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Comparative Laboratory Experimental Study off the RCC Slab and Brick Composite Slab Under Four Point Loading Condition”

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ABSTRACT

The primary goal of this research work is to investigate the use of bricks in place of cement concrete mixture. The strength of the concrete lying just above and below the neutral axis is not fully utilized in reinforced concrete slabs. Bricks have thus taken at the place of concrete mixture in the tension zone and close to the neutral axis in order to lighten the weight and lower the cost of slabs. A programme of experimentation is run on six basic slabs of reinforced concrete. The six slabs were cast into two distinct groups, with three slabs in each group. Brick composite slabs make up the second group of slabs, whereas reinforced concrete slabs make up the first group. The two slab groups are compared to one another. Dial gauges are used to obtain readings of the deflection (in millimetres). One dial gauge is positioned at the slab's centre, while the other three dial gauges are positioned 300 mm from the slab's centre on the left and right corners, respectively. Total Five dial gauges are employed during the experimental investigation. A relationship is being developed between the load and the mid-span deflection.

1. GENERAL DESCRIPTION

Within RCC A common structural element used to make floors, roofs, and road pavements is the construction slab. A concrete slab is a flat piece whose depth is substantially less than its breadth and length. It could have columns directly supporting it, reinforced concrete slabs, or masonry walls. A slab often bears evenly distributed gravity loads that operate perpendicular to its surface and are transferred to the support via shear, flexure, and torsion. Deciding if the slab is a structural system or component in and of itself is difficult due to its complex behavior.

The fundamental tenet of reinforced brickwork slab design is that the load is applied uniformly across the slab. Design considers a width of one metre. In order to prevent the slab from becoming overly heavy, the depth of the slab should be restricted to one brick flat over one brick on edge, for a total depth of 180 mm, or outmost two brick on edge, for a depth of 225 mm. The primary reinforcement should have a small diameter—ideally, no more than 12 mm. A mortar cover that is at least as wide as the bar diameter should be provided by the mortar joint, which shall have a minimum width of 35 mm. The external clear cover should be 13 mm in diameter, or the greater of the bar's diameter.

In order to prevent vertical joints in the slab from reaching right up to cover the edges of the bearing wall, bonding of the bricks should be done so that the joints are preferably broken and the bricks at the edges rest half on the bearing wall. It is imperative to prevent shear failure. Twenty percent of the primary tension steel with positive bending moment should be distributed to account for shrinkage and temperature changes.

Compared to an RCC slab, the analysis and design of a brick composite slab are significantly more complex. The stresses in the brick composite slab vary greatly from those in the RCC slab as the number of bricks increases. The earliest building material is brick. Despite this, masonry has not advanced as technologically in earthquake engineering cas other construction materials like steel and concrete have. Engineers' lack of trust in its application in seismic environments stems from their ignorance of the subject. Based just on the known characteristics of the constituent materials, it is challenging to estimate the elastic properties of brick. Through testing, the bricks' compressive strength was determined.

The most innovative construction method of the modern era is without a doubt RCC construction. A composite material that is robust, long-lasting, and reasonably priced has been created by combining the high tensile strength of steel with the high compressive strength of concrete and the elasticity of steel. It is put through mechanical testing.

This effort aims to create textured brick composite slabs and RCC slabs, and then compare the deformation effects. The goal is to arrive at a decision about which of the two procedures is superior to the other.

1.3 BACKGROUND AND HISTORICAL DEVELOPEMENT REINFORCED BRICK SLABS

In the USA, the first reinforced brick floors were created in the 1870s, the year when the Chicago Fire caused traditional wood structures to be replaced by fireproof brick constructions, and the year that the first tower blocks were built. Hollow bricks have been mass-produced for this purpose for a considerable amount of time already. In 1877 and 1878, Thaddeus Hyatt received patents for what are regarded as the first reinforced brick flooring in America and England. In 1892, Johann Friedrich Kleine announced the patent for the first reinforced brick floor, which is still the most well-known today, in Germany. In this case, the years leading up to 1910 saw the peak of a diverse array of brick floor kinds. In this case, the years leading up to 1910 saw the peak of a diverse array of brick floor kinds. The variation greatly exceeded that of the reinforced concrete slabs, which were created at roughly the same time. However, the reinforced brick slabs were distributed significantly more widely earlier. Slabs of brick were employed not just to build the diverse array of early 20th-century multi-story buildings, as well as numerous "classical modernist" structures, ranging from Le Corbusier to Mies van der Rohe - buildings that are frequently mistakenly believed to have been built using reinforced concrete slabs. Since the late 19th century until the present, reinforced brick slabs, which are inexpensive and simple to produce, have influenced the global skeleton construction system. There are still a lot of these old slabs in use today. However, not much is known about them. Not only does their load-bearing capacity need to be accurately and practically assessed (for instance, in reaction to changes in use), but even this basic classification raises a number of challenges. The possibility to systematically examine the historical development and structural typology of early German reinforced brick floors from their inception in 1892 to 1925 was made possible in recent years by a research project at the Chair of Construction History and Structural Preservation of the BTU Cottbus, made possible by funding from the German Research Foundation DFG. We will now replace a portion of the concrete with bricks and examine the behaviour of brick composite slabs. We have used dial gauges at various points on the slab to measure the deflection of both types of slabs.

