International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 05 | May - 2023 Impact Factor: 8.176 ISSN: 2582-3930

Assessment of Bubble Deck Slab

Sudhir Kapgate[1], Rohit Bhosle[2], Onkar R. Khupse[3], Ashish V. Meshram[4], Gauri B. Bhajikhaye[5], Umair Anwar[6], Pradeep F. Nishad[7]

1st & 2nd Professor, Department of Civil Engineering, Nagpur Institute of Technology
3, 4, 5, 6 & 7th Student, Department of Civil Engineering, Nagpur Institute of Technology

---

Abstract - A structural system of tremendous significance in constructions are crossbeams or bottom systems, it's called two- dimensional slab structural rudiments, where the third dimension is small compared with the other two introductory confines. Loads acting vertical crossbeams, to the flat star, may be from different shapes Y configurations counting on the need for which apply at all times seeks to make them lighter but covering the topmost possible distances and always seeking to ameliorate productivity and energy savings in construction. A extensively used type crossbeams are presently crossbeams corroborated concrete, these systems have several advantages similar as high resistance to compressive stresses and flexural conduct, in addition to a particularly low value in the construction of the rudiments. still, it has certain disadvantages in terms of weight and conservation of structures, renovation in large- scale constructions. In this area, themid-20th century systems relieved concave concrete crossbeams were created in order to reduce high rates weight- resistance of conventional systems. These systems reduce or change the concrete within the middle of the slabby a lighter material to from reduce the weight enjoy from the structure. But nonetheless these relieved as in crossbeams reduce the strength thereof before exposure to shear forces and fire. In the early 90s German mastermind Jorgen B reuning set up a way to ameliorate these downsides in crossbeams, linking the air space, sword and concrete in a concave slab bidirectional, using spheres made of plastic therefore giving rise to the BDT. BD is a biaxial technology that will increase span lengths and makes bottoms thinner by means of lowering the weight at the same time as keeping the performance of corroborated concrete crossbeams. This paper gives some of the reviews related to bubble Deck slab.

***Key Words*:** Bubble deck slab; Biaxial slab; Voided slab; Hollow recycled plastic balls; Reinforced concrete slab

1.INTRODUCTION

Bubble deck slab is a biaxial hollow core slab invented in Denmark. It is a method of virtually eliminating all concrete from the middle of a floor slab not performing any structural function, thereby dramatically reducing structural dead weight. Bubble deck slab is based on a new patented technique which involves the direct way of linking air and steel. Void forms in the middle of a flat slab by means of plastic spheres.

Eliminate 35% of a slab's self-weight, removing constraints of high dead loads and short spans Its flexible layout easily adapts to irregular and curved plan configurations. The system allows for the realization of longer spans, more rapid and less expensive erection, as well as the elimination of down-stand beams.

Bubble deck slab is the slab in which some amount of the concrete is replaced by the plastic hollow bubbles which are made by the waste plastic material, which reduces the self-weight of the structure. The main effect of the plastic sphere is to reduce the dead load of the deck by1/3 in compare to solid slab having same thickness without effecting its deflection behavior & bending strength It locks spheres between the top and bottom reinforcement meshes, thereby creating a natural cell structure, acts like a solid slab. The slab is cast with the same capabilities as a solid slab, but with considerably lesser weight due to elimination of excessive concrete.

This technology will then be applied to create lightweight bridge deck since a significant portion of the stress applied to a bridge comes from its own self-weight. By applying the knowledge gathered during the behavioral analysis. Modular deck components for pedestrian bridges that is notably lighter but comparable in strength to typical reinforcement concrete section will be designed This. floor system is designed to reduce the strength to weight ratio of typical concrete slab.it replaces or removes concrete from center of slab, where not or less useful.in place of that concrete, this design system uses hollow HDPE spheres to decrease the dead load of concrete floor.

However, it also reduces the slab resistance to fire and shear.

According to the manufacturer, Bubble deck slab can reduce total project costs by three percent. Bubble deck slab is a new innovative and sustainable floor system to be used as a self-supporting concrete floor. The application of the Bubble deck slab floor system in the Netherlands is manifested as the world-wide first application. The Bubble deck slab floor system can be used for storey floors, roof floors and ground floor slabs. A Bubble deck slab floor is a flat slab floor, therefore without beams and column heads. The principal characteristic is that hollow plastic spheres are incorporated in the floor, Clamped in a factory-made reinforcement structure. This reinforcement structure constitutes at the same time the upper and lower reinforcement of the concrete floor.

