www.cafetinnova.org

Indexed in
Scopus Compendex and Geobase Elsevier,
Geo-Ref Information Services-USA, List B of Scientific Journals, Poland, Directory of Research Journals

ISSN 0974-5904, Volume 09, No. 03

International Journal of Earth Sciences and Engineering

June 2016, P.P.604-607

Experimental Stability Analysis of Porotherm Infill Slabs

RANJITH V[1], SREEVIDYA V[1] AND M VADIVEL[2]
[1]*Department of Civil Engineering, Sri Krishna College of Technology, India*
[2]*Department of Civil Engineering, Nehru Institute of Technology, INDIA*

Abstract: Concrete is the one of the construction material produced worldwide. Here is the method to make the effective use of the material. In a simply supported RCC slab, the upper part of the slab is subjected to compressive forces while the lower portion is subjected to tensile forces. Concrete is very good in compression while it is weak in tension. Hence the steel reinforcement is placed in the tension zone. The concrete in this portion is only for holding together the steel reinforcement and has no structural purpose. By choosing the filler material judiciously, we could save about 30-35% of concrete compared to a traditional RCC slab. A light weight filler material also reduces the dead load hence less steel reinforcement is required. In all we may expect to save about 25% of the cost .And for strength and stability conditions is tested for the slabs with normal reinforcement and steel fiber strips. Finally the stability analysis of the slab element is done and the comparative results will be given.

Keywords: *Porotherm blocks, Flexture strength, compressive strength, Stability, Deflection*

1. Introduction

Porotherm is the clay block used for the masonry works. It acts as a light weight infill Material. Construction block technology offers a speedier, cost effective, environmentally sound alternative to conventional walling materials. It is based on the principle of densification of a lean concrete mix to make a regular shaped, uniform, high performance masonry unit. This technology can be easily adapted to suit special needs of users by modifying design parameters such as mix proportion, water/cement ratio and type of production system. To make the effective usage of the building materials like concrete and steel .And to have the stability to withstand the loads acting on the elements. The structure is long lasting with marvelous features. Pre-cast concrete roofs are smooth. This type of concrete in roofing and sunshade accessory will be resistant to the extreme weather condition.

2. Aim and Objective

The main objective

- To analyze the stability of the pre cast slab elements.
- To reduce the self-weight of the slab elements.
- To reduce the cost.
- To make the better finish.
- To make the efficient use of building materials

3. Description of the Porotherm Blocks

Offering exceptionally fast, virtually dry construction, plus high strength and thermal efficiency, Porotherm is a modern clay block structural walling system with reassuringly traditional values. A natural progression from handmade bricks to engineered blocks; it is widely used and has been proven on millions of projects for over 30 years in Europe in both domestic and commercial applications, and is ideal for use on projects from single storey to Multiple-storeys.

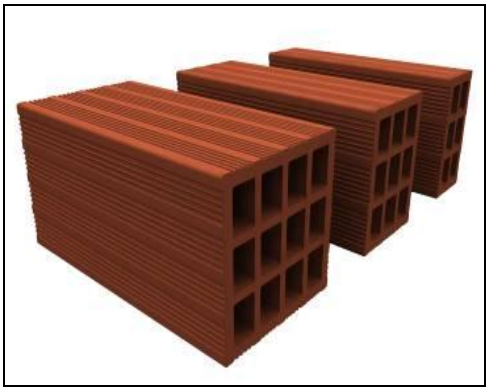

Fig-1 *Showing the Porotherm blocks of the different sizes*

Porotherm is a highly efficient alternative to other building materials such as timber, concrete or light steel frames and is suitable for a variety of construction applications. Each Porotherm block is a precision designed and engineered vertically perforated walling unit made from prepared clay, (with typically 20% recycled materials e.g. sawdust, paper or minerals).

Types of Porotherm

Offering exceptionally fast, virtually dry construction, plus high strength and thermal efficiency, Porotherm is a modern clay block structural walling system with reassuringly traditional values.

There are two type of porotherm brick is available, thus are,

- Porotherm HP (Framed Structure).
- Porotherm VP (Load-Bearing Structure).