2. LITERATURE REVIEW

In order to contextualize the current work, related works from literature is discussed. In addition a thorough review of literatures on various aspects nonlinear analysis of RCC slab and Brick composite slab and other factors that is load distribution, shear and reaction distribution, deflection is presented. This was done with the purpose of gaining a better understanding on the advantages and disadvantages of providing Brick composite slabs and other related issues. A literature review was also done on lateral live load distribution factors in slabs, effect linear and nonlinear design and based on yield line theory. In literature review the research work regarding to the various experiments & methods used for the testing of the slabs are dissertate. Literature review gives an ambient review of the work; it has been done by many researchers in the field of RCC and Brick composite slabs.

Aleksa Milijaš et al., 2023 explained in their research about reinforced concrete (RC) frames with masonry infills are common, particularly in areas that are prone to earthquakes. Masonry infills are typically not taken into account during the design phase, but when there is seismic loading, they are susceptible to both in-plane and out-of-plane forces, which may act concurrently or separately. Recent seismic events have shown that seismic stresses can seriously harm masonry infills or even lead to their total collapse, particularly if the loads act in tandem. Because of this, there has been an increased focus recently on the effects of the interaction between in-plane and out-of-plane loads on the seismic performance of masonry infills. Nonetheless, the majority of research primarily looks at totally enclosed frames, despite the fact that apertures like windows and doors are crucial components of enclosed spaces that significantly impact. The findings of a thorough experimental investigation of nine full-scale conventional masonry RC frames filled with contemporary hollow clay bricks for configurations with and without window and door openings under independent, consecutive, and combined in-plane and out-of-plane stress are presented in this article. A thorough comparison and explanation for the various loading and infill configurations is provided based on the findings. The test results unequivocally demonstrate the detrimental effects of openings and the combined loading circumstances, as well as the significance of the circumferential mortar joint between the fill and frame being executed with high quality. The recently discovered information can serve as a foundation for the necessary creation of creative ways to significantly enhance the seismic performance of RC frames with masonry infills **[1]**.

S Bakardzhiev, 2023 explained about the behaviour of a reinforced concrete slab, which is a component of an experimental reinforced concrete structure, is examined in this study under loads resulting from the concrete mix put in the slab above it and from the casting of the formwork system of the subsequent plate. The deviations dial gauges were used to measure each level separately. It was investigated how the concretes used in the building handled deformation and full strength. Every step of the slab's loading process was examined, as well as the concrete's placement within the formwork and the formwork's formwork construction. Using the technique for Early striking of reinforced concrete slabs, conclusions have been drawn regarding the behaviour of the slabs during manufacture **[3]**.

Suhad M. Abd et al., 2023 explained about the primary application of textile reinforced mortar (TRM) is to reinforce pre-existing structural elements; in contrast, textile reinforced concrete (TRC) is a technology utilised during the construction of new members to improve the structural conduct. Many researchers have looked into using TRM to the tension zone of reinforced concrete (RC) slabs in order to increase the flexural capacity. It is necessary to investigate the efficacy of textile textiles utilised as internal reinforcement in the TRC technology of RC slabs. As a result, the study describes the experimental study carried out on three specimens of one-way RC slabs reinforced with textile grid. The steel bars were utilised as external reinforcement together with a novel carbon textile grid made of polyacrylonitrile (PAN). To study the flexural behaviour under a four-point loading system, two textile-reinforced RC slabs with one and two layers of textile grid (SRC + 1T and SRC + 2T, respectively) and one reference slab (SRC) were constructed. It was established that the inside textile reinforcement layer or layers were effective in increasing toughness, ductility, deformability, and cracking load. Comparing SRC + 1T and SRC + 2T slabs to SRC slab, the material ductility increased by 41% and 44%, respectively. Additionally, it was discovered that the deformability ratio was greater than 4, which suggests that the textile-reinforced slabs failed ductilely. Furthermore, moment-curvature curves were developed using the load-deflection relationship as a basis. Furthermore, the Eurocode 2 prediction model was utilised in the development of these curves. The moment-curvature curves anticipated and experimentally demonstrated good agreement **[]**.

Zhixiang Xiong et al., 2023 presented in his research about a non-explosive technique for modelling blast loading on reinforced concrete (RC) slabs is presented in this work. By applying a rapid impact force to the slab using a recently designed blast simulator, the technique creates a pressure wave that resembles a real blast. Both the method's efficacy was assessed through both numerical and experimental simulations. The experimental findings demonstrated that a pressure wave with a peak pressure and duration similar to those of a real blast may be produced using a non-explosive method. Additionally, there was good agreement between the experimental data and the numerical models. In addition, parameter experiments were carried out to assess how the impact loading was affected by the rubber shape, impact velocity, bottom thickness, and top thickness. According to the findings, planar rubber is less appropriate than pyramidal rubber for use as an impact cushion when mimicking blast loading. The greatest range of regulation for peak pressure and impulse is found in the impact velocity. Peak pressure ranges from 6.457 to 17.108 MPa and impulse ranges from 8.573 to 14.151 MPa·ms as the velocity increases from 12.76 to 23.41 m/s. The impact load is more positively impacted by the variation in the upper thickness of the pyramidal rubber than by the variation in the bottom thickness. The peak pressure dropped by 59.01% and the impulse rose by 16.64% when the upper thickness increased from 30 mm to 130 mm. In the meantime, as the thickness of the lower portion rose from 30 to 130 mm, the impulse increased by 11.01% but the peak pressure reduced by 44.59%. The suggested technique offers a secure and economical replacement for conventional explosive techniques used to simulate blast loads on RC slabs **[]**.

