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Preparation of Stability Report for Apartment and Techniques to be Adopted Based on the Report

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ABSTRACT: Concrete is the most widely used structural material in the world due to its inherent properties. The need to upgrade the deteriorated civil engineering infrastructure greatly enhances with the ever increasing demands. Ferrocement is ideally suited as an alternate strengthening component for the rehabilitation of reinforced concrete structures. Strengthening of damaged RC beams using ferrocement laminates which are directly glued into the tension face of the beam is adopted in this study. Totally six beams have been casted and out of the six beams, one beam is kept as control specimen. Firstly the control beam is applied for ultimate load and calculated the deflection. Secondly all the remaining five beams are damaged by applying 80% load and calculated the deflections. Finally the five 80% damaged beams are strengthened by wrapping with the ferrocement laminates in different volume fractions in soffits and sides with epoxy resin. Then the strengthened beams are again tested by applying ultimate load and calculated the deflection. Then the deflection, cracking performance and ultimate flexural strength of ferrocement laminated beams are compared with the control specimen and the result is analyzed. This shows that the ferrocement laminated beam 1,2,3,4&5 has an improvement of about 30% ,50% ,40% ,47% &45% of deflection against the control beam. The ferrocement laminate increases the ultimate load by about 50%. From this experiment found that the retrofitted beam carries more load carrying capacity and less deflection than the control beam due to increase in the volume fraction of the laminate.

I. INTRODUCTION

A structural assessment is a procedure utilized to check the adequacy. Structural integrity and soundness of structures and their components. An assessment is made to evaluate a structures current and future use and conformance to current building codes. There are different building assessment methods, and each specific method such as rating method and multi – criteria , decision making method has an evaluation mechanism in assistance with a group of assessment criteria.

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II. PRELIMINARY TEST

RESULTS

Rebound hammer test is conducted to check the existing condition of the structure all the beams in the structure is checked for rebound number. The results are as follows.

Sample No.	Compressive strength (Mpa)	Rebound Number	
		Horizontal	Vertical
B-1	15.88	25.34	21.63
B-2	15.33	25.00	20.23
B-3	10.57	25.10	24.15
B-4	15.19	24.60	20.15
B-5	6.15	16.50	13.67
B-6	8.30	18.50	16.90
B-7	13.94	22.30	18.56
B-8	11.25	20.30	16.18
B-9	9.37	19.50	17.10
B-10	9.52	20.30	17.20
B-11	14.14	22.60	19.00
B-12	10.57	25.10	24.15
B-13	15.19	24.60	20.15
B-14	6.15	16.50	13.67
B-15	8.30	18.50	16.90
B-16	13.94	22.30	18.56

Table 3.1 Rebound Hammer Test Results for Beam

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Sample No.	Compressive strength (Mpa)	Rebound Number	
		Horizontal	Vertical
4. MATERIALS USED			
Cement - 53 Grade			
C-1	15.12	21.00	17.18
C-2	15.33	24.50	19.23
Fine Aggregate			
C-3	10.57	25.10	24.15
C-4	15.19	24.60	20.15
Coarse Aggregate (4.75mm)			
C-5	6.15	16.50	13.67
C-6	10.34	25.50	20.36
C-7	13.94	22.19	17.65
Weld Mesh			
C-8	10.57	25.10	24.15
C-9	6.15	16.50	13.67
Epoxy Resin (COROCRETIN IHL - 18)			
C-10	9.52	20.30	17.20
C-11	14.14	22.60	19.00
C-12	10.57	25.10	24.15
C-13	15.19	24.60	20.15
C-14	13.94	22.30	18.56
C-15	8.30	18.50	16.90
C-16	12.24	20.21	17.34

Table 3.1 Rebound Hammer Test Results For Beam

III. MESH DETAILS (Wrapping pattern)

The beam 1 is wrapped with two layers of weld mesh in the soffit and two layers of weld mesh in the sides. The beam 2 is wrapped with two layer of weld mesh and one layer of woven mesh in the soffit and one layer of weld mesh and one layer of woven mesh in the sides. The beam 3 is wrapped with one layer of weld mesh and one layer of woven mesh in the soffit and two layer of weld mesh and one layer of woven mesh in the sides. The beam 4 is wrapped with three layer of weld mesh in the soffit and three layer of weld mesh in the sides. The beam 5 is wrapped with two layer of woven mesh in the soffit and two layer of woven mesh in the sides.

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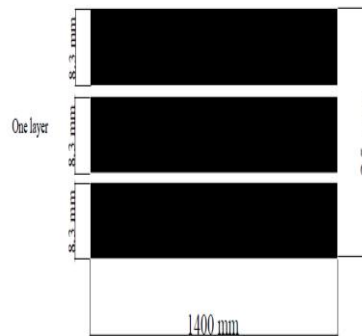


Figure 4.1 Two layer mesh details

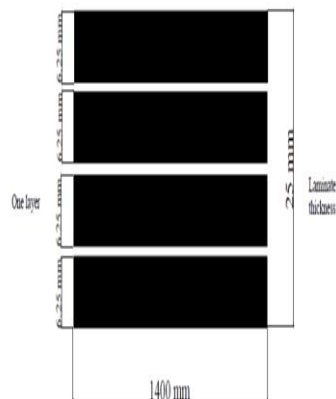


Figure 4.2 Three layer mesh details

33 LOADING PATTERN

All the six casted beams are tested under two point load system and calculated ultimate load for one control beam and damaged the remaining five beams by applying 80% load.

