CHAPTER 4
Improving the compressive Strength of Hollow Block in Using Fibers

Prof. M. Vadivel
Nehru Institute of Technology, India
Prof. S. Sukumar
Nehru Institute of Technology, India
Ar. S. Sundar
Nehru School of Architecture, India
Ar. S. Stella Mary
Nehru School of Architecture, India

ABSTRACT

Study involves two different types of techniques for concrete hollow blocks. Comparing reinforced hollow blocks with their structural behavior to that of an ordinary hollow block The comparisons are based on the result, both before and after the specimens were subjected to uniform loading up to initial failure. It was show that the success depended on the mode of failure of the concrete hollow block. This paper presents the results of experimental test carried out on partial replacement of sand with quarry dust and fly ash as it affects the compressive strength of concrete hollow blocks. Mix proportions (1:3:6)were used with fibre content varying between 0.5%and2.5% of total volume at regular intervals. Machine compaction method was used. Curing was done by sprinkling water on the specimens. The results showed that for each mix proportion and compaction method, the compressive strength increases with increase in fibre content

Keywords: *hollow blocks. , Mix proportions, compressive strength, concrete hollow blocks etc*

INTRODUCTION

Hollow and solid cement concrete blocks known as hollow block, have been developed as an alternative to bricks. The products are widely used in construction activity. The blocks are made of cement , stone chips ,stone dust and sand are not only cheaper than bricks but have other specialities as well , These blocks have more compressive strength the walls constructed from these blocks act as thermal insulators because of their hollowness . Cement hollow blocks have an important place in modern building industry.

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They are cost effective and better alternative to burnt clay bricks by virtue of their good durability, fire resistance, partial resistance to sound , thermal insulation , small dead load and high speed of construction . concrete hollow blocks being usually larger in size than the normal clay building bricks and less mortar is required , faster of construction is achieved . Also building construction with cement concrete hollow blocks provides facility for concealing electrical conduit , water and sewer pipe wherever so desired and requires less plastering

MARKET

As the construction activity is growing day by day, there is a good demand for hollow concrete blocks . these blocks find wide applicability and construction cost is largely reduced . it is also observed that there is good demand for housing activity among tribels . Cement concrete hollow blocks are modern construction materials and are used in all the construction materials and are used in all the construction viz. residential , commercial and industrial building constructions . Construction industry is a growing sector . The demand for this product is always high in all cities and other urban centres due to construction of residential apartments , commercial buildings and industrial buildings . Growing public awareness about the advantages of the product , coupled with increase in the government and financial institute support for housing which is a basic human necessity that would ensure a healthy growth in the demand .

LITERATURE REVIEW

1. **O.E. ALUTU AND A. E . OGHENEJOBO** (civil engineering Department , university of Benin , Benin city , Nigeria) Strength and durability of cement – stabilized hollow blocks made with laterite soils at three different locations in Edo state were studied. To this end, blocks were produced with water content at about the optimum moisture with varying percentages of cement from 3% to 15% at 2% increments and comp active pressures ranging from 3.44N/mm2 to 17.20N/mm2 . The result showed that for 7% cement content and 13.76N/mm2 compactive pressures , blocks of strength of at least 2.0N/mm2 at 28 days , could be produced . The blocks showed no features of wear after exposure to rain with weight losses with in permissible limits after 12 cycles of wetting – brushing – drying . cost analysis showed that laterite blocks have 405 cost advantage over similar sand crate blocks.

2. **FINITE ELEMENT ANALYSIS OF INTERLOCKING MORTARLESS HOLLOW BLOCK MASONRY PRISM** Computer & structures , volume 86, issue 6, march 2008, pages 520-528 waleed A.M. Thanoon , Ahmed H . Alwathaf , Jamaloddin Noorzaei , mohd. Saleh jaafar ,mohd. RazaliAbudulkadir. Interlocking mortarless masonry system has been developed as an alternative system for the conventional bonded masonry . This paper covers the analysis of interlocking morterless hollow concrete blocks system subjected to axial compression load using FEM. An incremental iterative finite element code is written to analysis the masonry stem till failure. The stress- strain relation obtained from test is employed and equivalent uniaxial strain concept is used to account for the material nonlinearity in the compression stress field . The developed program is also capable of simulating the nonlinear progressive contact behaviour of dry joint taking into account the developed FE program and the experimental test results .

3. **DEVELOPMENT OF AN INNOVATION INTER LOCKING LOAD BEARING HOLLOW BLOCK SYSTEM IN MALAYSIA** Construction and building materials, volume 18, issue 6, july2004, Page 445-454. Waleed A Thanoon, Mohdsalehjaafar, mohdrazali Abdul kadir, Abang Abdullah Abang Ali , D.N Trikha, Amad M.S Najm The paper describes the development of a new interlocking hollow block masonry system appropriate for load bearing masonry wall construction. The developed system is an alternative to the traditional bonded masonry system where the blocks in the wall are integrated through mortar layers. In the system developed, the blocks are stacked on one another and three- dimensional interlocking protrusions are provided in the blocks to integrate the blocks into walls. This paper includes the background, concept and procedure used to develop an efficient interlocking hollow block system, Which may be used in the construction of load bearing walls. Twenty one different block models have been investigated and analysed with respect weight, bearing and shear area, shape, ease of production, ability to accommodate vertical and horizontal reinforcing stabilizing ties and efficiency of the interlocking mechanism under imposed loads. The blocks, developed under the name 'PUTRA BLOCK', have been used to construct a single-storey house at university pura Malaysia. The system provides a fast, easy and an accurate building system.