Jindan Zhang et al., 2023 presented in their research two precast reinforced concrete floor slabs and one regular reinforced truss composite floor slab were planned and produced for flexural performance testing in order to investigate the impact of rib size on the flexural performance of the novel reinforced truss concrete composite floor slab. The impact of rib size on the flexural capacity of the floor slab was investigated, as well as the failure mode of the concrete slab under uniform load. The findings demonstrate that the precast slab's excessive deflection during construction may be successfully resolved by strengthening the steel truss composite slab, greatly increasing the precast slab's stiffness. Based on the experimental investigation, the impact of the concrete rib height, rib width, and top chord steel bar diameter on the short-term stiffness is thoroughly examined through the application of enhanced finite element modelling. The findings indicate that the diameter of the initial stiffness of the precast slab is mostly determined by the latter stage, and the width of the concrete rib and the top chord reinforcement are positively correlated with the composite slab's stiffness. The height of the concrete rib has minimal bearing on this initial stiffness **[]**.

S. M. Anas et al., 2023, explained in their research about the low-flexural stiffness structural elements, like slabs, are more vulnerable to sudden loads brought on by falling equipment and tools during construction and installation as well as by rolling boulders and rocks brought on by wind or earthquake, particularly in mountainous regions. The impact resistance of reinforced concrete (RC) slabs supported on all four edges (also known as a two-way slab) and on two opposed edges (also known as a one-way slab) has been thoroughly investigated experimentally and computationally, and the results are published in the literature. Nevertheless, the impact response of the slabs supported on three corners has not been investigated in low-velocity impact. In order to achieve this, ABAQUS software is used to conduct a computer research using finite elements on the validated model. The result is the slab, which is supported on (i) three edges and (ii) and (ii) two opposing edges that will be struck at a low speed when a 105 kilogramme non-deformable steel mass is dropped onto the slab centroid from a height of 2500 mm. Additionally, the impact of the slab's material strength is examined by substituting standard or normal-strength concrete (NSC) for ultra-high performance concrete (UHPC). The software's explicit module is taken into account when modelling the impact load. The slabs' failure mechanism, displacement distribution, stress/strain contour, and fracture pattern are compared and analysed **[]**.

Ricardo Castedo et al., 2022 Numerical simulation of reinforced concrete (RC) slabs with the addition of an external reinforced polymer (FRP) have been developed and compared with full scale real tests. The size of the slabs was 4.4 x 1.46 m, with a span of 4 m, and a thickness of 15 cm. The slabs were built using concrete of class C25/30, and B500C reinforcing steel. Seven tests were conducted, one at a scaled distance of 0.83 m/kg1/3, three at a scaled distance of 0.42 m/kg1/3, and three at 0.21 m/kg1/3. For the biggest scaled distance, the slab had no extra reinforcement. In the other two cases one of the slabs had no extra reinforcement, while the other two tests were performed with carbon fibre reinforcement (CFRP) and E-glass fibre reinforcement (GFRP) located on the face opposite to the blast. Numerical simulation was performed with LS-DYNA software. The study elements (concrete, steel and reinforcement) have been simulated in a Lagrangian formulation with solid elements, beam elements and shells, respectively. Three concrete models have been used and compared: CSCM, MAT72-R3 and RHT. As for the explosive, the CONWEP-based Load Blast Enhanced (LBE) card was used. Reinforcement with CFRP resulted in a generally reduced damage area on both surfaces. All models show a good correlation with the test results and a non-destructive damage estimation technique when comparing them in terms of damage area **[]**.

Michael Fischer, Werner Lorenz, 2009 described in their paper about Since fire-proof brick constructions had begun to replace the traditional wood structures following the Chicago Fire in the 1870s, reinforced brick floors have shaped the system of skeleton construction worldwide up to our times – in a wide range of multi-storey buildings as well as in many famous buildings of "classical modernism" from Le Corbusier to Mies van der Rohe. The first phase of the project was focused on historical questions as different construction types, proliferation, typical advantages and faults or historical methods of dimensioning. The research in this phase was based on patent documents and contemporary publications as main sources but analyses of brick production works and of the transport ways in the German inland water and railway networks were also used. Building on the results of the historical studies, the second phase of the project was dedicated to the structural examination of reinforced brick floors from a contemporary point of view. Aiming at a close-to-reality assessment of the load bearing capacity the usual calculation algorithms could be refined **[]**.

Pankaj Agarwal and S. K. Thakkar, 2001 presented a paper in this study they analyse the hysteresis behaviour of the structure under prescribed loading and to determine the capacity of the structure such as maximum resistance and ductility by Quasi-static test. It has not yet been established how the results of these tests may be compared with dynamic results. In this paper, a comparative study of behaviour of two half-scaled bricks masonry house models have been made which are constructed with similar earthquake resistance features. The Quasi-static consists in applying a cyclic load at roof level at a very low frequency. The criterion for comparison of both the tests is the maxm absolute displacement at the roof level. The shock table model responds with a valuable higher initial strength & stiffness as compared to quasi-static model. The intensity of destruction is more in quasi-static test because of increased crack propagation, thus proving conservation of quasi-static test **[]**.

Anamika Tedia and Dr. Savita Maru, 2014 Explained about Concrete-steel composite construction means sections of steel interpolate in concrete for columns and concrete slabs is for columns & the concrete slabs or profiled deck slabs combined to the steel beams with the help of mechanical shear connectors so they acts as a unit. Concrete-steel composite with RCC different ways are perused for comparative analysis of G + 5 storey building with a certain height and wind speed of 50 m/s. The overall plan dimension of building is 56.3 m x 31.94 m. Analogical Static method of analysis is used. For modeling of RCC and Composite construction, staad-pro software is used & compared the results, & it is found that in this analysis the composite construction is more economical than single material construction.

