

IMPACT OF G-600 POLYMER WRAPPINGS ON THE STRENGTH CHARACTERISTICS OF FRC

Brijbhushan S¹, Dr. D.K. Kulkarni²

¹Asst Prof, of Construction Technology, VTU PG Centre Kalaburagi, Karnataka, India.

²Professor, of Civil Engineering, S.D.M Collage of Engineering Dharwad, Karnataka, India.

Abstract -Now a days facing the waste plastics and glass are major problem to environment, hence in our life style depends upon the plastics only so that indirectly we are the reasons for protects our surrounding environment by proper management techniques, we are using waste plastic buckets are disposed or recycled and properly maintain beauty of the nature. To finding this solutions glass are using as a fibers, the percentage of 0.5% are using in this Grade of M-30 concrete 0.45 w/c ratio and 1.5% of super plasticizer for workability of concrete.

In this work the performance of glass fibers and steel fibers are used in this concrete. The total 1% by volume of concrete are added, i e, 0.5% of glass fiber and 0.5% of steel fibers are used. The various mechanical properties are Compressive, Tension, and Flexural strengths are found out. The new word G-600 means glass fiber re-inforced polymer is laminated to normal and hybrid concrete. And to compare the various strength characteristics using the GFRP the strength properties are increased of M-30 grade of the concrete. The specimen's for mechanical properties are prepared and tested for 28 days. The results of each property are compared hybrid over controlled mix.

Key Words: compressive tests, flexural tests, crimped steel fiber, glass fiber, GFRP

1. INTRODUCTION

General concrete is mixture of cement fine aggregate coarse aggregate water and admixture concrete is an important role of civil engineering to construct major buildings like multistoried buildings hospitals shopping malls apartments etc Concrete is a major role for all construction activities Hence to not achieve the strength so that adding fibrous materials into the concrete to gain excess strength of hardened concrete. The various materials are Steel fibres, polypropylene fibers, waste plastic fibers glass fibers etc. In the concrete mixer the ordinary Portland cement concrete mix together with fibers this forming hard stratum and molded into any shape and size. The cement reaction with chemically with the other particles like water and other ingredient particles to form hard Matrix or hard structure, which is binding all cementitious materials together into a durable like a stone, this is used for various construction works like they are foundations, beams, columns, etc.

Now a days, in our India recently the domestic waste plastics, jugs, etc which are some parts degradable to environment. This is cause to natural resources depletion and also country resources are occur. Hence the waste plastic buckets are using to achieving the greater strength to enhance the concrete strength. The performance of concrete depends upon the ingredients of cementitious materials.

Various different fibers are used in cement concrete they are natural fibres, Steel fibre, polypropylene fibre, glass fibre etc these are incorporated in the concrete and also Mechanical properties are studied, the above fiber are used in various researches and result are reported. The research is still going on to improve the properties of concrete. In the present paper the effects of the adding of glass fiber and their behavior in the concrete have studied. The various effects on hybrid fiber concrete are studied such as compression, split tensile, flexure and shear test, to knowing the strength characteristics by adding different percentage of fibers.

2. OBJECTIVE

- ☐ The present work is to find out the strength of the steel fiber and waste plastic fiber on the different properties M-30 grade of concrete.
- ☐ 0.5% of steel fiber (SF) and 0.5% of waste Glass fibers (GF) are added,(SF+GF) and total 1% the volume of concrete are added.
- ☐ Comparing the conventional concrete with and without GFRP Wrappings and to know the failure pattern of the structure.

- ☒ To comparing between the hybrid concrete with wrapped and without wrapped. To know various strength tests are compressive, flexural tests.

3. MATERIALS USED

3.1 CEMENT

Ordinary Portland Cement (OPC) grade of 53 the product of cement is Birla A1, the properties are as per IS codes-12269-1987. The cement is an important role in the concrete to attain the strength.

3.2 Fine Aggregate

Shahpur sand which is local available in Zone II which is passing through Sieve size 4.75 mm. As per IS 383-1978. Its act as a filling voids to coarse aggregate.

3.3 Coarse Aggregate

Local produced materials which are passing through 20mm and retained on 12.5mm sieve, as per IS383-1978.

3.4 Super Plasticizer

The super plasticizer is a water reducing agent which improves the workability of mix. The quantity to be mixed is calculated, and added so as to improve workability and also the strength, in this project Sikament is used the dosage are 1.5% of concrete.

3.5 Crimped- Steel Fiber

Above Steel fiber are brought from M&J International, Mumbai of Length 50mm and 1mm least lateral dimension. Which makes the aspect ratio of 50, and dosage of 0.5% of volume of concrete is fixed

3.6 Glass Fiber

Glass fiber is a material consisting of numerous extremely fine fibers of glass. The length of 50mm was used and thickness of 1mm making aspect ratio of 50mm.

3.7 Glass fiber reinforced polymer(GFRP)

GFRP is in a fabric type of sheet form available in **BASF company's from Bengaluru**. Fiber used which is G-600gsm available over to incorporated in compression and flexural in concrete.



4. MIX DESIGN

The concrete mix design is done as per IS 10262:2009 we have followed above code for getting the strength of the concrete. In this project we have designed a mix for M-30 grade of concrete and even Hybrid Fiber Reinforced Concrete (HFRC) was prepared. Fibers are used crimped Steel Fiber & glass fiber and added total of 1% of volume of fiber to concrete i.e 0.5% of SF + 0.5% GF made to used as a Hybrid concrete.

