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Research Paper

Study of the Compressive Strength of Brick Prism of Normal Red Brick with Variation in Percentage of Recron Fibre with Cement Mortar of 1:6 And 1:8 Ratio

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ABSTRACT: *In cement mortar, randomly distributed fiber is generally used as Reinforcement to resist propagation of crack and also helpful to improve Strength and ductility behavior. The generally used fibers are mild steel fiber and polypropylene fiber. In the above said material fiber gives more stability than normal mortar. it is proved that fiber added brick work has more post-cracking flexural Stress, Toughness, ductility, compared to plain mortar material and in contrary to that recron fiber have also very good for considerable reduction of cracks during plastic and hardening stage as well as it protects corners in precast slab and concrete flooring. In this investigation an attempt that been made to study the compressive strength of brick prism of normal red brick with variation in percentage of Recron fiber with cement mortar of 1:6 and 1:8 ratio and behavior of brick masonry bonded with Recron fiber mixed mortar and compared with plain cement mortar bonded brick masonry.*

Keywords: *Compressive strength, Brick masonry, Cement mortar, Recron fibers, Normal Red Bricks.*

I. INTRODUCTION

The cement mortar structures are weak intension and strong in compression. Due to this the structure having low ductility and there are propagation of cracks .To avoid this problem generally narrow steel fiber, mild steel fiber, recron fibers, sugarcane bags fibers are used in the cement mortar to reinforce. This will improve the ductility and resist crack formation in the brick work. However there are some disadvantages in using recron fiber as there in for cement ,it is widely used in many areas. The recent studies shows that the recron fiber reinforced brick work attain its full strength. And also it is proved that the recron fiber added brick work has more capability to with stand more load, and has more crack resistance when compared with other materials added with cement mortar. This investigation and research attempted to understand mechanisms of bond developed between mortar and brick and conclude that the brick-mortar bond is essentially mechanical in nature. Improve the network of hydration products with the addition of lime, but there is in adequate evidence for bond strength improvement. In this research, 10 different mortars made with sets of combinations of OPC and polypropylene fiber(PPF),we reused with sand and cement. The compressive strength of masonry prisms, made of one brick long, three bricks high, were studied for each mortar at the age of 28 day. The study showed that the behavior of cement brick is superior to the silt brick .Compressive strength of masonry prisms were affected by mortar strength, addition of fiber. The used prism is recommended to be used as a mean of quality control. This research evaluated the effect of increased bond strength on compressive strength of masonry prisms without altering the brick and mortar characteristics .Brick mortar strength is poor, the prism failure is also accompanied by a failure of the brick mortar bond. Attempt has made to study the performance of cement mortar with recron fiber at various percentages. The recron fiber mixed mortar is used for analysis of compressive strength behavior in brick masonry. Experimentally investigated the increase in the compressive strength for the various percent age of recron fiber added with the various ratio of cement mortar in brick work at the thickness of mortar between brick layer. They use 6 no of brick to make one brick prism. They made brick cube for 0.5%, 1%, 1.5%, 2% of recron fiber with 1:6, 1:8, ratio of cement mortar for the thickness of cement mortar between brick layer of 12 mm.They have concluded that 1.25 % of fiber for 12 mm mortar thickness gives better result, when compared that other percent age of recron fiber and mortar mix ratios. In this study,

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investigations has been made to analyze the influence of bond strength on compressive strength of brick masonry.[1]

II. EXPERIMENTAL PROGRAMME

The main objective of the present investigation is to determine the optimum mix percentage to be mixed to obtain maximum compressive strength ,and to find the characteristic of brick masonry using cement mortar mixed with the optimum mix percentage of recron fibre.