Soheyl Sazedj et al., 2013 explained in their paper he studied the references of economic sustainability of building construction; it is a controversy to decide which method of construction is more suitable without declining the quality of the construction. This analysis is about the comparison conventional reticulated RCC structure loaded with ceramic blocks versus unreinforced brick masonry construction with ceramic blocks and comparison of the cost of structural elements which are used in construction. We found from the results that the cost of unreinforced masonry construction is lower than concrete construction in case of small buildings, which is used for home or public utilities.

Emmanuel Akintunde Okunade, 2008 concluded in this paper he discovered the probability of making the use of burnt bricks manufactured locally by entirely traditional methods as pavers on unpaved field & rural earth roads in poor communities. We can eliminate the problems on such roads of being water logged & bumpy during the rainy season months & those of health and environmental hazards from enlarged dust during the dry season months by using pavers. In this analysis he investigated three clay soils in the Ado region of western Nigeria. Burnt brick pavers were manufactured using perfectly traditional methods, which are readily available in the rural and poor environment. He determined the engineering properties of the brick pavers and it was found that they contented the requirements prescribed by ASTM C 902 specification for Light traffic paving bricks & pedestrian, thus making them reasonable for usage on the earth roads.

-3 SAMPLE PREPARED FOR TESTING

SLAB DESIGN PROCEDURE

3.1.1 RCC SLABS

In order to examine the load-displacement graph and assess the structure's performance, we cast three RCC slabs. Three test slabs with an aspect ratio of 2.5—which indicates that they are one-way slabs—made of RCC material were formed in order to verify the analytical results of the suggested approach. The test slab was cast using M 25 concrete, and distribution steel bars with 8 mm diameter bars at 285 mm c/c were placed over the main reinforcement in a line parallel to the supports. The reinforcement consisted of 8 mm diameter bars at 160 mm c/c. Slab thicknesses have been maintained at 100 mm, with a 20 mm clear overlay.

Test slabs were cast using cement concrete of grade M-25.

The size 150 mm cubes' compressive strength was tested for 28 days. The following procedures are used to design RCC slabs:

Slab dimensions for RCC:- Length: 2,500 mm

Breadth: 1000 millimetres

Thickness of support: -250 mm

It is a one-way slab because of its aspect ratio of - 2.5.

Suppose a total depth of -100 mm. Depth of operation: 76 mm Load design: 16.25 KN

Main Reinforcement: 160 mm c/c of steel bars with an 8 mm diameter are provided.

Distribution Reinforcement: supply steel bars with an 8 mm diameter at a 285 mm c/c.

Figure 1 Plan of RCC slabs

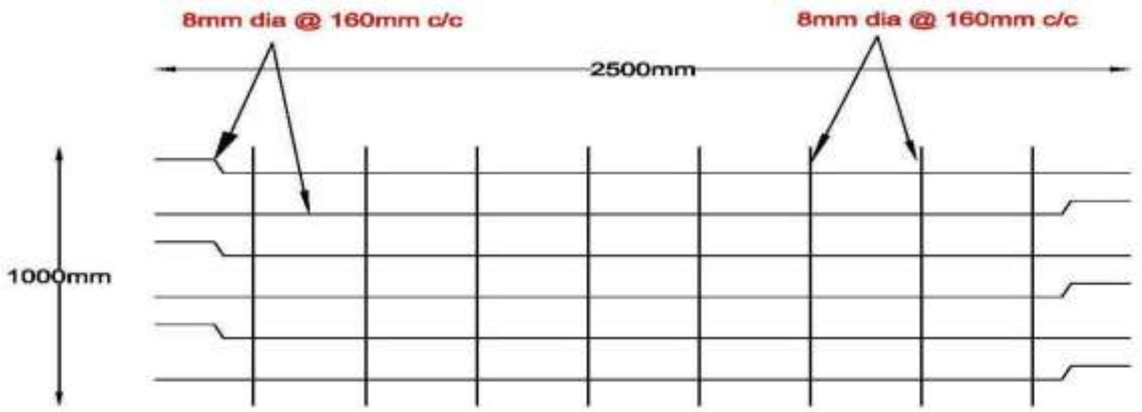
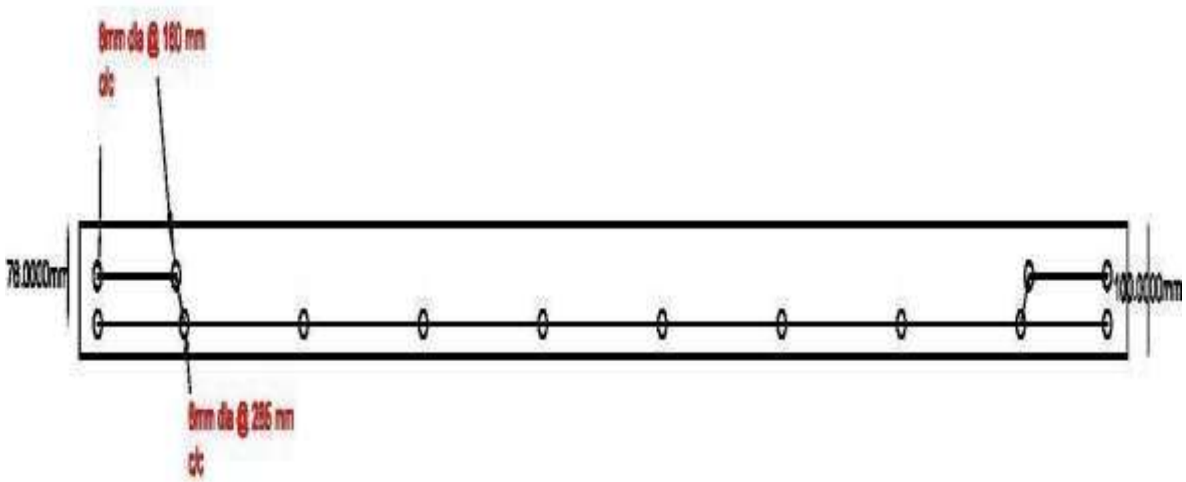


