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**EXPERIMENTAL STUDY ON REPLACEMENT OF
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AND OVER BURNT BRICKS IN CONCRETE**

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Experimental Study on Replacement of Coarse Aggregate with Waste Aggregate and Over Burnt Bricks in Concrete

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Abstract – The main objective of this paper is to present the experimental investigation on the properties of concrete obtained by replacing of coarse aggregate (fully) with waste aggregate from concrete waste and over burnt bricks. Modernization and urbanization is leads to dismantling of older structure and construction of newer structure which produces large quantity of construction waste moreover during manufacturing of bricks in and around 20-30% of over burnt and breakage bricks are produced. Therefore the utilization of waste materials like aggregate and over burnt bricks from construction industry as construction materials in concrete production. An experimental investigation is carried out for different percentages of waste aggregate and over burnt brick in concrete i.e. RA60 + OB40, RA50 + OB50, RA45 + OB55, RA30 + OB60 and RA35 + OB65. Total five batches of concrete blocks are prepared for M20. Different tests slump cone, compaction factor and compressive strength carried out on fresh concrete and hardened properties of concrete.

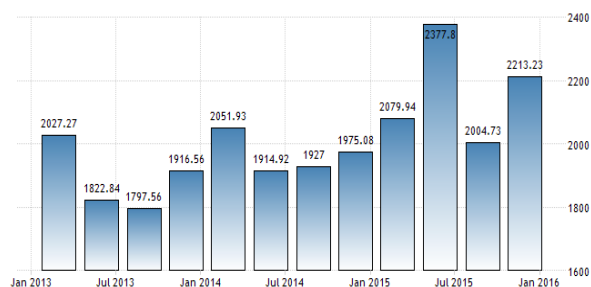
Keywords: Coarse aggregate, Concrete, over burnt bricks (OB), Waste aggregate (RA)

I. INTRODUCTION

The construction industry in India is booming. Already at 10 per cent of the GDP (Gross Domestic Product), it has been growing at an annual rate of 10 percent over the last 10 years as against the world average of 5.5 per cent per annum. Almost 70 per cent of the building stock in India is yet to come up. The built-up area is expected to swell almost five times from 21 billion sq ft in 2005 to approximately 104 billion sq ft by 2030.

The total C&D waste generated in India just by buildings in one year 2015 amounts to a humungous 530 MT, 44 times higher than the official estimate. Imagine the scenario if the waste generated by infrastructure projects such as roads and dams is added. Not surprisingly, in India, if C&D waste is quantified, it will be more than all the other types of solid waste put together.

India GDP from Construction



SOURCE WWW.TRADINGECONOMICS.COM:
CENTRAL STATISTICAL ORGANISATION, INDIA

In the manufacturing of bricks over an average of 20-30% of bricks are rejecting in the construction

industry because of over burnt and breakages in brick.

This paper presents the use of waste aggregate and over burnt bricks as coarse aggregate in concrete mix and their results.

As we observed that the compressive strength of an over burnt brick is 3.5 N/mm^2 .

MATERIAL USED

(A) Cement

Cement is a very useful binding material in construction. We used cement for binding the materials which we used to prepare concrete block. We used Ordinary Portland Cement of 53 Grade to prepare the cube mould conforming to IS: 8112-1989.

S. No.	Characteristics	Standards	Obtained values
1.	Specific gravity	3.15	3.02
2.	Setting time: Initial	30 minutes	64 minutes
	Final	600 minutes	260 minutes
3.	Normal consistency	26-33%	32%
4.	Fineness	Min. 225 m^2/kg	410.94 m^2/kg

Table 1 Properties of Cement

(B) Fine aggregate

Sand is used as fine aggregate to prepare concrete mix. Sand is used to fill the voids in concrete. The sand which we used is confirmed to IS: 383-1970. Sand which is passed through 2.36 mm sieve will be used for preparing concrete cubes.

Sieve Size	Percentage of Passing For				
	Grading zone-I	Grading Zone-II	Grading Zone-III	Grading Zone-IV	Observed Sieving
10 mm	100	100	100	100	100
4.75 mm	90 – 100	90 – 100	90 – 100	95 – 100	95
2.36 mm	60 – 95	75 – 100	85 – 100	95 – 100	86
1.18 mm	30 – 70	55 – 90	75 – 100	90 – 1000	69
600 micron	15 – 34	35 – 59	60 – 79	80 – 100	46
300 micron	5 – 20	8 – 30	12 – 40	15 – 50	24
150 micron	0 – 10	0 – 10	0 – 10	0 – 15	7

Table 2 Sieve analysis of fine aggregate

As per sieve analysis we observed that the sand which we taken for concrete mix are ZONE-II.

