

Construction of Low Cost Slab using Various Bricks.

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Abstract — The main objective of our project is to study replacement of concrete by various brick and reduce a cost of slab. In reinforced concrete slab strength of concrete laying the neutral axis (just above and below) is not fully utilized. So near the neutral axis as well as in tension zone concrete has been replaced by bricks in order to reduced weight and cost of slabs. An experimental test is conducted on simply supported concrete slab as well as various brick slabs. All types of slab compare with each other. The volume of slab and cost comparison of all types of slabs has been carried out.

Keywords- RCC Slab, Normal Brick Slab, Fly ash Brick Slab, Rate analysis, Compressive Strength

I. INTRODUCTION.

A structural member composed of two or more dissimilar materials joined together to act as a unit and the resulting system is stronger than the sum of its parts. In reinforced slabs, less stressed concrete near the neutral axis and tension zone, it can be replaced by bricks to reduce the weight of the structure and also achieve the economy. The behavior of reinforced brickwork is almost similar to that of reinforced concrete and current design method for reinforced brickwork is based on the principle of elastic design of reinforced concrete. A reinforced concrete slabs should be able to resist tensile, compressive stresses induced in it by loads on slabs. Concrete is fairly strong in compression but very weak in tension. Thus the tensile weakness of concrete is overcome by provision of reinforced steel in the tension zone around the concrete to make a reinforced concrete slabs. In this study partially utilized concrete of RCC slab have been replaced by bricks in order to reduce the weight of slabs and also achieve economy, and by reducing concrete we have to save cement and by saving cement reduced the greenhouse gasses emissions. So it will be environment friendly.

II. EXPERIMENTAL STUDY.

Total six numbers of reinforced concrete slabs and Brick Composite slabs were casted for the experimental study. All six slabs were casted in three different groups of two slabs in each group. The first group of slabs is consisting two reinforced cement concrete slabs. The second group of slabs is consisting two normal brick slabs. The third group of slabs is consisting two fly ash brick slabs. These three different groups are compared with each other based on the some various parameters.

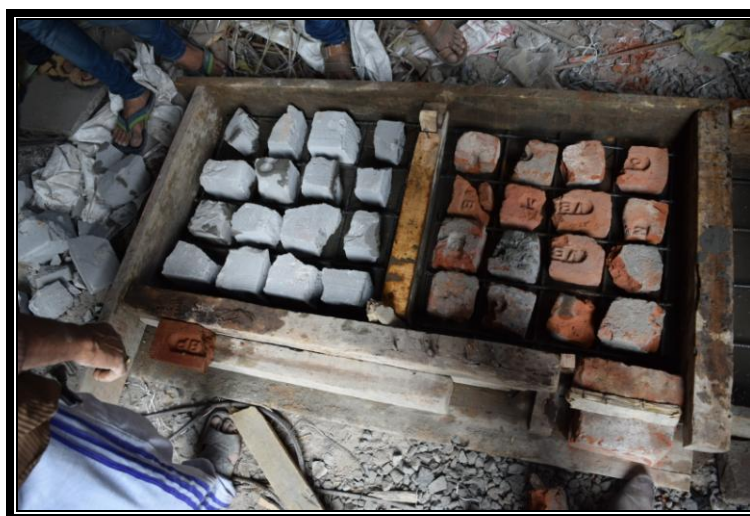


Figure 1. Arrangement of Bricks with Reinforcement.

III. CASTING OF SLAB SPECIMEN

For conducting experiment, six reinforced concrete slab specimen of size 1m x 1m x 0.1m. The mix proportion used is for water, cement, fine aggregate and coarse aggregate is taken. The mixing is done by manual mixing. The slabs cured for 28 days. Figure 2. Reinforcement for slabs and Figure 3 and figure 4 shows the casting of slabs.



Figure 2. Reinforcement for slabs.



Figure 3. Casting of slab.



Figure 4. Casting of slab.

IV. EXPERIMENTAL SET UP

The slabs were tested at the loading frame in “Technocrat Engineering Services & Lab”. The testing procedure for the entire specimen was same. First the slabs were cured for a period of 28 days then its surface is cleaned with the help of sand paper. The NDT Rebound hammer test performed at any place like laboratory or at a construction site. For this testing, smooth, clean and dry surface is to be selected. If loosely adhering scale is present, this should be rubbed off with a grinding wheel or stone. Rough surfaces resulting from incomplete compaction, loss of grout or tooled surfaces do not

give reliable results and should be avoided. For taking a measurement, the rebound hammer should be held at right angles to the surface of the concrete member. Rebound hammer test is conducted around all the points of observation on all accessible faces of the structural element. Concrete surfaces are thoroughly cleaned before taking any measurement. Around each point of observation, six readings are taken and average of these readings becomes the rebound index for the point of observation. Figure. 5 show testing of slabs.