Figure 2 Section of RCC Slabs



3.1.2 BRICK COMPOSITE SLABS

In order to examine the load-displacement graph and assess the structural performance, we cast three brick composite slabs. To verify the analytical outcomes of the suggested method, three test slabs with an aspect ratio of 2.5—which indicates that this is a one-way slab—have been cast in brick. The test slab was cast using M 25 concrete, and distribution steel bars with 8 mm diameter bars at 285 mm c/c were placed over the main reinforcement in a line parallel to the supports. The reinforcement consisted of 8 mm diameter bars at 160 mm c/c. Slab thicknesses have been maintained at 100 mm, with a 20 mm clear overlay.

Test slabs were cast using cement concrete of grade M-25. 150 mm cubes with a 28-day compressive strength were cast. The following procedures are used to design brick composite slabs:

Slab dimensions for RCC:- Length: 2,500 mm

Breadth: 1000 millimetres

Thickness of support: -250 mm It is a one-way slab because of its aspect ratio of -2.5. Suppose a total depth of -100 mm. Depth of operation: 76 mm Load design: 16.25 kN

Main Reinforcement: 160 mm c/c of steel bars with an 8 mm diameter are provided. Distribution Reinforcement: supply steel bars with an 8 mm diameter at a 285 mm c/c.

We offered bricks in several dimensions for this kind of slab, which are as follows: Measurement in length: 23.5 cm

Breadth: 11.5 cm

Depth: - 4 cm.

In the tension zone, bricks are used in place of concrete. It is situated below the neutral axis and has a 20 mm transparent cover and a 25 mm mortar joint. This photo demonstrates my use of the brick in between the steel bars.

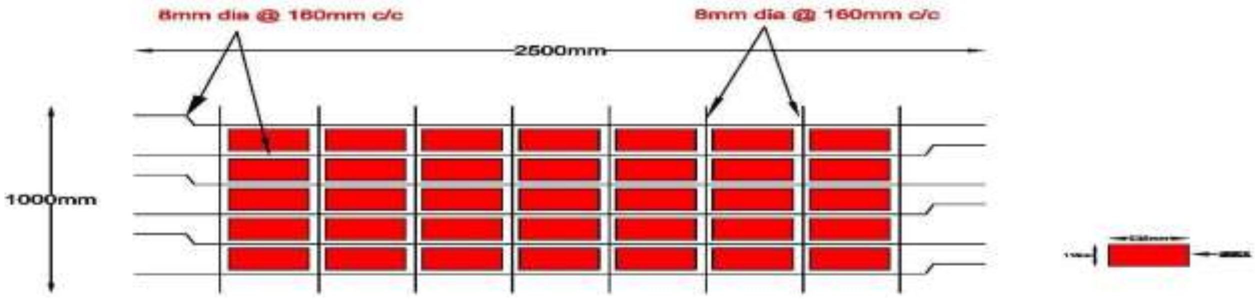


Figure 3 Plan of Brick Composite slabs

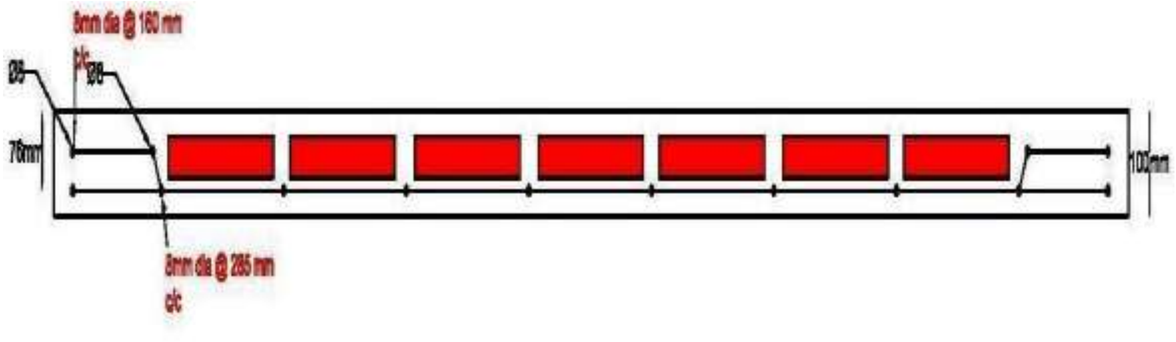


Figure 4 Section of Brick Composite slabs

4. RESULTS AND DISCUSSIONS

In this chapter we show the results of RCC slab & Brick Composite slab. The analysis of Brick Composite slab under the static incremental four point loading has been performed by hydraulic jack and pressure pump and readings were recorded by dial gauge. Afterward these results are compared with experimental results of Flexural behavior of reinforced cement concrete slabs. This is followed by the cracking behaviour & load deflection curve of slabs are obtained from the analysis.