2. LITURATURE REVIEW

1. Mr. Muhammad Shafiq Mushfiq.et al - (2017):- This take a look at presents the Experimental take a look at of the BDS based totally on B/H Ratios. In the BDS, one has spherical balls of size 90 mm wherein (164 kg) of concrete become used and the other has spherical balls of length 120mm in which (151.54kg) of concrete become used and B/H ratios of 0.60 & 0.80 having 35 and 16 spherical balls respectively. The conventional slab became casted with (183.35 kg) of concrete. Experimental tests outcomes indicate that the conventional slab carried a load of 424.95KN and reason 12.1 mm deflection with

crack taking place after a load of 164KN. The bubble deck slab with B/H ratio 0.60, carried load of 350 KN and cause 12.64 mm deflection with crack taking place after a load of 168 KN. The remaining Bubble Deck slab with B/H ratio 0.80, carried a load of 398.2KN and reasons thirteen.3mm deflection with crack going on after a load of 300KN. a complete of 10.55% of concrete became stored within the first Bubble Deck slab and 17% of concrete saved in the 2nd one. This means that the bubble deck slabs have less load wearing capacity compared to the conventional slab.

2. Sameer Ali.et al - (2017): - The objective of this takes a look at is to perform the behavioural evaluation of conventional slab and bubble deck slab using Ansys workbench 14.0. This study includes the take a look at of normal slab and BDS with HDPE ball. The analysis result confirmed the maximum stresses and internal forces within the BD about to 40% lower than the normal slab due to the reduced useless load from using HDPE balls in place of concrete. The deflection of the BDS was slightly higher but the stiffness reduced due to the presence of the HDPE ball, but this situation will be overcome by the reduced overall stress in the slab. Upon the brief study of the bridge deck slab shows that it don‟t follows the office slab of the models which was created with the same general parameters.

3. Reshma Mathew et al - (2016) :- In this have a look at GFRP(Glass Fiber reinforced Polymer) strips with diverse orientation is used as a strengthening gadget for bubble deck slab .Finite element analysis was done using ANSYS software program. She concluded that Punching shear capacity of bubble deck slab is a prime hassle due to its decreased weight. GFRP strengthening system is used on this report. Strengthened slabs have greater punching potential compared with normal BDS. Increase in load carrying capacity up to 20 percent because of strong of BDS with GFRP. Reinforced bubble deck has low deflection compared to un reinforced bubble deck slab.

4. Dr. Thaar Saud Salman -(2015) :- This paper presents the consequences of experimental program investigating the impact of fire flame (excessive temperature) at the structural overall performance of BDS. This system consisted casting and trying out 9 specimens. the dimensions of the specimens have been 270 X 500mm in plane and with two special thicknesses; 90 and 140mm.The test consequences confirmed that, the residual strength of specimens reduced from 71.8% to 21.6% and their significant deflection multiplied with growing the fire flame temperature from 200 to 800oC and exposure time from 1 to 2 hours. For unexpectedly cooling specimen the residual flexural strength and primary deflection had been much less than those of equal specimen while cooled regularly. Later, growing the thickness of bubble slabs via 56% progressed surprisingly each the residual energy about 45% and stiffness of specimens.

5. Ma. Leilani T. Manalaysay.et.al-Philippine (2014) :- The local government of Mandaluyong wants to construct its very own cultural center in the city. They need this building in order to showcase Mandaluyong‟s history. The cultural centre will consist of a museum and an auditorium. This will provide the people knowledge about the city, and some opportunities that will showcase their artistic talent. This project would give the local government of Mandaluyong the design needed to construct the said building. The researchers would be using BD System in an effort to reduce the weight and increase the slabs Strength.

6. Kivanc Taskin.et al-(2014) :- This studies is based totally on the modeling of void slabs the usage of different structural evaluation program (SAP 2000 etc) due to TS 500 (necessities for design and production of strengthened Concrete systems Turkish widespread).Additionally this have a look at scrutinizes the economy of numerous slab structures (waffle, mushroom, rib and so on.), exposed to distinct load intensities and practical span tiers. The consequences shows that the plastic voided slab systems offer an outstanding opportunity to stable concrete slabs for many applications. Weight and cost savings as well as architectural flexibility can be achieved with plastic voided slabs.

7. Mihai Bindea.et al- (2013) :- This paper offers two collection of experimental checks regarding the shear load-carrying capacity of spherical hollow flat slabs in case of low degrees of longitudinal reinforcement. The take a look at consequences factor to a low rate of shear failure within the case of hollow flat slabs with reinforcement possibilities underneath 0.5%, whereas in case of reinforcement percentages close to 0.5%, the remaining shear stress is type of equal to the maximum value of the conventional slab with the equal bending capability but minimize height.

