International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 7 (2018) pp. 270-273

STRENGTH STUDY ON REINFORCED HOLLOW CONCRETE BLOCK MASONRY

Anusha G Krishna
Assistant professor, Department of Civil Engineering,
REVA University, Rukmini knowledge park, Kattigenahall, Yelahanka.
Bengaluru- 64, Karnataka, India.

Abstract
Masonry can be termed as the compounding of building units joint with the help of cementitious material required to function. Reinforced Masonry was introduced to increase the durability and strength of Free Masonry and to overcome the tensile strong point. Coating of reinforcement in the Masonry structures increases the ductility and also provide better shear strength under seismic effect. In this survey we will be using hollow concrete blocking as a masonry unit and we will compare the strength obtained in reinforced and unreinforced masonry. In this work reinforced and unreinforced hollow concrete block masonry optical prism are tested to monitor the behaviour under axial compression and shear strength. Half masonry wall for both reinforced and unreinforced are tested to study the flexural strength. In this experimental studies were carried out to compare the strength of reinforced and unreinforced hollow concrete block masonry under compression, shear and bending. Initial examination was carried out on 200mm hollow concrete block, mortar, and concrete to obtain basic properties. Three trials were carried out on reinforced and unreinforced masonry optical prism which were casted and tested under compression and shear. And masonry wall with both reinforced and unreinforced were tested under in loading framing after 28 days of hardening. The comparing will be carried out to find the increase in strength after providing steel reinforcement in the masonry.

Keywords: Key Words: Reinforced Concrete Hollow Block Masonry, Unreinforced Masonry.

Introduction

Masonry may be termed as the compounding of building social unit joined with the help of cementitious materials accepted joining material to perform required function. Based on structural perception masonry can be classified into two types- Knit masonry and Reinforced masonry.

Plain masonry is one where the building units are bonded (or joined) with the help of cementitious material without any strengthened. This type of masonry gives little tensile strength- hence it cannot be used in horizontal members like beams, slabs and also for column where it is subjected to tensile tension due to loading. Similarly, reinforced masonry is a type of masonry where reinforcements are used to improve plain stitch masonry and improve its strength in both tension and compression.

1. Methodology

The Conventional tests is adopted on

a. Unreinforced HCBM

b. Reinforced Concrete Hollow Block Masonry. 8mm DIA reinforcement were tried prior to experiments on RCHBM. All the staple properties of Hollow concrete, Mortar and

EXPERIMENTAL INVESTIGATION

In present investigation the prism specimens, masonry triplets and masonry wallet were casted using concrete hollow block of dimension 400×200×200 mm for Compressive test, Shear test and Flexure test respectively. In all cases, Fe-415 steel of diameter 8 mm were taken for reinforcement in RHCBM and 53 grade of ordinary Portland cement was used. The cement mortar 1:6 with w/c ratio 0.7 obtained by Flow table test was adopted. M20 grade concrete has been used for filling the cells of block in RHCBM. Totally three number of Reinforced concrete hollow block masonry prisms (RCHBM), using 8 mm diameter bar and three number of unreinforced masonry prisms were casted for Compression test and shear test. Similarly, three number of masonry wallet in two sets were casted and tested for flexure test.

Fig -1: Masonry triplet Specimen after casting

Fig -2: Masonry wallet after casting

Fig -3: Setup for Shear test

Fig-4 :Setup for Compression test

Fig -5: Setup for flexure test

Table1: Basic Properties of Hollow Concrete Block

Sl. No	Name of the Test	Test Results	Unit
1	Dimensionality	401.63x152.07x199.3	mm
2	Dry density	1.163	g/cc
3	Water absorption	5.33	%
4	Initial rate of absorption	1.25	kg/m²/min
5	Flexural strength	1.92	N/mm²
6	Compressive strength	6.08	N/mm²
7	Modulus of Elasticity	5898	MPa

Table -2: Basic Properties of Cement Mortar

Sl.No	Name of the Test	Test Results	Unit
1	Compressive strength	10.23	N/mm²
2	Flowability	0.7	-

Table -3: Compressive strength of URM at 28 days

Specimen no.	Load at failure (kN)	Compressive strength MPa	C.F=1.2
1	600	7.5	9
2	560	7	8.4
3	550	6.87	8.224
Mean flexure strength MPa		7.12	8.54

Table -4: Compressive strength of RHCBM-8ϕ at 28 days

Specimen no.	Load at failure (kN)	Compressive strength (MPa)	C.F=1.2
1	710	8.87	10.64
2	690	8.62	10.34
3	650	8.12	9.74
Mean flexure strength MPa		8.53	10.24

Table -5: Shear strength of URM at 28 days

Specimen no.	Load at failure (kN)	Shear strength (MPa)	C.F=1.2
1	150	1.21	1.45
2	120	0.96	1.15
3	130	1.04	1.24
Mean flexure strength MPa		1.07	1.28

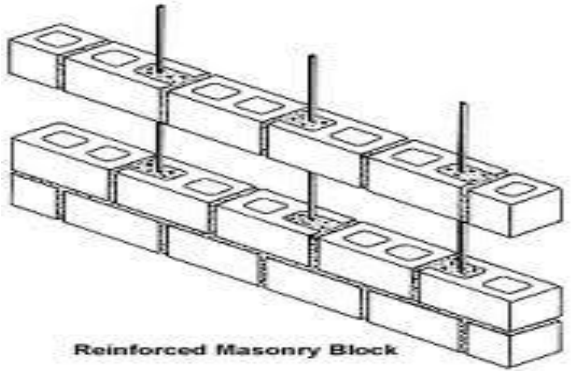
Table -6 Shear strength of RHCBM-8ϕ at 28 days			
Specimen no.	Load at failure (kN)	Shear strength (MPa)	C.F=1.2
1	300	2.4	2.88
2	320	2.56	3.07
3	290	2.32	2.78
Mean flexure strength MPa		2.42	2.91

Also, an attempt has been made to calculate the load carrying capacity of RHCBM using the mechanics based approach and the details are mentioned below.