The rebound hammer method provides a convenient and rapid indication of the compressive strength of concrete by means of establishing a suitable correlation between the rebound index and the compressive strength of concrete. Formula for converting rebound number in to the compressive strength is,

$$\text{Compressive strength (N/mm}^2\text{)} = 0.0062(\text{Rebound No.})^2 + 1.2595(\text{Rebound No.}) - 18$$



Figure 5. Testing of slab

V. RATE ANALYSIS

Table 1. Rate analysis of 1.0m x 1.0m x 0.1m RCC Slab

Material cost:-					
Sr.No.	Item	Qty.	Rate	Unit	Amount (Rs.)
1	Cement	1	280	Bag	280
2	Sand	0.0498	800	m ³	39.84
3	Aggregate	0.0997	1000	m ³	99.7
4	Steel	7.85	40	kg	314
5	Binding wire	0.0785	50		3.925
6	Misc.....Lump sum.....				50
				Total	Rs.787.465
Labour cost:-					
Sr.No.	Item	Qty.	Rate	Unit	Amount (Rs.)
1	Labour	1	350	Day	350
2	Vibrator and mixer.....Lump sum.....				100
3	Steel cutting binding and placing in position	0.00785	5000	Tons	39.25
4	P/L shuttering for slab work	0.1	500	m ³	50
				Total	RS.539.25

	Material cost and Labour cost	RS.1326.715
	Add 1.5% of water charges	RS.19.9
	Add 10% of contractor charges	RS.132.67
	Total cost	RS.1489.285

Table 2. Rate analysis of 1.0m x 1.0m x 0.1 m Normal Brick slab

Material cost :-					
Sr.No	Item	Qty.	Rate	Unit	Amount (Rs)
1	Brick	29.87	1.2	Kg	35.844
2	Cement	0.5	280	Bag	140
3	Sand	0.0221	800	m ³	17.68
4	Aggregate	0.0442	1000	m ³	44.2
5	Steel	7.85	40	Kg	314
6	Binding Wire	0.0785	50	Kg	3.925
7	Misc..... Lump sum.....				50
				Total	RS.605.649
Labour Cost :-					
Sr.no	Item	Qty.	Rate	Unit	Amount (Rs)
1	Labour	1	350	Day	350
2	Vibrator and mixer..... Lumpsum.....				100
3	Steel cutting binding and placing in position	0.00785	5000	Tons	39.25
4	P/L shuttering for slab work	0.1	500	m ³	50
				Total	RS.539.25
	Material cost and Labour cost				RS.1144.89
	Add 1.5% of water charges				RS.17.1734
	Add 10% of contractor charges				RS.114.489
	Total cost				RS.1276.55

Table 3. Rate analysis of 1.0m x 1.0m x 0.1m Fly ash brick slab

Material cost :-					
Sr.No	Item	Qty.	Rate	Unit	Amount (Rs.)
1	Brick	23.89	2	kg	47.78
2	Cement	0.5	280	bag	140
3	Sand	0.0221	800	m ³	17.68
4	Aggregate	0.0442	1000	m ³	44.2
5	Steel	7.85	40	kg	314
6	Binding Wire	0.0785	50	kg	3.925
7	Misc..... Lumpsum.....				50
				Total	Rs.617.585
Labour Cost :-					

Sr.no	Item	Qty.	Rate	Unit	Amount (Rs.)
1	Labour	1	350	Day	350
2	Vibrator and mixer.....Lumpsum.....				100
3	Steel cutting binding and placing in position	0.00785	5000	Tonn	39.25
4	P/L shuttering for slabwork	0.1	500	m ³	50
				Total	Rs.539.25
	Material cost and Labour cost				Rs.1156.835
	Add 1.5% of water charges				Rs.17.3525
	Add 10% of contractor charges				Rs.115.6835
	Total cost				Rs.1289.871

VI. RESULT

The behavior of slabs throughout the test is described using recorded data of NDT Rebound hammer test in table 4.