8. Corneille Charles Marais.et al- South Africa- (2009) :- The goal of this take a look at is to set up the least expensive variety of spans in which Cobiax flat slabs can be used for a sure load criteria, in addition to addressing the protection of crucial design standards of Cobiax slabs in terms of SANS 10100:2000. Vertical shear, horizontal shear and deflection might be investigated a good way to motivate the secure use of German research elements in mixture with SANS 10100:2000. The financial system of Cobiax slabs can also be investigated to establish graphs comparing Cobiax slabs, coffer slabs and post-tensioned slabs for different spans and load intensities. Those graphs are to simplify the consulting engineer‟s preference whilst having to determine on the most cost-efficient slab systems for a particular span length and load application.

9. Tim Gudmand.et al - Denmark- (2003) :- In Bubble deck construction there are necessarily joints of different kinds. The in-situ a section of the BD is cast on a prefabricated slab (a filigran deck).On this take a look at the bond strength of the reinforcement is calculated in a joint amongst precast slabs. The bond strength is encouraged through the casting joint among the precast slab and the in-situ concrete.. It has been shown in the note how the load carrying capacity of a joint in a Bubble deck may be calculated using the theory of plasticity. A direct use of code rules is impossible in such a complicated case. Therefore the note also demonstrates the advantage of having a theory instead of relying on empirical rules with doubtful extrapolations.

3. CONCLUSIONS

1. The slab BD analyzed the project proved the most applicable and cost effective taking into account the results obtained when compared to the others. The slab using such technology resulted in a lower steel consumption, lower consumption of concrete and lower maximum deflection, a criterion that invalidated the use of smooth slab of 18cm. Importantly, in addition to economic factors BD also takes advantage of the

2. comfort generated to the user, mentioned above, verified by renowned institu tions and also lived in several buildings around the world.

3. The solution proved to be very simple in its design The solution proved to be very simple in its design when adapted to the Brazilian standard and demonstrates a constructive ease, with different play styles for each specific case.
4. Also related to the financial aspect of the project, it may be mentioned that the foundations are a considerable part in the final cost of the structure and therefore a structure that uses less material, such as BD, transmit less load to the ground and therefore need smaller foundations.
5. For future work is suggested to carry out experimental test s in order to confirm that the data provided by the slab manufacturer BD, they are consistent. It is also
6. important to make a comparative analysis of execution time and cost to get a better evaluation of the results.

REFERENCES

1. P. Prabhu Teja , “Structura l Behaviour of Bubble Deck Slab” (IEEE International Conference On Advances In Engineering, Science And Management (ICAESM 2012 March 30, 31, 2012) W. K. Chen, Linear Networks and Systems. Belmont, Calif.: Wadsworth, pp. 123 135, 1993. (Book style)
[2] Amer M. Ibrahim , Nazar K. Ali Oukaili and Wissam D. Salman , “Flexural Behavior and Sustainable Analysis of Polymer Bubbuled Reinforced Concrete Slabs” (Fourth Asia Pacific Conference on FRP in Structures (APFIS 2013)11 13 December 2013, Melbourne, Australia© 2013
[3] Er. Immanuel Joseph Chacko, Er.Sneha M. Varghese, “Structural Behaviour of Bubble Deck Slab using Indian Standards (International Journal of Innovative Research In Technology, IJIRT 143950, September 2016 | IJIRT | Volume 3 Issue 4 | ISSN: 2349 6002) R. Nicole, "The Last Word on Decision Theory," J. Computer Vision, submitted for publication. (Pending publication)
[4] Neeraj Tiwari1, Sana Zafar, “Structural Behaviour of Bubble Deck Slabs and Its Application” (IJSRD International Journal for Scientifi c Research & Development| Vol. 4, Issue 02, 2016 | ISSN (online): 2321 0613). D.S. Coming and O.G. Staadt, "Velocity-Aligned Discrete Oriented Polytopes for Dynamic Collision Detection," IEEE Trans. Visualization and Computer Graphics, vol. 14, no. 1, pp. 1-12, Jan/Feb 2008, doi:10.1109/TVCG.2007.70405. (IEEE Transactions)
[5] Tae Young Jang, Sang Mo Kim2, Sang Dae Kim, “New Eco friendly Two way Void Slab” (International Conference on Sustain Building Asia)
[6] Tim Gudmand Høyer, “Note on the Moment capacity in a Bubble deck joint” (Danmarks Tekniske Universitet,byg•dtu R-074,ISSN 1601-2917,2003,ISBN 87-7877-137-4)