

Strength Of Concrete Hollow Block With Used Plastic Bottles

C.Vaidevi, E.Smithin, Kiran Ramesh, M. Akbar Badsha

Abstract: The purpose of this study is to find the possibility of using plastic bottles in the hollow concrete blocks. The voids are created at equal distance in the masonry units using the plastic bottles. For this study 500ml plastic bottles are used around that a concrete is placed to form a masonry units. After casting and curing the compressive strength of the conventional hollow concrete block and concrete block with plastic bottles is tested. The testing results shows about a 40 % increase in compressive strength for the hollow concrete block with plastic bottles for 28 days curing. This proves further research is necessary regarding determine the appropriate mix design and incorporate plastic bottles in hollow space in all other aspects. The results are obtained for the curing period of 7, 14 & 28 days.

Index Terms: Hollow block, Plastic bottles, Compressive strength.

1 INTRODUCTION

In framed structures, a hollow concrete blocks are the most important and common member used for wall construction. In our country, nowadays the usage of plastic water bottles also increasing rapidly. During the disposal, the problems and challenges are faced with dumping. So the idea is to make a hollow in a block using these used plastic bottles. It provides a maximum advantage of consuming materials, reduction in plastic waste & incorporating plastic bottles with closed manner inside the concrete produces pressure and increases strength in these type blocks. It is an alternatives to bricks in construction with less making charges. Thistypes of blocks are used in the compound wall, interior and exterior wallconstruction. For all partition wall construction, this is the best and suitableblock which can be used.

2 MATERIALS USED

- Cement
- Sand
- Coarse Aggregate
- Plastic Water Bottles

3 METHODOLOGY

In this test, a 3 samples of hollow concrete blocks are casted with 500ml plastic bottles and compared with a locally available blocks for 7, 14 & 28 curing days.



Fig 1. Methodology

- C. Vaidevi*, Assistant Professor –II, Department of Civil Engineering,
- Smithin.E, Kiran Ramesh, Akbar Badsha M, Students, Department of Civil Engineering, Aarupadai Veedu Institute of Technology, Vinayaka Mission's Research Foundation, Chennai, Tamil Nadu, India Email: Kiranramesh6454@gmail.com.

7, 14 & 28 days curing with locally available hollow concrete block and hollow concrete block with 500ml plastic bottles.

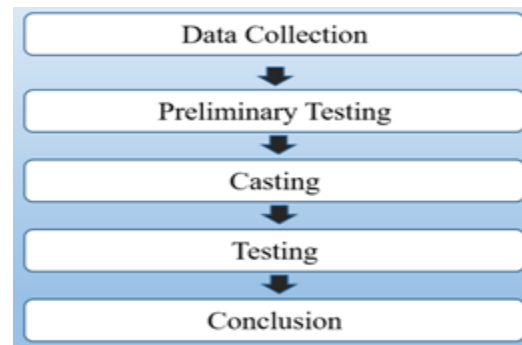


Fig 2. Casting of Concret hollow block with plastics

The mix ratio of concrete is taken as 1:3:6 (M10). Three moulds are made for casting. 500ml plastic water bottles are collected. Before mixing and casting of concrete 8 empty plastic water bottles(closed air tightly to obtain pressure and to have air void gap inside the hollow concrete block) which collected is placed inside each mould at some distance as shown in the image and rubber bands are used to keep the bottles in place (fig 2). One part of cement, 3 parts of sand and 6 parts of coarse aggregate are taken and mixed thoroughly with water. And hence the casting is done and kept for the setting. After setting, the hollow concrete block with plastic bottles is removed from the mould and kept for 7, 14 & 28 curing days. The results are higher for 14 & 28 days curing hollow concrete block with the plastic bottle is tested in UTM machine (fig 3). Hence, the compressive strength with used plastic bottles is found, the results are compared with the conventional concrete hollow block Table 1.

