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Improving Strength in Brick Column by Providing Electro Welded Wire Mesh

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***Abstract:** This research paper has been selected to explore the procedure of making the brick masonry columns more strong and durable in resisting the compressive forces by using the wire mesh and hence reduces the cross sectional area of column, which increases our floor area. The size of wire mesh is2mm diameter of wire and 15mm X 15mm spacing. Three samples of sizes 9 inch X 9 inch have been used. Out of which the sample no. 1 is simple and In sample no. 2 & 3 wire mesh have been placed in the odd and even mortar joints (coarse no.1, coarse no.3, coarse no. 5 & coarse no. 2, coarse no.4). The ratio of Cement & Mortar is kept same for all the samples i.e. 1:3 (one part of cement and three parts of sand). The tests shows that the sample no.2 gave the strength 1.9 times the strength of sample no. 1 and sample no.3 gave the strength 1.8 times the strength of sample no.1. Thus the columns become stronger and columns also show ductile behavior during failure.*

I. INTRODUCTION

A. General

Brick masonry columns are constructed in a variety of structures – homes, private and public buildings. Their main function is to resist the compressive forces. But due to the least compressive strength many brick masonry units especially columns become unsafe and require economical, safe and easy techniques to meet the required needs.

In this study, brick masonry columns were strengthened by using wire mesh of same size and it was kept in mind that the conditions suit to the actual site conditions and not the laboratory conditions, so that's why all the columns were casted in open air fully expose to the atmospheric conditions and the method of casting resemble to the general practice. In this study effort has been made to increase the compressive strength without increase in the cross – sectional area and the dead load of columns using commonly available wire mesh.

B. Scope and limitations

The study deals with the application of wire mesh in the horizontal mortar joints. The following parameters are kept constant in the study

1) Ratio of mortar for brick masonry work equal to 1:3 (1 part cement, 3 parts sand).

2) Size of brick masonry columns equal to

9 in. x 9 in. x 20.5 in. (length x width x height).

3) Three samples with each sample having two sub samples that means total of 6 columns were casted of same size.

4) Two of the samples are reinforced with a wire mesh in between the brick courses (one in even courses and other in odd courses).

5) It should be noted that the grade of cement is OPC 53.

II. METHODLOGY

A. General

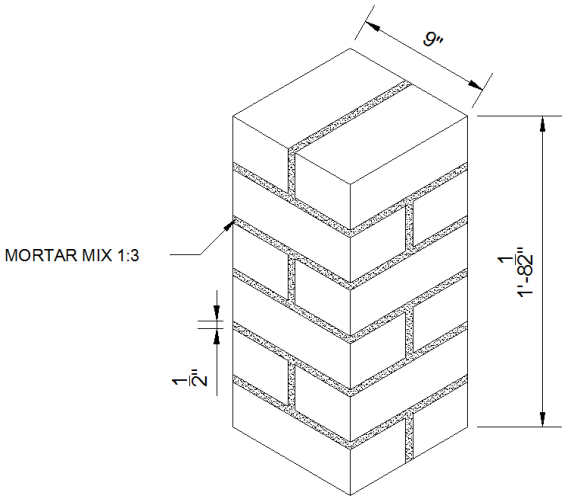
All the masonry columns were prepared under ordinary conditions having mix proportion of 1:3. There were 6 columns of same size. All the specimens were moist cured air dried in open air for 28 days before testing. The testing was carried out after 28 days of casting of specimens.