S. No.	Tests done	Observed Values
1.	Specific gravity	2.6
2.	Water absorption	6.7
3.	Fineness modulus	3.63

Table 3 Properties of fine aggregate

(C) Coarse Aggregate

The size in between 4.75 mm – 19 mm two variety of coarse aggregates is used in this study. They are a) Waste Aggregate (Concrete waste), b) Over burnt bricks

a) Waste aggregate

Recycling is the process of converting waste materials into reusable objects to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials. Waste aggregate can be taken from the construction site and demolition debris of construction.



Figure 1 Construction waste

S. No.	Characteristics	Standard value	Observed value
1.	Fineness modulus	2-4	2.04
2.	Specific gravity	2.5	2.7
3.	Water absorption		0.92

Table 4 Properties of waste aggregate

b) Over burnt bricks

The bricks are defined as artificially moulded clay blocks, with mass of natural clay with uniform size and shape. Bricks are moulded in rectangular shape of suitable size with plastic clay when it is in semi-solid condition. The bricks are suitably dried and burnt to attain strength durability etc. In the burning process some of bricks may burnt overly this over burnt bricks are not using in the construction of structure which leads to dump on the land this making harm to the environment and the soil. To reduce the harm cause by this scenario the over burnt bricks have to be use in other ways. To reduce harm caused by over burnt bricks, in this experiment we used over burnt bricks.

Water absorption of over burnt brick is 0.162%



Figure 2 over burnt bricks

EXPERIMENTAL PROCEDURE

Collection of material

From the brick industry we collected the rejected bricks i.e. over burnt bricks which are burnt well and some of over burnt bricks are not suitable for this experiment they are the bricks which are very black in nature like coal ash because they will not get good strength and almost all it becomes black ash.

From demolition of building structure we collected the construction waste (concrete waste). Which are dumping as municipality waste which leads to increase of municipality waste and creates environmental hazard?

Procedure of preparing material use for concrete mix

The collected raw material is crushed into pieces for a size in between 12.5 mm – 20 mm. Then the materials are cleaned with water to remove dust particles over on it and concrete waste are polished properly to remove sand and etc particle which are bonded on it.

S. No.	Proportions	Cement in Kg's	Fine Aggregate In Kg's	Coarse Aggregate	
				Waste Aggregate in Kg's	Over burnt bricks in Kg's
1.	Normal Concrete	5.659	8.488	16.977	
2.	60+40	5.659	8.488	10.189	6.788
3.	50+50	5.659	8.488	8.488	8.488
4.	45+55	5.659	8.488	7.652	9.325
5.	40+60	5.659	8.488	6.803	10.174
6.	35+65	5.659	8.488	6.071	10.906