4. **LABORATORY-BASED PRODUCTIVITY STUDY ON ALTERNATIVE MASONRY SYSTEM** By J.Constr.Engg.And Mdmt. Volume 129, issue 3, pp.237-242(ASCE) This paper outline relative productivity assessment of conventional and interlocking-block masonry with different construction methods. To measure the utilization of time by the members of the team, work sampling was used. The frequencies of occurrences of each work category, namely direct, indirect, and non-contributory , have been established. Due to the variation in the non-contributory work component for different method of construction, the net output has been expressed as output per productive hour.

5. **COMPRESSIVE STRENGTH OF CONCRETE MASONRY PRISMS** By Tariq S. cheema and Richard E. klinger, journal proceeding,January 1,1986. Experimental tests on prisms and constituent material were used to calibrate linearly elastic finite element models for hollow and grouted concrete masonry prisms. These finite element models were then used to develop simplified relationships which closely predict the compressive strength and failure modes of prisms.

6. **BEHAVIOR OF CONCRETE BLOCK MASONRY UNDER AXIAL COMPRESSION**

By Robert G. Drysdale and Ahmad A. Hamid, journal proceeding, june 1, 1979. The results of 146 axial compression tests of concrete block masonry prisms were reported. The results show that the strength of grouted prisms are not affected much by the mortar joint. The average compressive strength for grouted prisms was less than for similar un grouted prism indicating that the concept of superposition of the strengths of grout and the un grouted prism is not valid. An explanation for this phenomenon is suggested which indicates that the incompatibility of deformation characteristics for the grout and the block contributes to this result

RAW MATERIALS

The concrete commonly used to make concrete blocks is a mixture of powdered Portland cement, water, sand and gravel. This produces a light grey block with a fine surface texture and a high compressive strength. A typical concrete block weight 38-43 Ib (17.2-19.5 Kg). In general, the concrete mixture used for block has a higher percentage of sand a lower percentage of gravel and water then the concrete mixture used for general construction purpose. This produces a very dry , stiff mixture that holds it's shape when it is removed from the block mould. If granulated coal or volcanic cinders are used instead of sand and gravel, the resulting block is commonly called a cinder block. This produces a dark grey block with a medium-to- coarse surface texture, good strength, good sound- deadening properties and a higher thermal insulating value then a concrete block. A typical cinder block weight 26-33 Ib (11.8-15.0Kg).

Lightweight concrete blocks are made by replacing the sand and gravel with expanded clay, shale , or slate. Expanding clay,shale and slate are produced by crushing the raw materials and heating them to about 2000F (1093C). At this temperature the material bloats or puffs up because of the rapid generation of gases caused by the combustion of small quantities of organic material trapped inside . A typical light-weight block weights 22-28 Ib (10.0- 12.7Kg) and is used to building non-load-bearing walls and partitions. Expanded blast furnace slags, as well as natural volcanic materials such as pumice and scoria, are also used to make lightweight blocks.

I addition to the basic components, the concrete mixture used to make blocks may also contain various chemicals, called admixtures, to alter curing time, increase compressive strength, or improve workability. The mixture may have pigments added to give the blocks a uniform colour throughout, or the surface of the blocks may be coated with a baked-on glaze to give a decorative effect or to provide protection against chemical attack. The glazes are usually made with a thermosetting resinous binder, silica sand , and colour pigments.

DESIGN

The shapes and sizes of most common concrete blocks have been standardized to ensure uniform building construction. The most common block size in the united states is referred to as an 8-by-8-by-16block, with the nominal measurements of 8 in (20.3 cm) high by 8 in (20.3 cm) deep by 16 in (40.6 cm) wide. This nominal measurement includes room for a bead of mortar, and the block itself actually measures 7.63 in (19.4 cm) high by 7.63 in (19.4 cm) deep by 15.63 in (38.8 cm) wide. May progressive block manufactures offer variations on the basic block to achieve unique visual effects or to provide desirable features for specialized applications. For example, one manufacture offers a blocks specifically designed to resist water leakage through exterior walls. The block specifically designed to resist water leakage through exterior.

CONCLUSION :

The following conclusions were drawn from the tests and results:

The compressive, flexural, horizontal shear and diagonal shear strength of hollow concrete block masonry walls were greater than brick masonry walls which are often used in building construction in Indonesia. This is due to the higher compressive strength of the hollow concrete block compared with the brick material and the confinement effect of the infilled concrete in its wall system. The flexural capacity of the reinforced hollow concrete block beam was higher than the ordinary reinforced concrete beam due to the confinement effect provided by the hollow concrete block on the infilled concrete. The flexural capacity of a reinforced hollow concrete block beam can be calculated based on the same theory as that of the ordinary reinforced concrete beam, which is based on the equilibrium of internal forces and moment. The shear capacity of the reinforced hollow concrete block beam was higher than the ordinary reinforced concrete beam due to the confinement effect provided by the hollow concrete block on the infilled concrete. The equation to calculate the shear capacity of reinforced hollow concrete block beam was proposed by considering the contribution of hollow concrete block. The confinement effect of the infilled concrete in the reinforced hollow concrete beam failed in flexural and also caused the infilled concrete to have the ability to deform more before its compression zone crushed since the ultimate strain of the confined concrete is much higher than the value for the unconfined concrete, thereby, causing the increase in its ductility. The ductility index of reinforced hollow concrete block beams that failed in flexural was 1.5 times that of the ordinary reinforced concrete beam.

The crack in the reinforced hollow concrete block beam failed in flexural propagation through the spacing between two hollow concrete blocks. The centric axial strength of the reinforced hollow concrete block column was found to be lower than the ordinary reinforced concrete column due to the lack of good bond between infilled concrete and hollow concrete blocks, which led to separation under axial compression, thereby causing the load to be carried only by the core concrete and reinforcing steel.

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