Table 1 *Showing Thed Details of the Porotherm Blocks*

Name	Size	Weight	Density
	mm(L, H, W)	*kg*	*kg/m^3*
HP400	400*200*200	11.6	694
HP150	400*150*200	8.5	733
HP100	400*100*200	6.2	788

4. Mechanism

Materials used to make the pre cast slab.

- Concrete *(M30).*
- Steel Reinforcement Bars(Fe415).
- Steel fibre strips.
- Porotherm Bricks.

The precast slab is a mechanism to replace the concrete in the tension zone. The filler material, thus, is not a structural part of the slab. By reducing the quantity and weight of material, the roof become less expensive, yet retains the strength of the conventional slab.

- Case 1: Nominal concrete mix and porotherm blocks with steel reinforcement.
- Case 2: Nominal concrete mix and porotherm blocks with steel strips as a reinforcement.

Progress of making the pre cast slab

1) Selection of the Porotherm HP 100mm thick block.

Porotherm Brick having the size of 400mm x 200mm x 100mm. This brick is used in slab.

Fig-2 *Showing the data Porotherm blocks of the size 400*100*200*

2) Shuttering size for the slab is taken as 1.5m x 0.6m

Fig-3 *Showing the shuttering placement*

Shuttering having the inner size of 1.5m x 0.6m.This is made by wood. Which this support by the brick and a cover of 20 mm.

3) Laying of the porotherm blocks in the shuttering

Porotherm Blocks are placed in between the shuttering ends, which are having the spacing of 140mm.

4) Reinforcement details

Here we are using 10mm diameter bar in tension zone. 5 bars in shorter direction and 2 bars in longer direction. Cover of slab is 20n mm.

Fig-4 *Showing the placement of the porotherm blocks and the steel bars.*

5) Placing of concrete

Fig-5 *Showing the casting of the Concrete slabs*

Grade of concrete used in the slab is M30, Which was placed over the reinforcement and the sides of Porotherm brick. Concrete was placed in compression zone, Reinforcements are provided in tension zone.

6) De-moulding

After the casting work the slab is kept aside for one day and the shuttering are d- moulded

Fig-6 *Showing the de-moulding of the Concrete slab*

7) Curing process

Portable water is used for curing, which was done for 28 days. Jute fibre bags are preferred for the curing process. And the specimen is taken for the testing.

Fig 7 *Showing the curing of the slab*

5. Test Results

Load vs Deflection

Table 1 *Showing the Details of Testing of the Slabs*

Load (kn)	Deflection in slab1(mm)	Deflection in slab2(mm)
2	3	1
3	13	5
4	18	11
5	27	17
6	37	24

DEFLECTION CHART - (Load Vs Deflection)

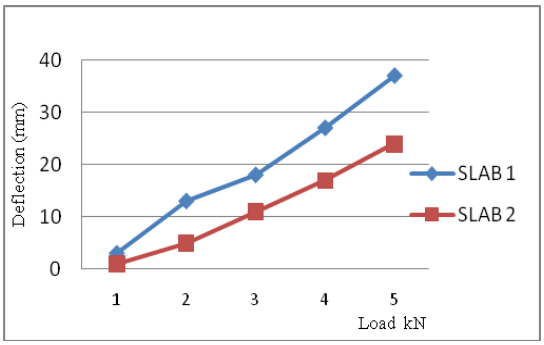

Fig-8 *Showing the Load vs deflection graph of the Concrete slabs*

6. Conclusion

Porotherm hollow bricks are placed between steel ribs and concrete is poured into the gap to make a filler slab. The structure requires less steel and cement and it is also a good heat insulator. Reduces use of concrete and saves cement and steel by about 40%. It is an ideal option for low-income users who have limited space for building a house. It also reduces the dead load of the slab and thereby providing the strength and stability to the structure. If steel strips are used as the reinforcement it improves the performance of the slab in terms of the strength and the stability to withstand the loads acting on to it.

Acknowledgements

I wish to express my sincere thanks to “Sri Krishna College of Technology, Coimbatore and Staffs of Civil Engineering Department” for providing all the facilities for carrying out this work and for encourage me in completing the project and for their valuable guidance and timely suggestions during the project work. I wish to thank my guide Dr.Sreevidya Ph.D for her support throughout the project. Finally I wish to thank my parents and my classmates for their general support.