Table -7: Flexure strength of URM wallet at 28 days			
Specimen no.	Load at failure kN	Flexure strength (MPa)	C.F=1.2
1	210	0.83	0.99
2	230	0.93	1.11
3	200	0.81	0.97
Mean flexure strength MPa		0.85	1.02

Table -8: Flexure strength of RHCBM wallet			
Specimen no.	Load at failure kN	Flexure strength (MPa)	C.F=1.2
1	450	1.83	2.19
2	480	1.96	2.35
3	492	2.00	2.4
Mean flexure strength MPa		1.93	2.31

Table -9: Comparison of Reinforced and unreinforced masonry			
Sl.no	Tests	Reinforced Avg. strength (MPa)	Unreinforced Avg. strength (MPa)
1	Compressive test	10.24	8.54
2	Shear test	2.91	1.28
3	Flexure test	2.31	1.02



CONCLUSIONS

The present investigation focuses on the axial load carrying capacity of RHCBM based on the experimental and analytical investigation of the following:

1) Water absorption of HCB is found to be 5.33%.
2) 1.163 g/cc is the Block Density of HCB is found
3) IRA for HCB is found to be 1.25 kg/m^2/min.
4) The average flexural strength of HCB arrives to 1.92 N/mm^2. This is indeed very high compared to conventional masonry units, because these HCB's are manufacture for a design mix under good quality control
5) The average compressive strength and modulus of elasticity of concrete hollow blocks is found to be 6.08 N/mm^2 and 5898 Mpa.
6) The average Compressive Strength of Mortar Cube (1:4) with a w/c ratio of 0.7 is found to be 10.23 Mpa for 28 days.
7) The average Compressive Strength of RHCBM-8ϕ (reinforced using 8 mm bar) is found to be 10.24MPa and umreinforced is found to be 8.54MPa
8) The average Shear Strength of RHCBM-8 ϕ (reinforced using 8 mm bar) is found to be 2.91 MPa and for unreinforced is was found to be 1.28MPa
9) The average Flexure strength of RHCBM wallet is found to be 2.31MPa and for unreinforced is was found to be 1.02 MPa

REFERENCES

[1]. Beer Johnston De Wolf, "Mechanics of Materials", 2004, Mc-Graw-Hill New York.

[2]. Jagadish.K.S, Venkataraman Reddy B.V, Nanjunda Rao K.S (2009), "Alternative Building Materials and Technologies" New Age International Publisher

[3]. Narendra taly (2007), "Design of Reinforced Masonry Structures" Mc-Graw-Hill Publicatin, New York

[4]. IS: 456-2000 "Code of Practice for structural plain and reinforced concrete", BIS Publication, New Delhi

[5]. IS: 1905-1987 "Code of practice for structural use of un-reinforced masonry", BIS Publication, New Delhi

[6]. IS: 2185(Part I)-1979 "Specification for concrete masonry units", BIS Publication, New Delhi

[7]. IS: 2250-1981 "Code of practice for Masonry mortars", BIS Publication, New Delhi

[8]. BibianaLuccioni[1] and Viviana C. Rougier[2] (2010), "In-plane retrofitting of masonry panels with fibre reinforced composite materials", [1]Structures Institute, National University of Tucumán, Argentina, [2] National Technological University, Uruguay.

[9]. Claudio Modena (2001), "Reinforced and Rectified Clay blocks masonry**",** University of Padua, Padua, Italy

[10]. Raghunath s. (2003) "Static and Dynamic behavior of Brick Masonry with Containment Reinforcement", PhD Thesis submitted to Dept of Civil Engineering, IISC, Bangalore

[11]. Dhanasekar M (2003), "Effect of Grout Comfinement on the Compressive Strength of masonry", Journal of Institute of engineers, New Delhi.

[12]. Hemanth Kumar.M.N, " Flexural and Shear Strength of Hollow Concrete Block Masonry Prisms under Normal Stress" , M.Tech Thesis submitted to Dept of Civil Engineering, BMS College of Engineering,

V.T.U Belgaum

[13]. M.Corradi[1], C. Tedeschi[2], L. Binda[2], A. Borri[1](2007), "Experimental evaluation of shear and compression strength of masonry wall before and after reinforcement: Deep repointing", [1]Department of Civil and Environmental Engineering, University of Perugia, Italy , [2]DIS-Dept. of Structural Engineering, Politecnico of Milan, Italy, Available online Science Direct

[14]. Matthias Ernst[1], Gert König[2], "Shear Strength and Compressive Strength of Reinforced perforated clay block masonry", [1] Institute für Massivbau, TH Darmstadt, now Ingenieurbüro BUNG , [2] Institute für Massivbau und Baustofftechnologie i. Gr.,Universität Leipzig

[15]. Manih.S, " Experimental and Analytical Studies on Reinfoced Masonry", M.Tech Thesis submitted to Dept of Civil Engineering, BMS College of Engineering, V.T.U Belgaum

[16]. Petras Pukelis, "Estimation in LST EN 1996-1-1 of Influence of Transversal bed joint reinforcement on Compressive Strength of Masonry", Dept of Reinforced Concrete and Masonry Structures, Vilnius Gediminas Technical University, Saulėtekio al.

[17]. Oliviera (2008), "Axial compression behavior of concrete masonry wallettes strengthened with cement