacted structure and hence, they are sometimes found stronger than even first class bricks.

B. Impact Value

TABLE V. IMPACT VALUE

Nomenclature	Coarse Aggregate (gm)	Over Burnt Bricks (gm)
W_1	618	328
W_2	112	94
Impact Value	**18.12**	**28.65**

Impact value of course aggregates is 18.12% which is considered to be exceptionally strong. Impact value of over burnt bricks is 28.65% which is satisfactory and can be used for road surfacing.

C. Workability Of Concrete

TABLE VI: WORKABILITY OF CONCRETE

S. No.	Percentage of Variation	Slump in (mm) over burnt bricks(M25)	Slump in (mm) over burnt bricks(M30)	Slump in (mm) over burnt bricks(M35)
1	**0**	**72**	**75**	**92**
2	**10**	**68**	**72**	**85**
3	**20**	**65**	**65**	**80**
4	**30**	**60**	**58**	**77**

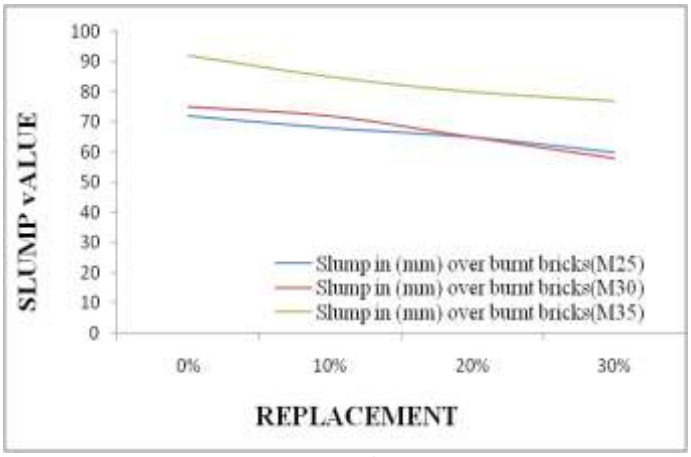

Fig.2 Slump Test of Concrete

From the above table, we can see that when the percentage of over burnt bricks increases the workability decreases in all the three grades.

D. Compressive strength of concrete

TABLE VII: COMPRESSIVE STRENGTH OF M-25 GRADE

Replacement / Day's	7	14	28	50
0%	19.06	26.40	30.613	31.47
10%	18.23	23.63	27.62	28.61
20%	17.41	22.86	27.01	27.63
30%	16.19	21.24	25.11	26.20

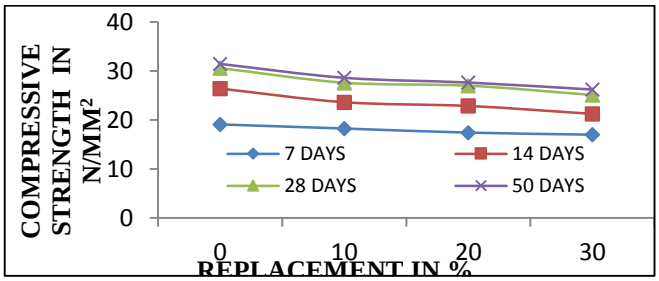

Fig. 3 Compressive Strength of M-25

TABLE VIII: COMPRESSIVE STRENGTH OF M-30 GRADE

Replacement / Day's	7	14	28	50
0	**26.15**	**29.81**	**39.79**	**40.47**
10	**24.01**	**28.01**	**34.23**	**35.56**
20	**23.68**	**26.38**	**33.24**	**33.77**
30	**21.34**	**25.93**	**31.70**	**32.40**

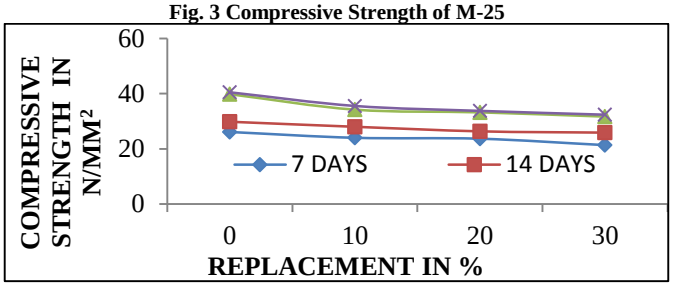

Fig. 4 Compressive Strength of M-30

TABLE IX: COMPRESSIVE STRENGTH OF M-35 GRADE

Day's / Replacement	7	14	28	50
0	30.19	32.53	44.29	45.40
10	27.96	32.38	39.60	40.22
20	26.16	31.89	38.86	39.70
30	23.84	30.86	36.44	37.12

