

Experimental Study on Solid Block Masonry Prism with Varies Mix Combination of Cement Mortar

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Abstract: This experimental study is carried out to determine the efficiency of wire meshes in strengthening of masonry wall. Masonry walls have been built by solid block and three cement mortar mix ratios are used which are such as 1:3, 1:5, and 1:6. Total of six walls have been built, in which three walls wire meshes are used before plastering and the other three walls are plastered without wire meshes. The parameters such as ultimate load for masonry and basic tests values for solid block are identified. This paper have emphasized the practice of using wire mesh in masonry structures, which will have high performance when compared to the masonry units without wire mesh.

Index Terms—Masonry block, Solid Blocks, Wire Mesh, Ultimate load.

I. INTRODUCTION (HEADING 1)

In this project we have built masonry units with the use of solid blocks and we have confined it with and without wire mesh in various cement mortar proportion of 1:3, 1:4, 1:5 & 1:6. All the masonry units are subject to Ultimate load testing by using the load frame. As preliminary work all the mortar proportion are casted and test for its compressive strength and the solid block is also test for ultimate load test, water absorption test, weight density test and efflorescence test are done in the solid block. All the result are tabulated and compared with all test results and best confinement methods has been emphasized in this paper.

II. CASTING

Casting of Mortar Cubes

Cement mortar is a mixture of cement, river sand and water. The materials are mixed with care and the mortar cubes of size 70.6 x 70.6 x 70.6mm were cast. The mortar cubes are cured for 28 days in laboratory. Then mortar cubes are tested in laboratory to get their compressive strength value and stress strain behavior. Mortar cubes of ratio 1:3, 1:5 and 1:6 were cast as per IS 1905: 1981.



Figure-1 Casting of mortar cubes

Casting of Solid Block Masonry Walls

A masonry wall is constitutes of brick and mortar that is constructed to serve as a test specimen for determining properties of masonry units. In this investigation, walls were constructed by assembling masonry units, one on top of the other, using cement mortar as the bonding material in the contact surface of the masonry units. The solid blocks were used for making the masonry walls. Cement and sand are used for making cement mortar of ratio 1:3, 1:5 & 1:6. The walls are constructed in stacked bond using cement mortar of thickness 20mm. Walls were cast for size of 1.02x0.82x0.1m with a mortar thickness of 20mm.



Figure 2 Casting of Solid Block Wall



Figure 3 Casting of Wire Mesh

Confining of Solid Block Walls

Solid block walls were confined with wire meshes as shown in figure 4 to increase its strength and durability. Then they were plastered as shown in figure 5 to provide a pleasing appearance. The wire meshes of 1mm thick were used for the confinement of wall.



Figure 4 Confining of solid block walls



Figure 5 Plastering of Confined solid block masonry walls

III. TESTING OF SOLID BLOCK

Test are carried out on solid block walls by using cement mortar proportion of 1:3, 1:5 and 1:6 confined with and without wire mesh.

The tests were carried out in solid blocks for determination of their properties. Tests carried out on bricks are as follows.

1. Compressive Strength Test
2. Water Absorption Test
3. Weight Density Test

And ultimate load carrying capacity of the masonry units is tested using loading frame.

IV. RESULTS AND DISCUSSION

In this chapter results and discussion based on the experimental investigation carried out on solid block masonry wall using different mortar proportion of 1:3, 1:5, 1:6.

The following test results are tabulated and discussed.

1. Basic Properties Test on Solid Block
2. Ultimate Load Bearing Test on
 - a. Solid Block wall confined with wire mesh using CM 1:3
 - b. Solid Block wall confined with wire mesh using CM 1:5
 - c. Solid Block wall confined with wire mesh using CM 1:6
 - d. Solid Block wall confined without wire mesh using CM 1:3
 - e. Solid Block wall confined without wire mesh using CM 1:5
 - f. Solid Block wall confined without wire mesh using CM 1:6

Properties of Solid Block

The basic properties of solid blocks such as compressive strength, weight density and water absorption are tested and their results are tabulated in Table 1.

Table 1 Test Result of Solid Blocks

Sl.No	Description	Solid Block
1	Compressive Strength (N/mm ²)	8.64
2	Water absorption (%)	10.74
3	Weight density (Kg/m ³)	24.35

Compressive Strength Test of Mortar Cubes

Compressive strength test was carried on mortar proportion of 1:3, 1:5 and 1:6 by casting cubes of size 70.6mm x 70.6mm x 70.6mm. Totally 6 specimens were tested for determining compressive strength test results of mortar.

Table 2 Compressive Strength Values of Mortar

Sl.No	Mortar Ratio	Compressive Strength (N/mm ²)
1	1:3	12.5
2	1:5	11.30
3	1:6	9.2

Ultimate Load on Solid Block Masonry Walls

In this section ultimate load capacity of the masonry is tested and the result were tabulated in table no 3. By using the results of the ultimate load, ultimate stress is calculated for all masonry units.

Table 3 Ultimate Load and Stress Obtained For Walls

SI NO	Cement Mortar	TYPE OF WALL	ULTIM-ATE LOAD (KN)	ULTIMA-TE STRESS (N/mm ²)
1	1:3	C _C	2009.4	19.7
2	1:3	Ordinary	1601.4	15.9

3	1:5	C _C	1621.8	15.7
4	1:5	Ordinary	1142.4	11.2
5	1:6	C _C	1132.2	11.1
6	1:6	Ordinary	867	8.5

The above table shows the different ultimate load bearing capacities of the different walls, which clearly explains that the masonry walls built using solid block with wire mesh shows better results. So it is clear that the wall that is built using solid block confined with the wire mesh shows better performance against loading than the other types of walls.

V. CONCLUSION

From the results it is very clear that the confinement which is provided using wire mesh has the better load carrying capacity when compare with the other masonry which doesn't have the wire mesh in confinement. And for confinement using of cement mortar 1:3 will have better performance, this is because of its high ultimate load carrying capacity of the cement mortar mix ratio. But the section of the cement mortar ratio will depends upon the environment, type of wall, internal wall plastering or external wall plastering. If the wall will not carry much higher load or non-load bearing wall cement mortar mix of 1:6 is enough, because literally the wall doesn't carry any structural loads and so the wall is constructed only for the purpose of the partition and as enclosures.

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