Table 5: Mix proportions for M20 (1:1.5:3) Concrete for 3 Blocks

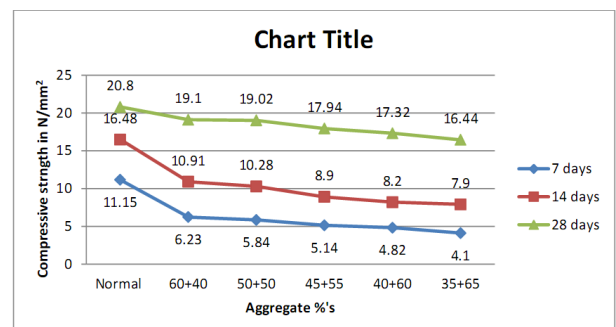
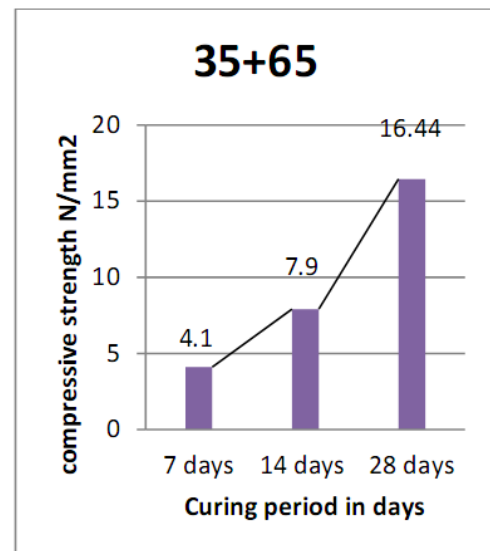
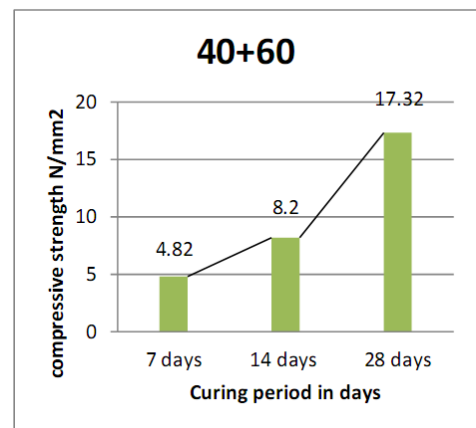
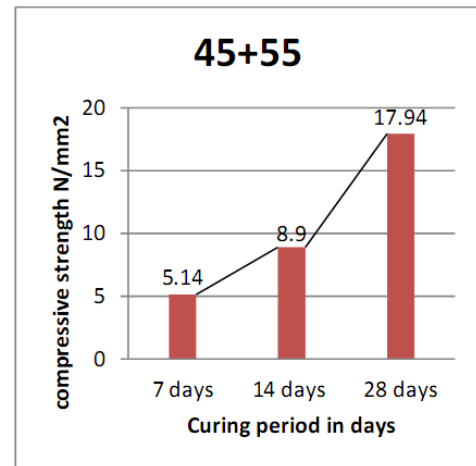
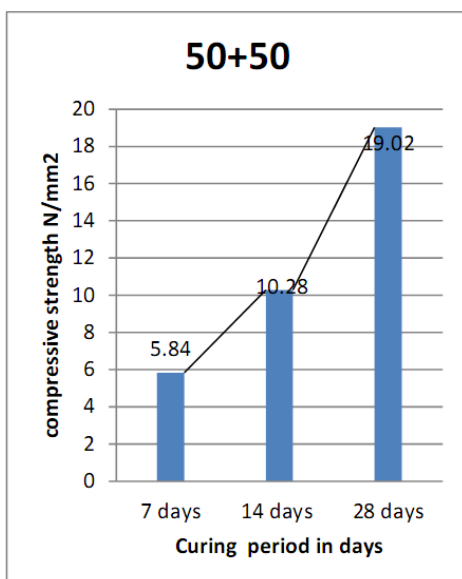
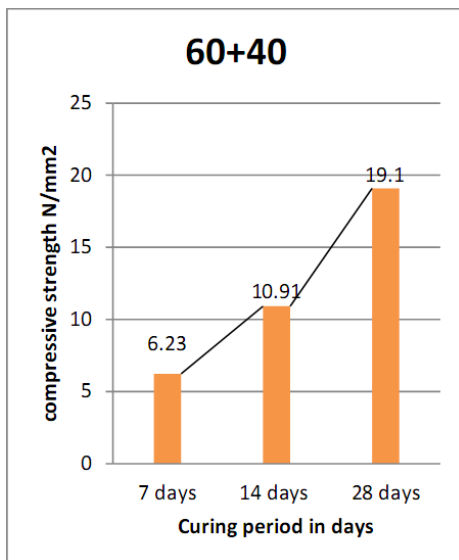
According to above calculated values we mixed the concrete and casted the concrete blocks in cubes of size 150X150X150 mm

TESTS AND RESULTS

2) Compressive strength

S. No	% added		7 days	14 days	28 days
	RA	OB			
1.	Normal Concrete		11.15	16.48	20.80
2.	60	40	6.23	10.91	19.10
3.	50	50	5.84	10.28	19.02
4.	45	55	5.54	9.84	17.94
5.	40	60	5.12	9.41	17.32
6.	35	65	4.89	9.17	16.44

Table 6 Compressive strength



CONCLUSION

- The use of waste aggregate and over burnt bricks shows a high of 19.10 MPa compressive strength when RA of 60% and OB of 40%.
- This also reduces the weight of concrete which results in making of light weight concrete.
- The use of RA and OB will reduces the waste disposal and results in safe disposal of waste material from construction as well as OB.
- As per my knowledge by 2050 we don't get the natural aggregate because of rapid growth in construction. So it is our responsibility to save our natural aggregate.
- By using this we can also save our environment.

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