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LOADING CONDITION

1. Ultimate load P_u
2. Remaining five beam 80% load

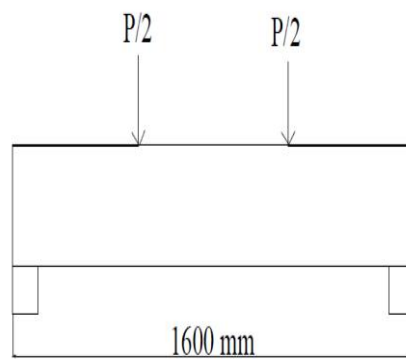


Figure 4.3 Loading pattern

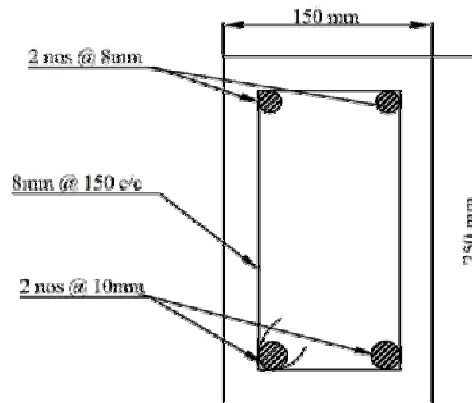


Figure 4.4 Cross section of beam

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IV. RESULTS AND DISCUSSION

4.1 COMPRESSIVE STRENGTH:

The 28 days compressive strength of concrete is calculated using compression testing machine.

RATIO	1:1.5:2.5
AVERAGE MASS OF 2523 CUBE(gm)	
AVERAGE COMPRESSIVE LOAD(KN)	220
DENSITY(Kg/m ³)	2.523
COMPRESSIVE 22 STRENGTH(N/mm ²)	

**Table 5.1 Characteristic
compressive strength.**

Control beam		Ferrocement laminated beams				
L	Defl	Bea	Be	Beam	Be	Be
o	ectio	m	a	NO:3	am	am
a	n(m	NO:	m		NO	NO
d	m)	1	N		:4	:5
K			O:			
N			2			
0	0	0	0	0	0	0
5	0.03	0.02	0.	0.02	0.0	0.0

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			02		2	2
1	0.06	0.04	0.	0.04	0.0	0.0
0			03		3	3
1	0.11	0.08	0.	0.07	0.0	0.0
5			06		6	6
2	0.17	0.12	0.	0.10	0.0	0.0
0			09		9	5
2	0.21	0.15	0.	0.13	0.1	0.1
5			11		1	2
3	0.26	0.18	0.	0.16	0.1	0.1
0			13		4	4
3	0.32	0.22	0.	0.19	0.1	0.1
5			16		9	8
4	0.40	0.28	0.	0.24	0.2	0.2

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			20		1	2
4	0.49	0.34	0.	0.29	0.2	0.2
5			25		6	7
5	0.54	0.38	0.	0.32	0.2	0.3
0			27		9	0
5	0.60	0.42	0.	0.36	0.3	0.3
5			30		2	3
6	0.66	0.46	0.	0.40	0.3	0.3
0			33		5	6
6	0.74	0.52	0.	0.44	0.3	0.4
5			37		9	1
7	0.85	0.60	0.	0.51	0.4	0.4
0			43		5	7
7	0.94	0.66	0.	0.56	0.5	0.5
5			47		0	2
8	1.03	0.72	0.	0.62	0.5	0.5
0			52		5	7
8	1.12	0.78	0.	0.67	0.5	0.6
5			56		9	2
9	1.21	0.85	0.	0.73	0.6	0.6
0			61		4	7

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Comparison between control beam and strengthened beams