Experimental program

1. Determination of physical properties of in gradients.
2. Casting of prism of bricks

2.1 Methodology

Six numbers of bricks are used to determine the compressive strength of brick prisms. Two types of bricks were used with size of red brick 225x100x75mm .Bricks are arranged in three layers, each layer hast numbers of brick .Each layer of brick is bonded with the 12 mm thickness of mortar.Recron fibre is added with the mortar in weight basis ,fibre is partially replaced for "wet mortar weight". We did only for12mm of mortar thickness. We made two samples for reach the average value of compressive strength is taken into account we made prisms for1:6,1:8 ratio of cement mortar ,each cement mortar mix prepared for the various percentage recron fibber added (reference (0%), 0.5% ,1% ,1.5%, 2%). Brick prisms are cured using gunny bags Compressive strength is determine 28 days curing time Compressive stress is determine using "Universal testing machine"[2]

2.2 Materials and Methods

Recron fibres are used with regular cement mortar of OPC 43 GRADE with Red bricks The details regarding the materials and their properties are discussed.

2.2 .1 Cement

43 grade, "Ordinary pozzolana cement" is used for cement. We used shree cement for this investigation The properties of cement were determined as per the IS 4031:1968 and results are given in the table no. 1

Table 1.: Properties of cement (as per the IS 4031:1968)

Properties	Values
Compressive strength	47.08 N/mm^2
Initial setting time	80 minutes
Final setting time	195 minutes
Standard consistency	29%
Specific gravity	3.10

2.2.2 Fine Aggregate

River sand was used as fine aggregate. Properties of natural aggregates. The properties should comply with the norms laid down in IS 383:1970 specifications for fine aggregates from natural sources for concrete. Aggregates should be chemically inert strong ,hard, durable of limited porosity free from the properties of the fine aggregates are in table no. 2

Table 2 : Properties of fine aggregates (as per IS 383:1970)

Sieve size	Cumulative retained Wt. in gm	Percentage Wt. Retained	Percentage passing	Percentage passing (zone III as per IS: 383-1970)
4.75 mm	27	2.7	97.3	90 – 100
2.36 mm	60	6.0	94.0	85 – 100
1.18 mm	186	18.6	81.4	75 – 100
600 µ	356	35.6	64.4	60 – 79
300 µ	584	58.4	41.6	12 – 40
150 µ	950	95.0	5.0	0 – 10
Pan	1000	100	0.0	Out of range

The fine aggregate confirms to be of ZONE III

Specific gravity = 2.48

Voids Content = 32.6%

2.2.3 Recron Fibre:

The properties of Recron fibres are provided in Table no.3

Table 3: Properties of Recron fibre

PROPERTIES	VALUES
Cut length	6mm or 12mm
Shape of fiber	special for improved holding of cement aggregates
Tensile strength	4000-6000 kg/ cm^2
Melting point	> 250°C
Dosage rate	Mortar Use CT 2012 (6 mm) at 125 gm /cement bag 1:4 cement/ sand ratio Optimize as per application

2.3 Compressive Strength Of Brick

Compressive strength of normal red brick are variable for different classes. It may vary from 30 kg/cm^2 to 70 kg/cm^2

(a) common building bricks = 30 kg/cm^2
(b) second class building bricks = 45 kg/cm^2
(c) first class building bricks = 70 kg/cm^2

Water absorption of brick after 24 hr. immersion,

(a) first class building bricks = 20%
(b) second class building bricks = 22%
(c) third class building brick = 25%

Compressive strength of normal red brick used = 42 kg/ cm^2
Water absorption of brick is = 19%
The brick used is second class brick
Compressive strength of normal red brick used = 82 kg/ cm^2
Water absorption of brick is = 7.0% [3]

2.4 Mix Proportion

The cement mortar mix used for the experimental study was 1:6 and 1:8.The quantity of materials required to makes to number of brick cube are in the given Table no.4.