References

[1] A Pisanty ,Transverse flexural and torsional strength of Prestressed Precast Hollow-Core Slabs Tailor Made Concrete Str uctures – Walraven & Stoelhorst (eds) © 2008 Taylor & Francis Group, London, ISBN 978-0-415-47535-8

[2] Al-Tuhami AbuZeid Al-Tuhami AbdAllah and Ahmed Ismail Gabr Flexural Behavior of RC Sandwich and Hollow Block Bearing Walls

[3] ANSYS (2010). Release 14.0 Documentation. ANSYS Structures” 2013

[4] Willam, K. J. and Warnke, E. P. (1975), “Constitutive Models for the Triaxial Behavior of Concrete,” Proceedings of the International Assoc. For Bridge and Structural Engineering, vol 19, pp. 1 - 30.

[5] Izni Syahrizal Ibrahim, Kim S. Elliott, Simon Copeland, Interface Shear Stress of Hollow Core Slabs with Concrete Toppings

[6] T . J . S t r a t f o r d , BA, BEng, and C. J. Burgoyne, Lateral stability of long precast concrete beams

[7] MAS T R. F. Lateral stability of long prestressed concrete beams, part 1. PCI Journal, 1989, 34,

[8] MAS T R. F. Lateral stability of long prestressed concrete beams, part 2. PCI Journal, 1993, 38,

[9] Suikai Lu and Martin Kasa Seismic test program of special designed clay blocks due to earthquake resistance by Wienerberger consisting real scale shaking table-, cyclic shear-, diagonal tensionand Compression tests

[10] Vidya Jose1, Dr.P. Rajeev Kumar2 Hollow Core Slabs in Construction Industry,International

Journal of Innovative Research in Science, Engineering and Technology Volume 3, Special Issue 5, July 2014

[11] Sivagamasundari.R1, Kumaran.G Experimental study on the behaviour of concrete one way slabs reinforced with GFRP reinforcements under constant and variable amplitude repeated loadings,INTERNATIONAL JOURNAL OF CIVIL AND STRUCTURAL ENGINEERING Volume 2, No 2, 2011

[12] Technical report and design guidance for the use of Porotherm blocks in the UK

[13] F. Koksal · A. Ilki · M. A. Tasdemir Optimum Mix Design of Steel-Fibre-Reinforced Concrete Plates

[14] Nguyen Van CHANH STEEL FIBER REINFORCED CONCRETE

[15] R. D. Neves and J. C. O. Fernandes de AlmeidaCompressivebehaviourofsteel fibre reinforcedconcrete

[16] Mr. Nikhil A. Gadge1, Prof. S. S. Vidhale2 Mix Design of Fiber Reinforced Concrete (FRC) Using Slag & Steel Fiber Trevor D. Hrynyk and Frank J. Vecchio Behavior of Steel Fiber-Reinforced Concrete Slabs under Impact Load

[17] A.M. Shende1, A.M. Pande2, M. Gulfam Pathan Experimental Study on Steel Fiber Reinforced Concrete for M-40 Grade,International Refereed Journal ofEngineering and Science (IRJES) Volume 1, Issue 1 (September 2012)

[18] Saaid I. Zaki1, Khaled S. Ragab2 and Ahmed S. Eisa3 Flexural Behaviour of Steel Fibers Reinforced High Strength Self Compacting Concrete Slabs,International Journal of Engineering Inventions Volume 2, Issue 5 (March 2013)

[19] Amit Rana Some Studies on Steel Fiber Reinforced Concrete International Journal of Emerging Technology and Advanced Engineering Volume 3, Issue 1, January 2013)

[20] Geoff Taplin ,Mario Attard ,Three-point loading tests on composite slabs with interface slip

[21] Shweta A. Wagh, Dr. U. P. Waghe Comparative Study of R.C.C and Steel Concrete Composite Structures Int. Journal of Engineering Research and Applications Vol. 4, Issue 4(Version 1), April 2014

[22] Gary Robinson Design and performance of precast concrete structures.