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Experimental Investigation of Fibre Reinforced Composite Materials for Engineering Applications

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Abstract: - Due to increase in demand for light weight, high strength, better seismic resistance and low cost composite materials for engineering application. Still there is need of advancement and further testing of these materials. Currently glass fiber reinforced composites and carbon fiber composites are studied and tested by many researchers. This research study deals with experimental testing of glass and jute fiber reinforced composite laminates (Hybrid fiber reinforced composite laminates) retrofitted with reinforced concrete beams to plug few gaps in research.

Keywords: - Fiber reinforced composites, Composite laminates, Hybrid laminates, Reinforced Concrete beams, Retrofitted beams

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I. INTRODUCTION

Nowadays variety of fiber reinforced composites are being extensively used in numerous engineering applications than before [1, 2]. These composites materials behave quite differently than the conventional engineering materials under testing [3]. Due to excellent mechanical characteristics, glass, carbon fiber reinforced composites are being studied for variety of concrete repair and retrofitting of structural elements such as beams, columns, walls, slabs by research scholars [4, 5, 6]. The present study deals with glass and jute fiber reinforced laminates (fiber reinforced hybrid laminates) FRHL retrofitted to concrete beams need experimentally studied further to understand behavior under bending loads.

II. MATERIALS AND TEST SPECIMEN

The materials used for casting concrete beams are cement, fine aggregates, coarse aggregates, water and reinforcing bars. The dimensions of beams casted were length 1200 mm, width 150 mm and depth 300 mm. The Characteristic cylindrical compressive strength of concrete beams is 16 MPa. Hybrid fiber reinforced laminates of 6mm thick were prepared using glass and Jute woven mat with epoxy for this experimental work.

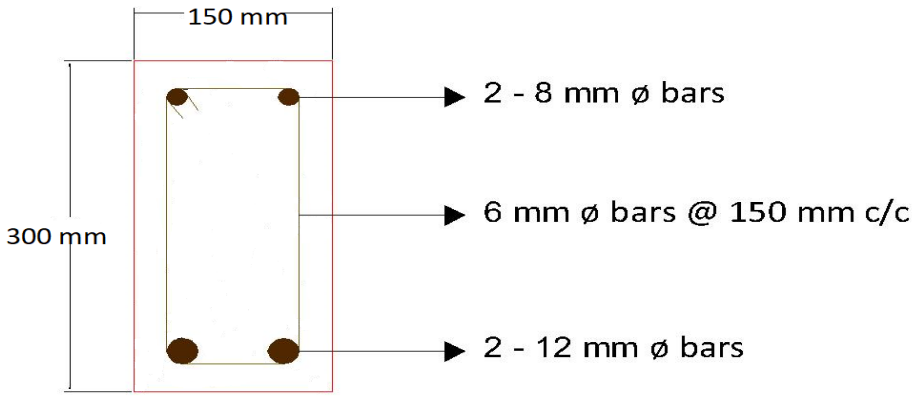

Fig 2.1 Geometry and reinforcement of beams.

III. EXPERIMENTAL TESTING SETUP AND METHOD

A total of ten beams where casted, out of which five beams are retrofitted with FRHL. The beams soffit was made roughed and loose particles were removed for proper bonding between these laminates and concrete beam soffit surfaces. The epoxy adhesive used to bond FRHL and the concrete beam. The beams were tested in four-point static loading. Figure below shows the overall instrumentation details of the test specimen.

Fig 3.1 showing reinforced concrete beam before testing.

Fig 3.2 showing retrofitted reinforced concrete beam before testing.

Fig 3.3 showing retrofitted reinforced concrete beam after testing.

The beams were loaded using universal testing machine with 1000 KN load capacity. The span between the supports for the beams was 900 mm and the distance between the loads are 300 mm. The beams were loaded until failure occurred.

IV. TABLES

Table 4.1 showing ultimate load and ultimate deflection of reinforced concrete beam (C.B) at failure

S. No	Sample Nos	Ultimate Load (KN)	Ultimate Deflection (mm)
1	C.B-1	117.5	3.6
2	C.B-2	111.8	3.8
3	C.B-3	120.2	4.4
4	C.B-4	116.3	4.7
5	C.B-5	123.1	5.1

Table 4.2 showing ultimate load and ultimate deflection of Retrofitted beam (R.B) at failure.

S. No	Sample Nos	Ultimate Load (KN)	Ultimate Deflection (mm)
1	R.B-1	194.95	9.2
2	R.B-2	192.3	8.8
3	R.B-3	191.97	9.5
4	R.B-4	195.68	9.3
5	R.B-5	194.22	9.1

V. CONCLUSION

- The experimental test shows that ultimate load at failure for retrofitted beams are much higher than the ultimate load at failure for reinforced concrete beams.
- The results exhibit that the retrofitted beams undergoes larger deflections at failure than reinforced concrete beams at failure.
- Since glass fibers and jute fibers are low cost fibers they can be considered for retrofitting of concrete beams.

REFERENCES

Books:

[1] M. Mukupadhya, *mechanics of composites materials and structures* (Hyderabad: Universities Press, 2009).

[2] P.K. Mallick, *composites engineering Hand book* (New York: Marcel Dekker Inc., 1997).

[3] J.M Hodgkinson, *mechanical testing of advanced fibre composites* (Cambridge England: Woodhead Publishing Limited, 2000).

Journal Papers:

[4] Huy Pham, Riadh Al-Mahaidi, Experimental investigation into flexural retrofitting of reinforced concrete bridge beams using FRP composites, *Composite Structures*, 66, 2004, 617-625.

[5] Obaidat,Y, Heyden,S., Dahlblom, O., Abu-Farsakh, G., and Abdel-Jawad, Y. Retrofitting of reinforced concrete beams using composite laminates. *Construction and Building Materials*, 2011; 25: 591–597.

[6] Toutanji, H., Zhao, L., and Zhang, Y. Flexural behavior of reinforced concrete beams externally strengthened with CFRP sheets bonded with an inorganic matrix. *Engineering Structures*, 2006; 28: 557-566.

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