B. Procedures For Casting Different Samples

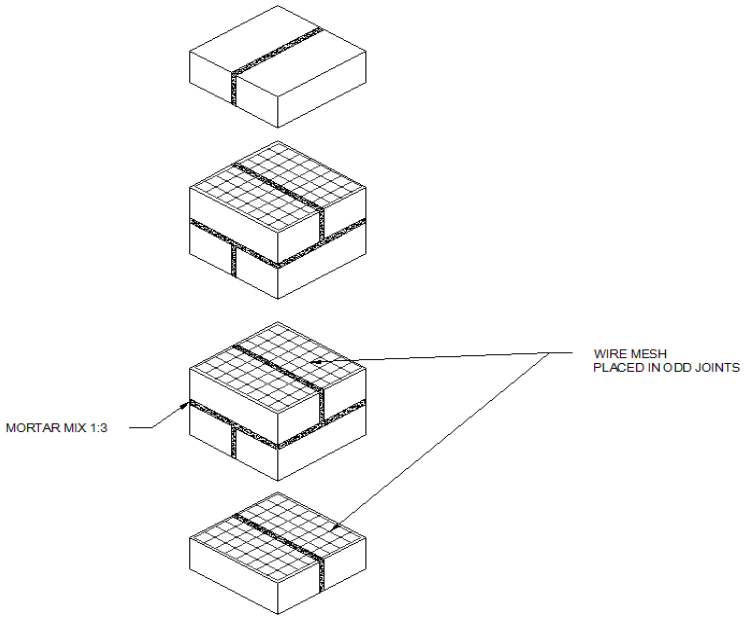
All the samples were casted with almost same procedure but the difference lies in the arrangement of providing the reinforcing materials. Before casting the bricks are soaked into the water for about 24hrs and then they are air dried. The next step is the preparation of the mortar in which the sand and cement are first dry mixed and then water is added to this dry mix. Water is added in such a way that the mortar becomes workable for a mason as it has to resemble with the general practice. The bricks are laid in such

a way that in the first course stretcher face is laid along the length and in the second course header face of the bricks are laid along the length. This arrangement is provided in order to break the continuity of the mortar joints. The procedures for casting of different samples are given below:

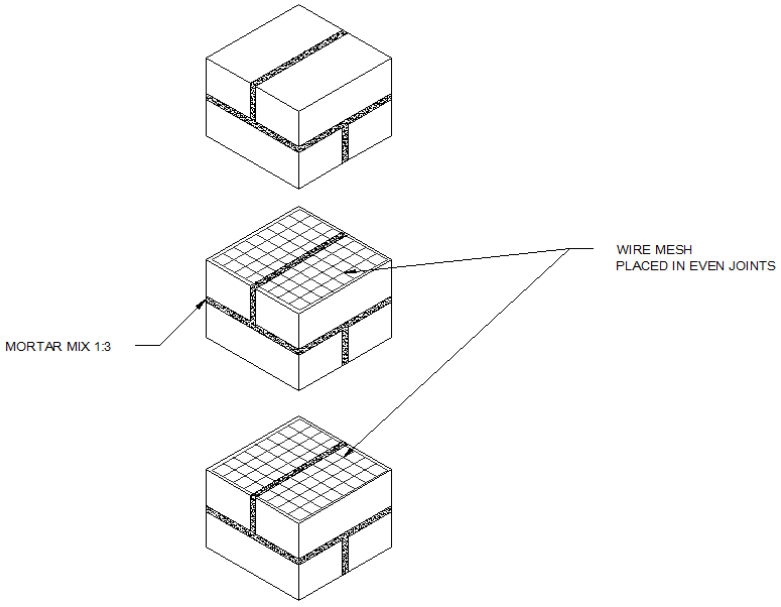
1) *Sample no. 1:* As discussed earlier that the sample no.1 is simple which means that it is not reinforced with any material. In this the bricks are laid on a prepared platform which is mainly of wood and the mortar thickness is kept ½ inch. As shown in figure below



2) *Sample no. 2:*In sample no. 5 wire mesh is embedded in the odd mortar joints in the form of squares of dimensions same as the column cross – section provided with a clear cover of about ¼ inch on all sides. As shown in figure below:



3) *Sample N3) :* In this sample wire mesh is embedded in the even mortar joints in the form of squares of dimensions same as the column cross - -sction provided with a clear cover of ¼ inch on all sides



C. Testing

1) *Test of sample no. 1:*In case of plane brick columns, all the two samples show brittle failure. Major cracks were vertical, however, few horizontal cracks were also observed. The vertical cracks passed through the joints and bricks, while horizontal cracks were through joints only. he cracks widening and propagation was quite fast after their first appearance. Near failure, the specimen demonstrated outwardbulging on all four faces. As shown in figure below:

Failure pattern of sample no. 1

2) *Test of sample no. 2:*In this case wire mesh is placed in the odd horizontal joints i.e. 1, 3 & 5. The column develops the very few minute vertical cracks on application of axial load. The vertical cracks fail to pass through the reinforced joints and no horizontal cracks were developed. The crack growth was quite stable and widening rate was much slower than the other samples. This slow rate of crack growth can be attributed to wire mesh presence inside the joints which helped in arresting the cracks during their propagation process.

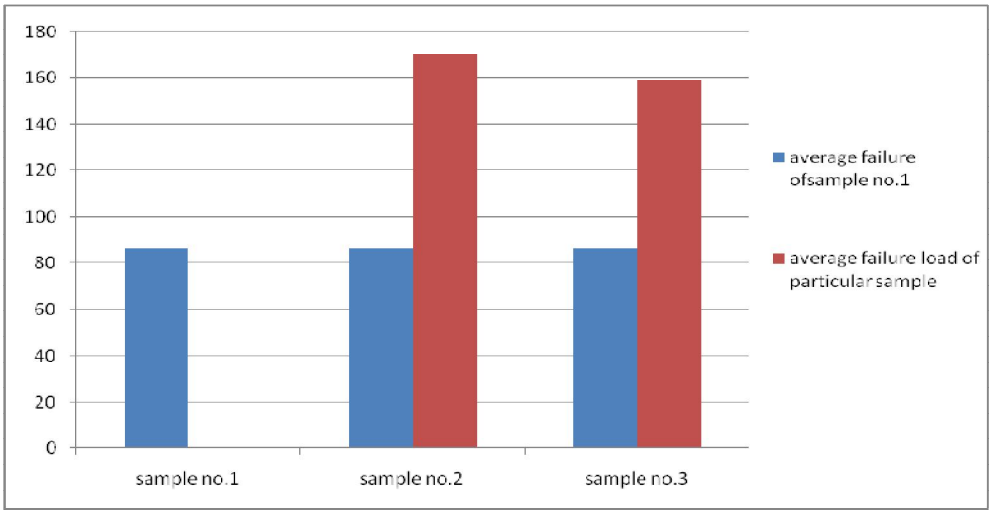
Failure pattern of sample no. 2

3) *Test of sample no. 3:*In this case wire mesh is placed in the even horizontal joints i.e. 2, 4. The column develops the major cracks vertically as well as horizontally while applying the axial loads. The vertical cracks fail to pass through the reinforced joints but the face of the column bulges out at the centre above the reinforced joint due to the restrictions developed by mesh. Near failure small chunks of bricks and mortar fell of the specimen, but no significant spilling was observed.

Failure pattern of sample no.3

SAMPLE NO.	SAMPLE DESCRIPTION	MAX. FAILURE LOADS OF SUB - SAMPLES	AVERAGE	PERCENTAGE INCREASE IN THE STRENGTH WITH REFERENCE TO SAMPLE NO.1
1	SIMPLE	86 KN 87KN	86.5 KN	_
2	WIRE MESH PLACED IN ODD HORIZONTAL JOINTS	186 KN 154KN	170 KN	96.5%
3	WIRE MESH PLACED IN EVEN HORIZONTAL JOINTS	132 KN 186KN	159 KN	83.8%

Test results of various samples



Comparison between the strengths of various samples

III. CONCLUSIONS

Firstly, the application of wire mesh enhances the compressive strength of brick masonry columns. As seen that the sample having wire mesh placed in the odd horizontal joints showed an increase in failure load upto 96.5% as compared to the simple brick masonry column.Wire mesh and mortar layer acts as a slab between. the respective joints prevents from the deep vertical cracks. Secondly,the cracking resistance and stable crack growth mechanism of simple masonry columnis improved due to the application of wire mesh. Lastly, he failure of brick masonry columns is very sudden and cracks widen rapidly after their formation leading to a brittle failure of the structure.