1. RESULTS OF RCC SLABS

In the present study, RCC slab designed as per details discussed in Chapter 3 using IS:456- 2000 under the four point loading has bee carried out. The objective of this study is to see the crack patterns, variation of load-displacement graph, propagation of the cracks & crack width at various of the deflection.

2. TESTING OF RCC SLAB-1 (RS-1)

RCC Slab-1 was tested by four point loading test with reference to IRC Class B in this test incremental load is applied at step of 5KN and deflection is recorded at every step by using dial gauge and crack pattern are also observed at every step. Tables and graphs are shown below which show the relation between load and displacement. The load is applied through four loading roller at a distance of 300 mm from the centre of slab on both sides.

Figure 5 Position of Dial Gauge in RCC slabs

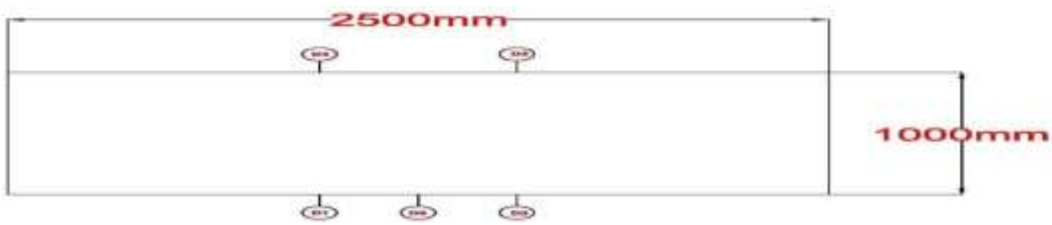
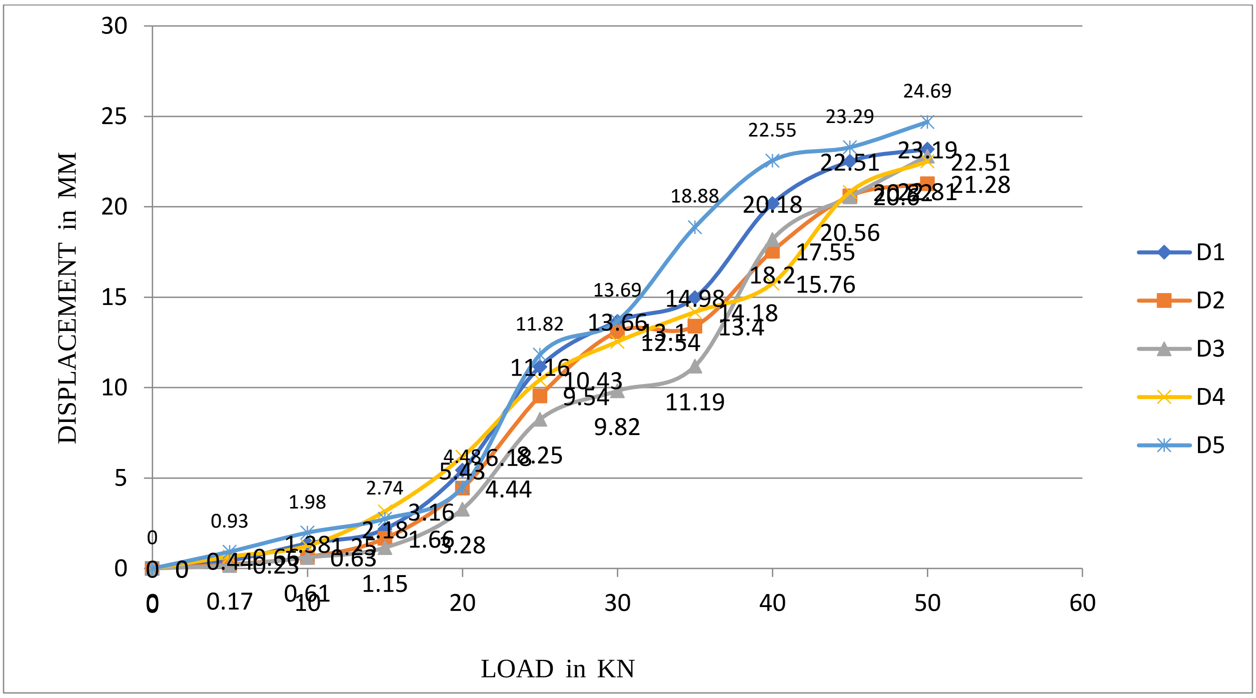


Table 1 Load Deflection Table for four point loading on RCC Slab-1

D/L	D1	D2	D3	D4	D5	Remark
00	00	00	00	00	00	
05	0.44	0.23	0.17	0.66	0.93	
10	1.38	0.63	0.61	1.25	1.98	
15	2.18	1.66	1.15	3.16	2.74	
20	5.43	4.44	3.28	6.18	4.48	
25	11.16	9.54	8.25	10.43	11.82	Initial hair line crack
30	13.66	13.10	9.82	12.54	13.69	
35	14.98	13.40	11.19	14.18	18.88	
40	20.18	17.55	18.20	15.76	22.55	
45	22.51	20.60	20.56	20.82	23.29	
50	23.19	21.28	22.81	22.51	24.69	