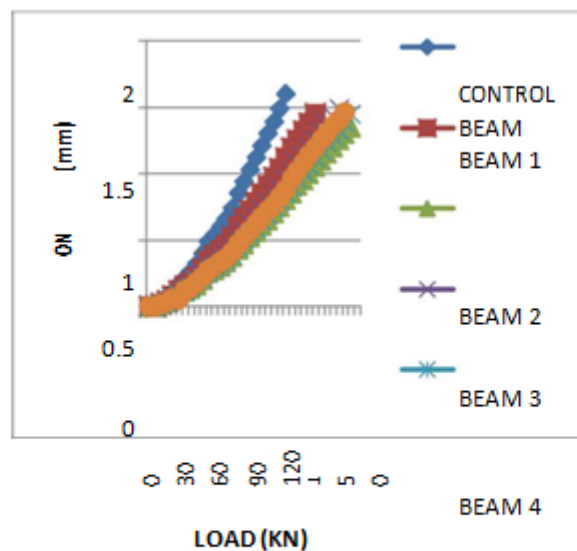


Figure 5.1 Load Vs Deflection for all beams

The graph shown in Figure 6.6 shows that, for specimen 1, wrapped with two layers of weld mesh in the soffit and two layers of weld mesh in the sides has 30% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 2, wrapped with two layer of weld mesh and one layer of woven mesh in the soffit and one layer of weld mesh and one layer of woven mesh in the sides has 50% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 3, wrapped with one layer of weld mesh and one layer of woven mesh in the soffit and two layer of weld mesh and one layer of woven mesh in the sides has 40% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 4, wrapped with three layer of weld mesh in the soffit and three layer of weld mesh in the sides has 47% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 5, wrapped with two layer of woven mesh in the soffit and two layer of woven mesh in the sides has 45% improvement of deflection and ultimate flexural strength against the control specimen. It can be seen that on the same value of load, the ferrocement laminated beam has lesser value of deflection compared with the control beam. This shows that the ferrocement laminated beams 1,2,3,4&5 has an improvement of about 30%,50%,40%,47%&45% of deflection against the control beam. The ferrocement laminate increases the ultimate load for maximum of about 50%. The reason for the improvement in deflection and ultimate load carrying capacity of the ferrocement laminated beam is that, the five beams are laminated with five different volume fractions. The volume fraction for the weld mesh is 0.55 and for the woven mesh is 0.65. The beam-2 is wrapped with two layers weld mesh and one layer of woven mesh in the tension zone has higher volume fraction compared with the other four beams has higher improvement of ultimate load and deflection. The beam -1 wrapped with two layers of weld mesh in the tension zone has lesser volume compared with the other four beams has less improvement of ultimate load and deflection. Thus the beams retrofitted with ferrocement laminate in different volume fraction used has less deflection more flexural strength, more cracking control, better economical.

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V. CONCLUSION

The study of strengthening the overloading damaged reinforced concrete beams using ferrocement laminates which are directly glued into the tension and side faces of the beam, the following conclusions are obtained from the experimental work:

For specimen 1, wrapped with two layers of weld mesh in the soffit and two layers of weld mesh in the sides has 30% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 2, wrapped with two layer of weld mesh and one layer of woven mesh in the soffit and one layer of weld mesh and one layer of woven mesh in the sides has 50% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 3, wrapped with one layer of weld mesh and one layer of woven mesh in the soffit and two layer of weld mesh and one layer of woven mesh in the sides has 40% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 4, wrapped with three layer of weld mesh in the soffit and three layer of weld mesh in the sides has 47% improvement of deflection and ultimate flexural strength against the control specimen. For specimen 5, wrapped with two layer of woven mesh in the soffit and two layer of woven mesh in the sides has 45% improvement of deflection and ultimate flexural strength against the control specimen. The improvement is due to the increase in volume fraction.

Based on the experiments carried out, it can be concluded that, on the same value of load, the ferrocement laminated beam has lesser value of deflection compared with the control beam. This shows that the ferrocement laminated beam 1,2,3,4&5 has an improvement of about 30% ,50% ,40% ,47% &45% of deflection against the control beam. The ferrocement laminate increases the ultimate load for maximum of about 50%. Effective retrofitting of precracked damaged reinforced concrete beam with ferrocement laminated sheets which are directly glued with epoxy resin in the bottom tension face and sides resulted in improving the ultimate flexural strength. Better strength is achieved by providing the number of layers of mesh is increased, resulting in enhanced load carrying capacity of the beam. The result shows that the strengthening the overloading damaged reinforced concrete beams wrapped with ferrocement laminates in different volume fractions which are directly glued into the tension and side faces of the beam, have better flexural strength and lesser deflection.

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REFERENCES

1. Akash Panchal and Ravi Dwivedi (2017), 'Analysis And Design Of G+6 Building In Different Seismic Zones Of India', International Journal Of Innovative Research In Science & Engineering.
2. Amrutha Mary A. and Vasudev R.(2014), 'Demolition of Structures Using Implosion Technology', International Journal of Innovative Research in Science, Engineering and Technology An ISO 3297: 2007 Certified Organization Vol. 3, Special Issue 5, July 2014 International Conference On Innovations & Advances In Science, Engineering And Technology [IC - IASET 2014]
3. Anoop A. and Fousiya Hussian (2016), 'Planning Analysis And Design Of Multi Storied Building by Staad.Pro.V8i, International Journal Of Scientific & Engineering Research, Vol. 4, April-2016 ISSN 2229-5518
4. Kajol Mevawala, Liza Hirpara, Kavita Choksi and Darshan Mehta (2016) 'Repair and Rehabilitation of RCC Structures: A Case Study' , Global Research and Development Journal for Engineering Recent Advances in Civil Engineering for Global Sustainability , March 2016 e-ISSN: 2455-5703.