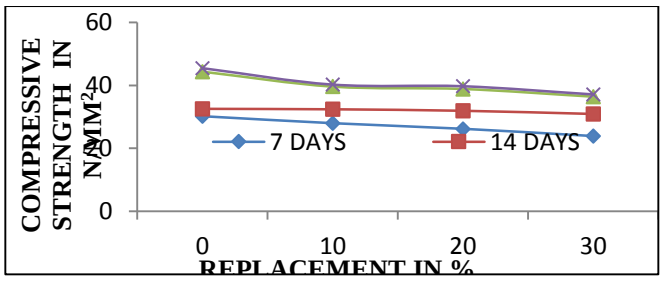

Fig. 5 Compressive Strength of M-35

From the above all the result we concluded that the Compressive strength decreases on replacement of 10%, 20% & 30% with over burnt bricks and it is less than conventional concrete with curing period of 7, 14, 28 and 50 days. There is the very narrow difference between the conventional concrete and the concrete with replacement in terms of compressive strength.

E. Split Tensile Strength

Table X: Split Tensile Strength Contain Over Burnt Bricks

Mix	Day's	0	10	20	30
M25	**28**	2.46	2.32	2.246	2.12
M30	**28**	3.38	3.11	2.89	2.59
M35	**28**	4.24	4.168	3.98	3.771

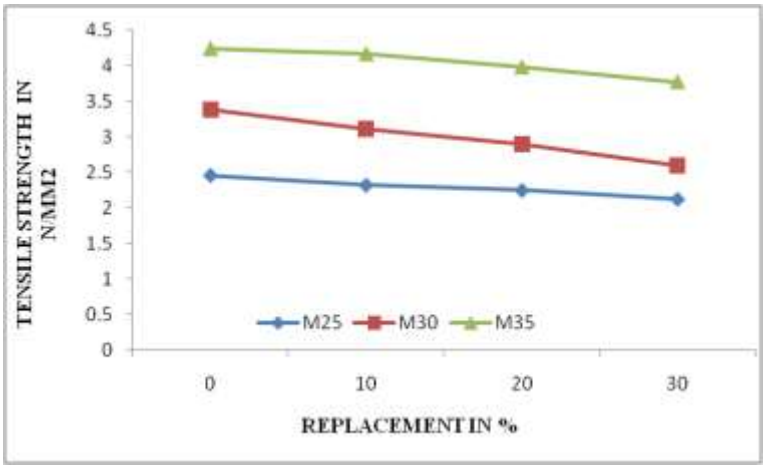

Fig.6 Split Tensile Strength

Split Tensile strength has decreased from 10% to 30% replacement of course aggregates by over burnt bricks and the split tensile strength is less than the conventional concrete.

F. Flexural Strength

Table XI: Flexural Strength M-25 Grade Contain over burnt Bricks

	Day's	0	10	20	30
M25	**28**	4.175	3.677	3.47	3.32
M30	**28**	5.16	4.37	4.03	3.62
M35	**28**	5.92	5.658	5.544	5.392

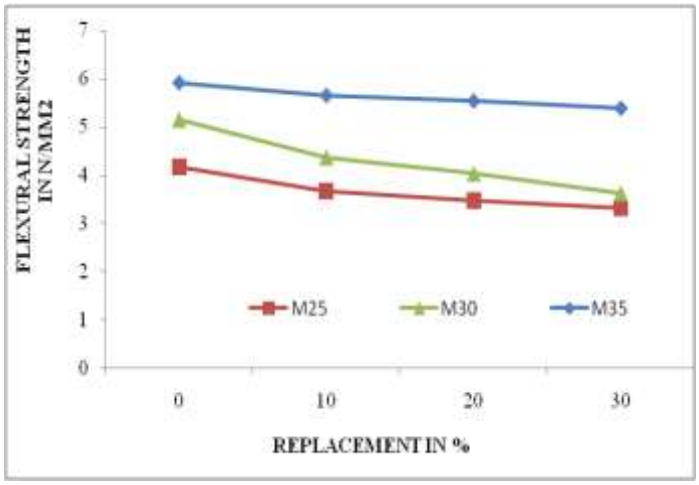

Fig.7 Flexural Strength

Flexural strength has decreased from 10% to 30% replacement of course aggregates by over burnt bricks and the split tensile strength is less than the conventional concrete**.**

CONCLUSION

Compressive Strength of conventional concrete (for the typical estimation of three cube test) at 7, 14, 28 and 50 days of M-25, M-30 and M-35 Grade is higher than the replaced over burnt bricks and the compressive strength on partial replacement of over burnt bricks from 10% to 30% replacement decreases. But with the replacement of course aggregates by over burnt bricks the variations of compressive strength between conventional concrete and on replacement is very small and the strength is within the targeted strength. Flexural strength and Tensile strength on replacement of over burnt bricks decreases with compared to conventional concrete. The value of slump or Workability decreases with the increase in replacement of over burnt on M-25, M-30 and M-35 grade of concrete.

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