IV. ACKNOWLEDGEMENT

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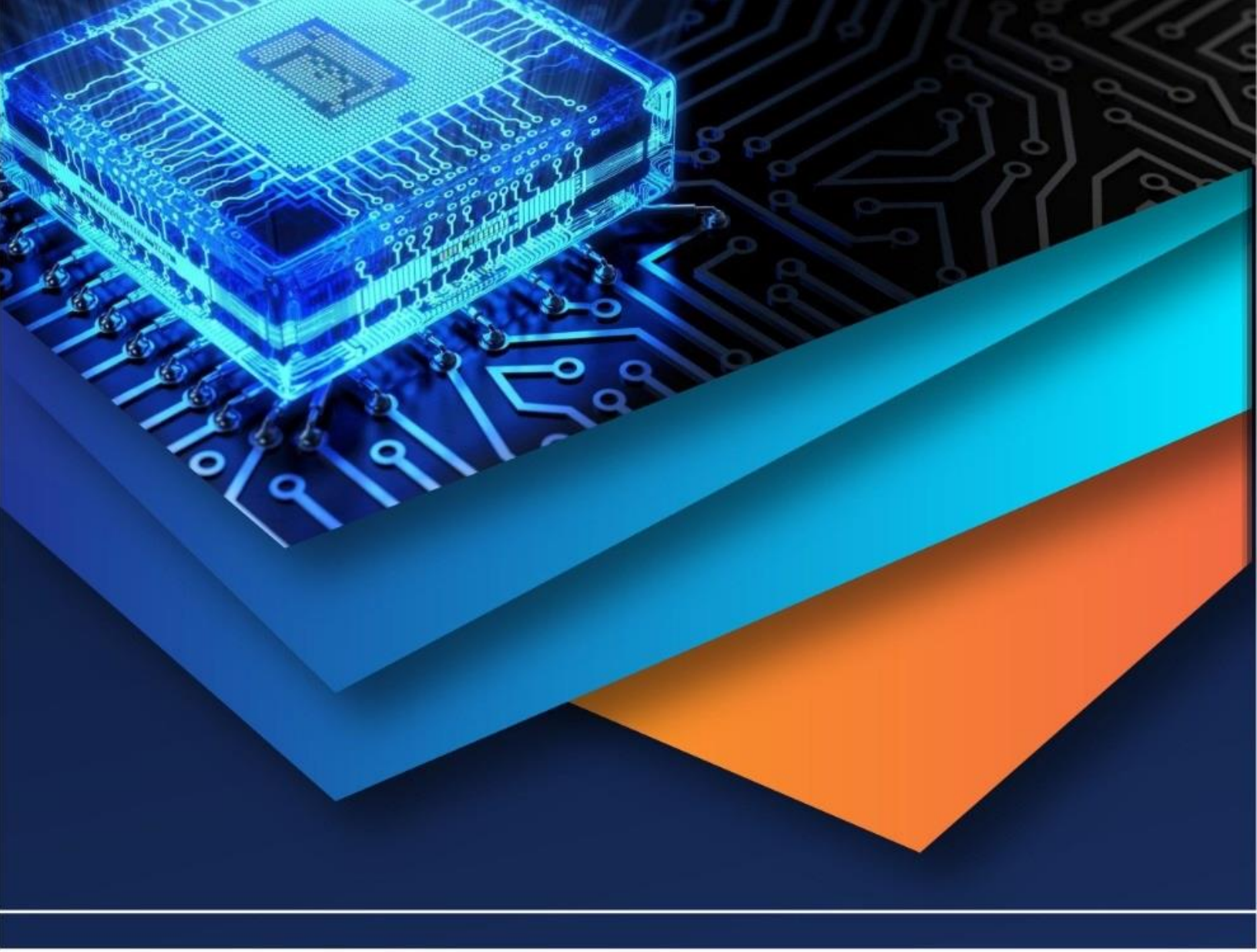

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