Table 4 Mix Proportion Details

% of fibre	Sand In Kg	Cement In Kg	Fibre In Kg	Sand In Kg	Cement In Kg	Fibre In Kg
	1:6			1:8		
0%	30	5	0	40	5	0
0.5%	30	5	0.025	40	5	0.025
1%	30	5	0.05	40	5	0.05
1.5%	30	5	0.075	40	5	0.075
2%	30	5	0.1	40	5	0.1

2.5 Preparation and Testing of Specimens

Identify the brick prism
I/D = N60, N60.5, N61, N61.5, N62, N80, N80.5, N81, N81.5, N82
Where N = Normal red brick prism
6 = 1: 6 Mix cement mortar
8 = 1:8 Mix cement mortar
0, 0.5, 1, 1.5, 2 = Percentage of Recron fibre

2.6 Casting of Brick Prisms

Six numbers of locally available second class bricks were used to construct masonry of size 225 mm x 212 mm x 24mm and 225mm x 212 mm x 324 mm were constructed using cement mortar ratios 1:6,1:8 The required quantity of sand and cement is calculated previously according to the required cement mortar ratio. Then they mixed properly. Then recron fibre is added on the basis of weight of wet cement mortar. They mixed well, then brick cube prepared. The casted brick prisms were kept under normal atmosphere for next one day .Then it was kept under curing using gunny bags, process for a period of 28days.[4]

2.7 Compressive Strength Test for Brick Prisms

The compressive strength test is the most common test conducted because most of the desirable characteristic properties of mortar and the structural design purpose are quantitatively related to compressive strength. The test was conducted in calibrated compression test in machine of 50 ton capacity as per the specifications given in IS-3495. [5]The prisms were properly held in position to apply axial load gradually till the crushing load is reached. The test specimen with flat face horizontal and mortar filled face facing upward between plywood, and carefully cantered between plywood were tested for compression by axially applied load at the rate of 5KN per minute till the failure.[6]

III RESULTS AND DISCUSSIONS

The results of the compressive strength of brick prism of normal red brick with variation in percentage of Recron fiber with cement mortar of 1:6 and 1:8 ratios discussed and interpreted below

3.1 Results

The investigation was carried to determine the strength characteristics due to the influence of recron fiber mixed cement mortar in brick masonry.The preliminary investigation includes finding out of aspect ratio of recron fiber that can be mixed with cement mortar.[7] The compressive strength of brick masonry prism with mortar mix of 1:6 and 1:8 with the variation of recron fiber quantity percentage 0%, 0.5%, 1%, 1.5% and 2% were found. The addition of recron fiber in cement mortar was found to increase the compressive strength of mortar in all four cases. The curing was done with the help of gunny bags with water for 28 days. Then the specimens was tested for the compressive strength of the brick masonry.[8]
The results found after the testing of the different bricks prisms are given below in Table no. 5 and 6

Table 5 : Compressive strength of prism 1:6 normal red bricks in C / M mixed with recron fiber.

I/D	SIZE	LOAD	Area	Strength	Average Compressive Strength	% Change
	Cm^2	tonnes	Cm^2	Kg/Cm^2		
N60	21.5 X 22	11.3	473.0	23.89	23.8	zero
N60	22 X 22	11.5	484.0	23.76		
N60.5	22.5 X 22	13.0	495.0	26.26	26.4	10.92
N60.5	22 X 22	12.8	484.0	26.45		
N61	22 X 22	11.9	484.0	24.59	24.6	3.36
N61	22 X 22	11.9	484.0	24.55		
N61.5	22 X 22	11.0	484.0	22.73	23.6	- 0.84*
N61.5	22 X 22	11.8	484.0	24.38		
N62	23 X 22	11.3	506.0	22.33	22.7	- 4.62*
N62	21.5 X 22	10.9	473.0	23.04		

*Lower due to less workable mortar with high quantity of fibres

Table 6: Compressive strength of prism 1:8 normal red bricks in C/ M mixed with recron fiber.