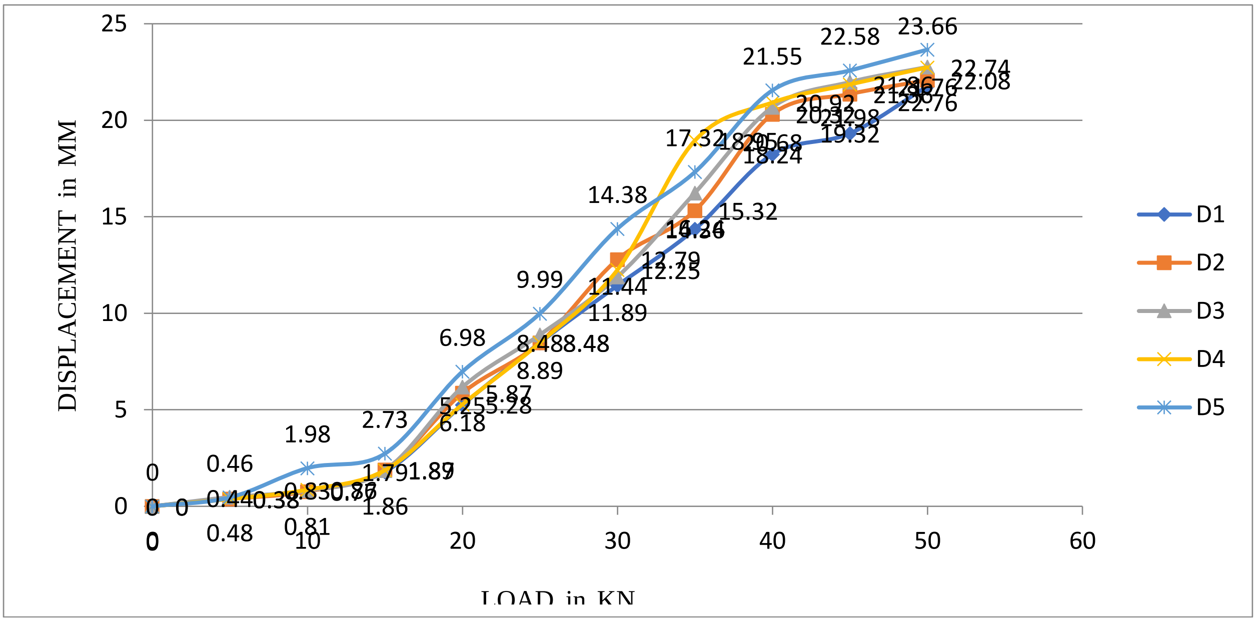
Graph 1 Load-Deflection curve of RCC Slab-1

4.1.1 TESTING OF RCC SLAB-2 (RS-2)

RCC Slab-2 was tested by four point loading test with reference to IRC Class B in this test incremental load is applied at step of 5KN and deflection is recorded at every step by using dial gauge and crack pattern are also observed at every step. Tables and graphs are shown below which show the relation between load and displacement. The load is applied through four loading roller at a distance of 300 mm from the centre of slab on both sides.

Table 2 Load Deflection Table for Four Point Loading on RS-2

D/L	D1	D2	D3	D4	D5	Remark
00	00	00	00	00	00	
05	0.44	0.38	0.48	0.38	0.46	
10	0.83	0.77	0.81	0.86	1.98	
15	1.79	1.89	1.86	1.87	2.73	
20	05.25	5.87	6.18	5.28	6.98	
25	8.48	8.48	8.89	8.48	9.99	
30	11.44	12.79	11.89	12.25	14.38	Initial hair line crack
35	14.36	15.32	16.24	18.95	17.32	
40	18.24	20.32	20.68	20.92	21.55	
45	19.32	21.36	21.98	21.86	22.58	
50	21.76	22.08	22.76	22.74	23.66	
52	22.14	22.82	23.98	23.35	24.99	



Graph 2 Load-Deflection curve of RCC Slab-2

Figure 5Testing of Beam

Table 3 Flexural Strength of Concrete

S. No.	Beam Name	Load (kN)	Flexural Strength (N/mm2)
1.	RS-1	22	3.91
2.	RS-2	24	4.26
3.	RS-3	23	4.09
4.	CS-1	22	3.91
5.	CS-2	24	4.26
6.	CS-3	23	4.08

Graph 3 Flexural Strength of Concrete

RESULTS ANALYSIS:

RCC SLAB

The first crack was noticed at the sixth step, and the behaviour of the RCC SLAB has been observed to be linear up to a higher value of the load.

1. The behaviour has been observed to be linear up to a value of the load of around 30 kN.
2. The crack initially appears at the midpoint, at the base of the slab.
3. A fracture at the upper surface has been noted at extremely high load values of 50 kN to 52 kN.
4. There is damage visible in the middle of the slab.

BRICK COMPOSITE SLAB

1. The BRICK COMPOSITE SLAB has been reported to exhibit linear behaviour up to a value almost equal to the load, or 25 kN. This behaviour was first noted at the fifth step,and it continues to exhibit linear behaviour up to a higher load value.
2. The crack initially appears at the midpoint, at the base of the slab.
3. A fracture at the upper surface has been noted at extremely high load values, ranging from 47 kN to 50 kN.