Table 4. Result of rebound hammer test

Sr.No.	Rebound Sr. No.	Type of Slab	Rebound Number	Compressive Strength, N/mm ²	Avg. Compressive Strength, N/mm ²
1	1	RCC Slab	27	20.53	21.63
	2		29	23.74	
	3		25	17.36	
	4		32	28.56	
	5		25	17.36	
	6		28	22.13	
2	1	Brick Slab	22	12.71	11.20
	2		20	9.67	
	3		19	8.17	
	4		22	12.71	
	5		23	14.25	
	6		20	9.67	
3	1	Flyash Brick Slab	20	9.67	14.03
	2		20	9.67	
	3		22	12.71	
	4		27	20.53	
	5		25	17.36	
	6		23	14.25	

Table 5. Approximate rate of slabs per 0.1m³

Types of Slabs	Approximate Rate per 0.1m ³ in Rs.
RCC slab	1490
Fly ash brick slab	1290
Normal brick slab	1275

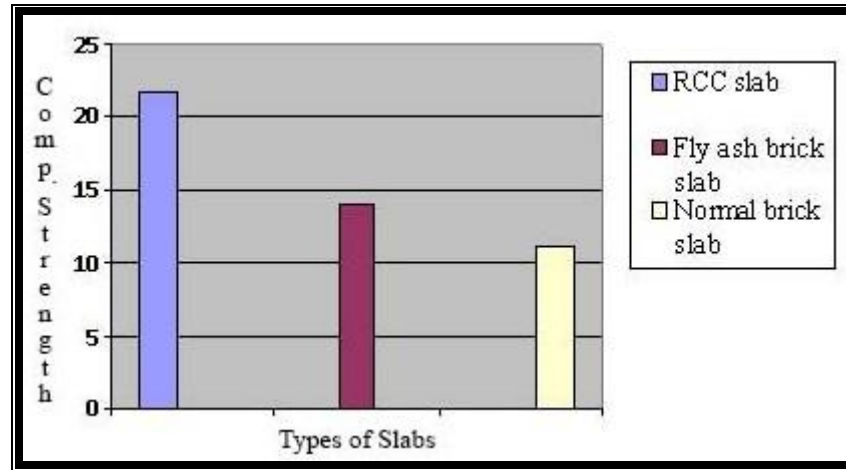


Figure 6. Comparison chart of compressive strength of slabs.

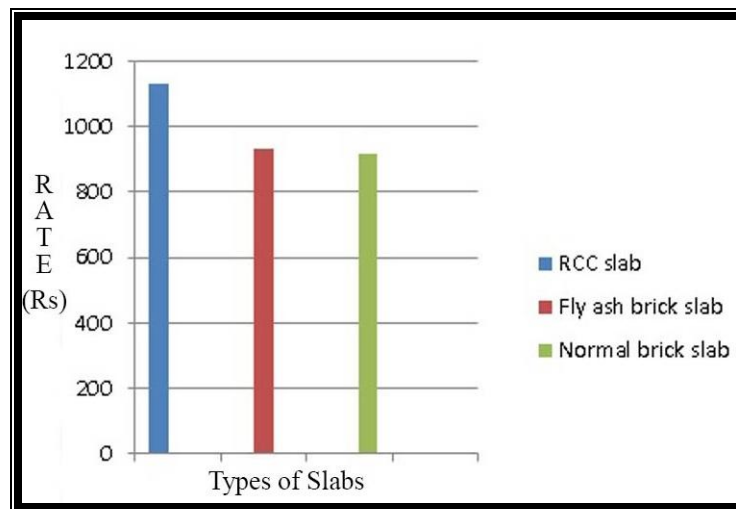


Figure 7. Comparison chart of rate analysis of slabs

VII. CONCLUSION

- Both brick slabs shows low compressive strength with respect to RCC slab.
- Presence of bricks in tension zone has not caused significant reduction in strength of both bricks and RCC slabs.
- By reducing concrete we have to save cement and by saving cement reduced the greenhouse gases emissions. So it is environment friendly.
- In Brick Composite slabs required less quantity of concrete as compared to RCC slabs so, it is less costly slab.
- Brick slabs have less weight than RCC slabs.
- As per rate analysis the cost of 1m³ RCC slab is approximately RS. 2000 more than the cost of normal brick slab and cost of fly ash brick slab. (Shown in figure 7.)

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