4.1 Physical Properties

- specific gravity
 - Cement (OPC) – 2.79
 - Fine Aggregate (M Sand) – 2.67
 - Coarse Aggregate (Sieve size < 12mm) – 2.54
- Plastic Water Bottles – 500ml air tight plastic bottles of height 200mm and diameter 60mm

4.2 Description of Mould

- Size – 400mm x 200mm x200mm
- 8 numbers of plastic bottles arranged in each mould

4.3 Density of Concrete Hollow Block

- Hollow Block (conventional)- 1570 kg/m³
- Concrete Hollow Block with used Plastic Bottles - 1544 kg/m³

4.4 Compressive Strength of Hollow Block

- Concrete mix ratio (cement, sand & coarse aggregate) – 1:3:6
- Water Cement Ratio – 0.6

TABLE 1

COMPRESSIVE STRENGTH OF HOLLOW BLOCK

<i>Compressive Strength of concrete hollow block & Concrete Hollow Block with Plastic Bottles</i>			
<i>Curing days Description</i>	<i>7 days N/mm²</i>	<i>14 days N/mm²</i>	<i>28 days N/mm²</i>
<i>Conventional Hollow Block</i>	8.64	9.69	10.25
<i>Concrete Hollow Block with Plastic Bottles</i>	8.33	11.74	13.45



Fig 3. Testing of Concrete Hollow Block with and without plastic bottles

5 RESULT AND DISCUSSION

- 1.The compressive strength increases by increasing the curing periods. It shows an approximate increase of 40% than conventional blocks.
- 2.The results compared with conventional block shows higher results are obtained in 14 & 28 days of curing.

6 CONCLUSION

This study found the strength of plastic bottled concrete blocks which gives an increase in compressive strength of increasing the curing days when compared with conventional blocks. To find practical usage, further research should be carried out so that the other properties and environmental benefits can be confirmed the practice of using water bottles inside concrete blocks.

7 REFERENCES

- [1] R. Ahmad, M I Malik, M U Jan, P Ahmad, H Seth, J Ahmad "Brick Masonry and Hollow Concrete Block Masonry – A Comparative Study", international journal of civil and structural engineering, Vol. 1, Issue 1, pp (14-21), October 2013-March 2014.
- [2] M K Maroliya, "Load Carrying Capacity of Hollow Concrete Block Masonry Wall", International Journal of Engineering Research and Applications, Vol. 2, Issue 6, pp (382-385), November- December 2012.
- [3] B. Amiri, G L. Krause, and M K. Tadros. "Lightweight High-Performance Concrete Masonry-Block Mix Design, Materials Journal, Volume: 91, Issue: PP (495-501), 1994.
- [4] S R. De Silva Chandrakeerthy. Compressive Strength Test for Low-Strength Cement Blocks, Journal of Structural Engineering , Vol. 117, Issue 3, 1991.
- [5] S M. Palmquist, D C. Jansen, and C W. Swan, "Compressive, Behavior of Concrete with Vitrified Soil Aggregate", Journal of Materials in Civil Engineering Volume 13, Issue 5 , pp (389-394), October 2001.
- [6] D C.Stahl, G. Skoraczewski, P.Arena, and B. Stempski, "Lightweight Concrete Masonry with Recycled Wood Aggregate" , Journal of Materials in Civil Engineering, 116-21, 2002.
- [7] S M. Wonderlich, "Strength of concrete masonry units with plastic bottle cores", Thesis for graduation of Master of Science degree, Department: Department of Architectural Engineering and Construction, Kansas State University. 2014.
- [8] ASTM Standard C140, 2012 (2014), "Standard Test Method for Sampling and Testing Concrete Masonry Units and Related Units." ASTM International, West Conshohocken, PA.
- [9] ASTM Standard C1552, 2012 (2014), "Standard Practice for Capping Concrete Masonry Units, Related Units and Masonry Prisms for Compression Testing." ASTM International, West Conshohocken, PA.