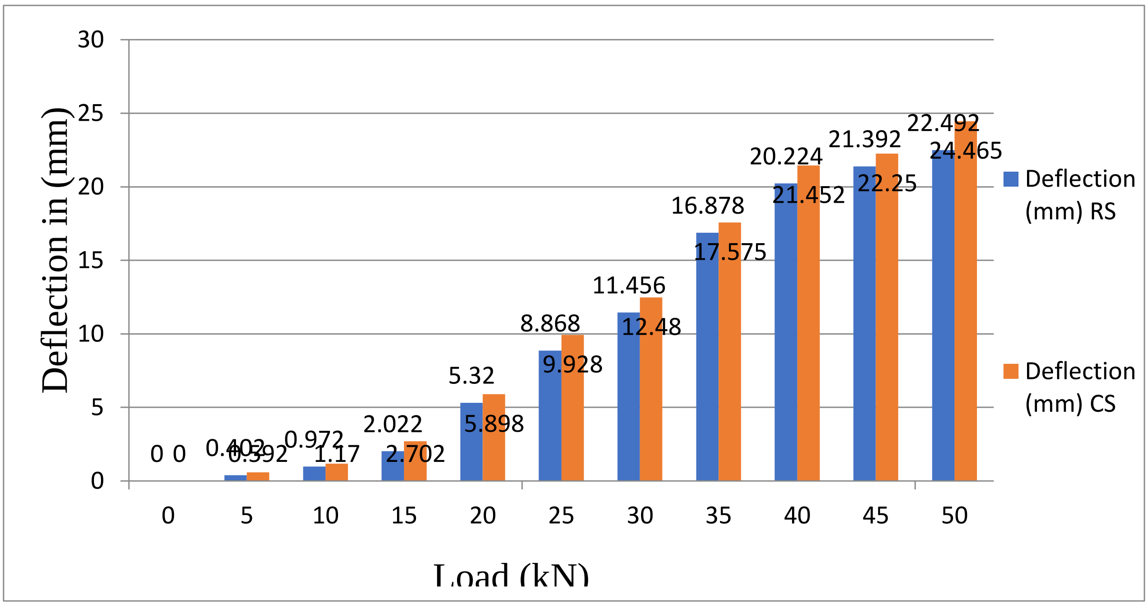
4. There is damage visible in the middle of the slab.

COMPARISON OF COMPOSITE GROUP SLAB CS AND RCC GROUP SLAB RS

The load deflection curve below illustrates the relationship between the composite group slab CS and the RCC slab (control slab) RS. This curve shows that the ultimate loads of the two groups of beams are not significantly different, and that slab group CS has slightly higher deflection than control group slab RS. Therefore, group slab CS has a slightly greater deflection than group slab RS but still has the desired strength.

Table 4 Comparison of Deflection in RCC and Brick Composite slab

Load (kN)	Deflection (mm) SLAB RS	Deflection (mm) SLAB CS
0	0.000	0.000
5	0.402	0.592
10	0.972	1.170
15	2.022	2.702
20	5.320	5.898
25	8.868	9.928
30	11.456	12.480
35	16.878	17.575
40	20.224	21.452
45	21.392	22.250
50	22.492	24.465



Graph 4 Comparison of Deflection in RCC and Brick Composite slab

CHAPTER-5

CONCLUSIONS AND RECOMMENDATIONS

In the current project, we used bricks, three cast RCC and Brick Composite slabs, in place of concrete. In order to conduct a comparative study with Brick Composite slab, we used a four point load to obtain the non-linear response of RCC and Brick Composite slab under incremental loading. When we tested the slabs, we measured the deflection under various loading scenarios.

5.1 CONCLUSIONS

It might be necessary to use Brick Composite slabs in order to support the structure's weight. The following finding was obtained from the analysis of RCC and Brick Composite slabs simply supported on two opposing rigid supports:

• Following the discovery of the first crack, four point loading displays the nonlinear load displacement curve.

• There isn't much of a difference in the deflection of either sort of slab, therefore we can assume that both types behave similarly.

• We saw the first crack in both slabs at loads between 25 and 30 kN.

• Brick Composite slabs are less expensive than RCC slabs because they require less concrete. • Brick Composite slabs are lighter than RCC slabs.

The following summarises the key findings and computations:

1. Brick Up to a weight of around 25 kN, composite slabs with four point loads exhibit linear elastic behaviour. Its conduct displayed non-linearity beyond this load value. Deflection has been seen more frequently as load rate drops. At a load of 40 kN, it has attained a value of 17.00 mm. Following this load value, the slab exhibited plastic behaviour, and a steady increase in deflection was noted beyond the 45 kN load value. After this, the deflections increased steadily and, at 50 kN of load, they approached 25 mm.

2. Up to a load of 30 kN, RCC slabs have exhibited linear elastic behaviour. Its conduct displayed non-linearity beyond this load value. More deflection has been noticed with load decrease.

3. The load-deflection curves demonstrated the general behaviour of the slabs and they were in good accord with the experimental results.

4. It was discovered that the deflection pattern of the Brick Composite slabs was almost identical to that of the RCC slabs. Because less concrete was used in Brick Composite slabs, it can be stated that the results hold up when compared to the experimental results of RCC slabs.

5. Microcracks were seen while the slab was in its elastic zone. It was discovered that the cracks were growing along with the deflections. It advances from the core to the edges that are devoid of it.

5.2 RECOMMENDATIONS

The outcomes of the analysis process and literature review will be helpful when applying the slab construction approach for analysis in the future. The Brick Composite slab performance data facilitates comparison with the RCC slab performance data. Future research on the replacement of RCC slabs with Brick Composite slabs, which yields positive results, is warranted. It is important to consider that the deflection values of Brick Composite slabs are either less than or equivalent to the results of RCC slabs while designing these types of slabs.

5.3 FUTURE EXTENSION

The characteristics of RCC slabs and Brick Composite slabs are almost identical. Therefore, in the future, we can use Brick Composite slabs to create lightweight, affordable structures. It will be especially helpful in hilly and rural places where building huge slabs is challenging, or in areas where earthquakes happen occasionally. Brick composite slabs are a cost-effective option for floor and roof slabs, particularly in locations where high-quality bricks are scarce and aggregate is expensive.

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