I/D	SIZE	LOAD	Area	Strength	Average Compressie Strength	% Change
	Cm^2	tonnes	Cm^2	Kg/Cm^2		
N80	22 X 22	9.2	484.0	19.0	19.3	Zero
N80	22 X 22	9.5	484.0	19.6		
N80.5	23 X 22	10.5	506.0	20.8	21.0	8.80
N80.5	23 X 22	10.7	506.0	21.2		
N81	22 X 22	9.1	484.0	18.8	18.9	
N81	22 X 22	9.2	484.0	19.0		-2.07*
N81.5	22 X 22	8.9	484.0	18.4	18.0	
N81.5	22 X 22	8.5	484.0	17.6		-4.92*
N82	22 X 22	8.4	484.0	17.4	17.1	
N82	22.5 X 22	8.3	495.0	16.8		-6.73*

*Lower due to less workable mortar with high quantity of fibers

3.2 Interpretations For Compressive Strength

1. Compressive strength of N60 is 23.8 kg/cm^2
2. Compressive strength of N60.5 is 26.4 kg/cm^2 is 10.92% more than N60 prism
3. Compressive strength of N61 is 24.6 kg/cm^2 is 3.36% more than N60 prism
4. Compressive strength of N61.5 is 23.6 kg/cm^2 is 0.84% less than N60 prism
5. Compressive strength of N62 is 22.7 kg/cm^2 is 4.62% less than N60 prism
6. Compressive strength of N80 is 19.3 kg/cm^2
7. Compressive strength of N80.5 is 21.0 kg/cm^2 is 8.80% more than N80 prism
8. Compressive strength of N81 is 18.9 kg/cm^2 is 2.03% less than N80 prism
9. Compressive strength of N81.5 is 18.0 kg/cm^2 is 4.92% less than N80 prism
10. Compressive strength of N82 is 17.1 kg/cm^2 is 6.73% less than N80 prism
11. Results are shows that whatever the ratio of mix 1:6 or 1:8 and compressive strength of mortar is increases by mixing of recron fiber up to 0.5 % and then after the strength of brick masonry is decreases, even after the strength got the lower value in compression to the brick masonry having 0% fiber. When 0.5% of recron fiber is mixed with cement mortar, the strength was found to be 10.92% higher than ordinary cement mortar for 1:6 ratio cement mortar and 8.80% for 1:8 ratio cement mortar with normal red bricks 11.11% for 1:8 ratio cement mortar[9]
12. But when 1% of recron fiber is mixed with cement mortar ,the strength was found to be 24.6 kg/cm^2 lower than cement mortar with 0.5% recron fiber strength for 1:6 ratio cement mortar The strength is continuously decreasing when the percentage of recron fiber is increasing. [10]

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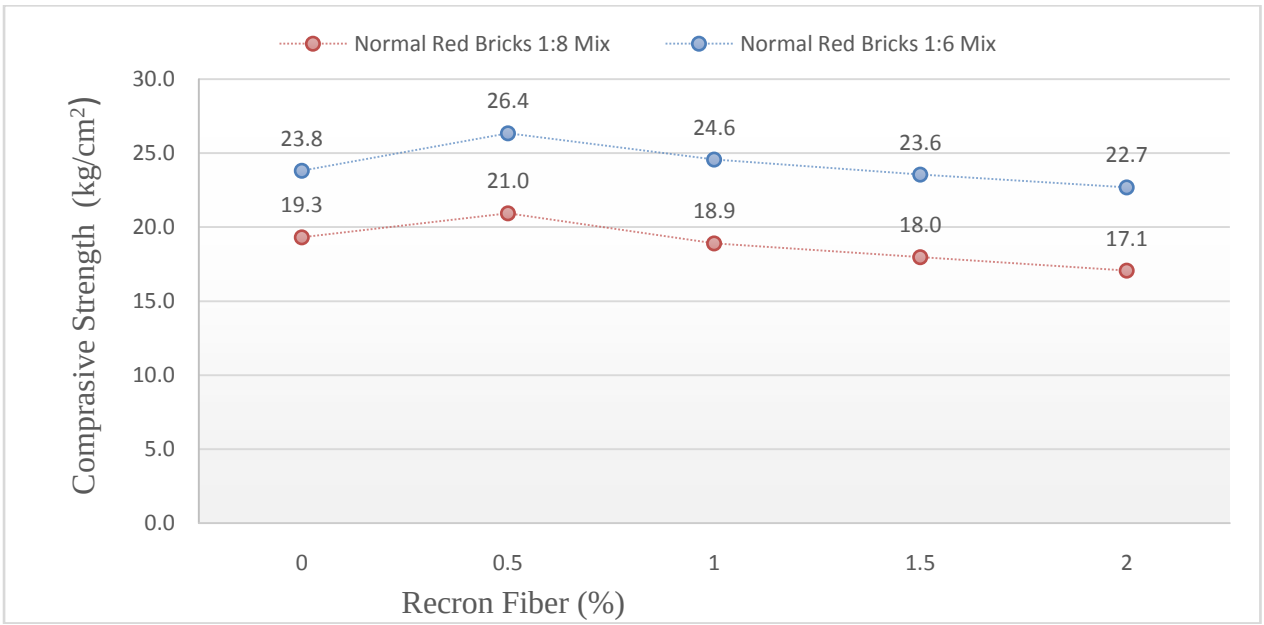

Figure 1: Comparison of compressive strength of normal red brick with 1:6 and 1:8 cement mortar ratio with various percentage of Recron fiber.

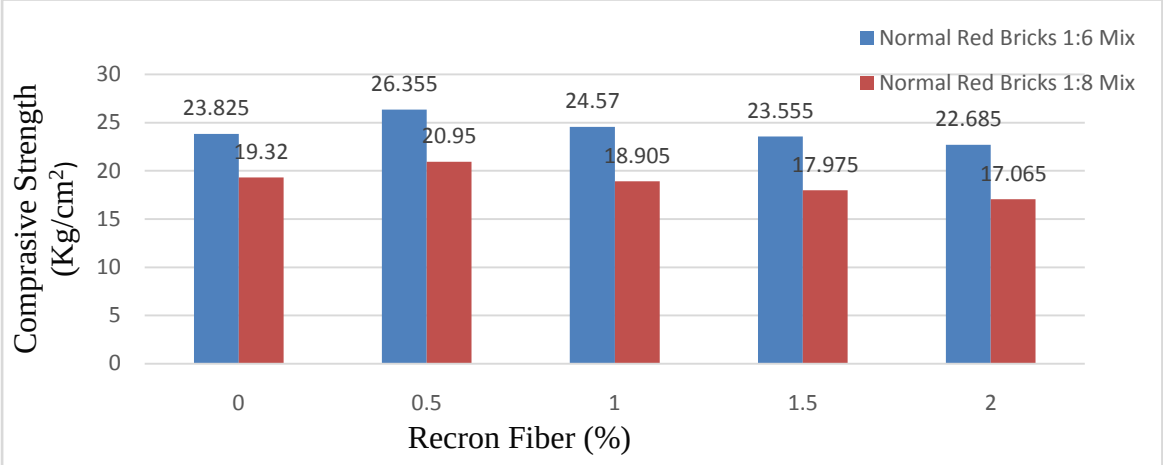

Figure 2: Comparison of compressive strength of normal red brick with 1:6 and 1:8 cement mortar ratio with various percentage of Recron fiber

IV CONCLUSION

The main conclusions drawn from investigation performed are as follow:

1. Compressive strength of cement mortar is increasing by mixing of recron fiber up to a optimum percentage of fiber then decreasing.
2. Compressive strength of cement mortar is also depends on the type of brick.
3. Optimum value of recron fiber is nearly equal to 0.5% bricks with mix ratios 1:6 and 1:8.
4. Percentage of decreasing the compressive strength of cement mortar is decreasing with a higher percentage of fiber.
5. Workability of mortar is decreasing when percentage of fiber is increases.
6. The study can be extended for the same combinations with the different ratio mortar as well as other admixture.
7. The study can be extended for flexural strength of mortar with different admixture.
8. The study can be extended for different heights of the brick prism.

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