The super plastisizer is a water reducing agent which improves the workability of mix. The quantity to be mixed is calculated, and added so as to improve workability and also the strength, in this project Sikament is used the dosage are 1.5% of concrete.

5. EXPERIMENTS AND RESULT

☐ COMPRESSION TESTING FOR CUBE

The concrete strength test is an very important test, to know that how much concrete has gained a strength. The test is conducted on 150*150*150mm, the cubes are well compacted for 25 blows, from IS code making of three layers to well compacted then the specimens are cured for 7, 14, and 28 days, after curing, it is dried in the air then cube was tested then results are noted down as failure Load by area.

The cube strength = load/ area N/mm²

☐ COMPRESSIVE STRENGTH TESTS RESULTS

Normal Concrete Without Wrap GFRP Results:

S.NO	Load KN	Strength in N/MM ²	Avg Strength N/MM ²
1	790	35.11	39.55
2	1020	45.33	
3	860	38.22	

Normal Concrete With Wrap GFRP Results:

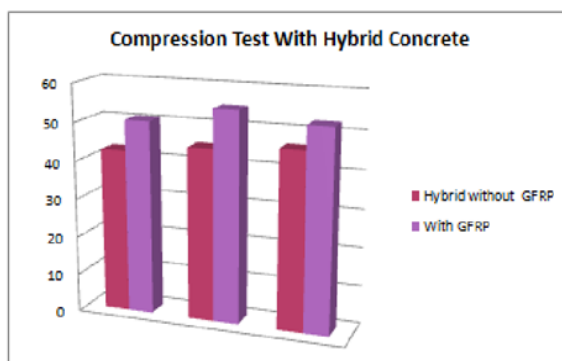
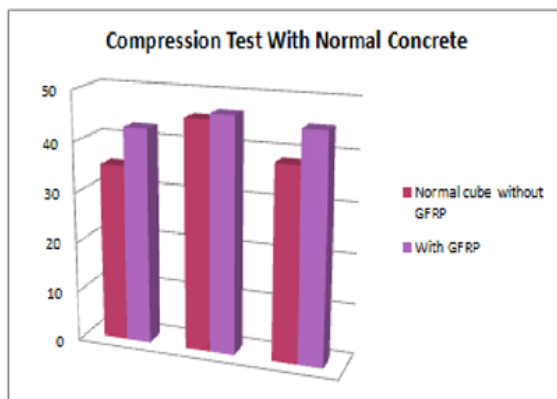
S.NO	Load KN	Strength in N/MM ²	Avg Strength N/MM ²
1	960	42.67	44.67
2	1045	46.44	
3	1010	44.89	

Hybrid Fiber Re-inforced Concrete Without Wrap GFRP Results:

S.NO	Load KN	Strength in N/MM ²	Avg Strength N/MM ²
1	960	42.67	44.59
2	1010	44.89	
3	1040	46.22	

Hybrid Fiber Re-inforced Concrete With Wrap GFRP Results:

S.NO	Load KN	Strength in N/MM ²	Avg Strength N/MM ²
1	1140	50.67	52.67
2	1235	54.89	
3	1180	52.44	



The above table and graph shows the result of normal concrete with and without GFRP wrapping which has increased about 5N/mm²

And also wrapped GFRP is increased comparing without GFRP. The average is 11.50% high.

➤ **FLEXURAL TESTING FOR PRISM FOR 28DAYS RESULTS**

This test generally used to finding out the flexural strength. Flexural test is conducted on U.T.M Two point contact loading is adopted of which the prism size is 100*100*500mm.

Formula for finding the strength: $(P*L/B*D^2) \times 1000$

Where,

P= load L= length

B=breath=depth

Normal Concrete Without Wrap GFRP Results

S.NO	Load TN	Strength in N/MM ²	Avg Strength N/MM ²
1	1.450	7.11	7.411
2	1.510	7.40	
3	1.575	7.725	

Normal Concrete With Wrap GFRP Results

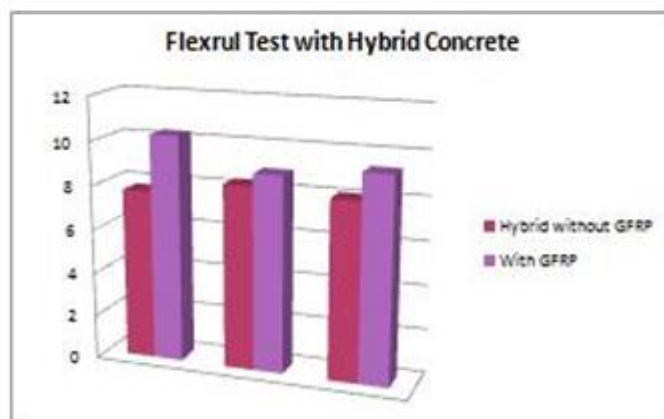
S.NO	Load TN	Strength in NMM ²	Avg Strength NMM ²
1	1.675	8.215	8.092
2	1.625	7.970	
3	1.650	8.093	

Hybrid Fiber Re-inforced Concrete Without Wrap GFRP Results

S.NO	Load TN	Strength in NMM ²	Avg Strength NMM ²
1	1.575	7.725	8.04
2	1.700	8.33	
3	1.650	8.09	

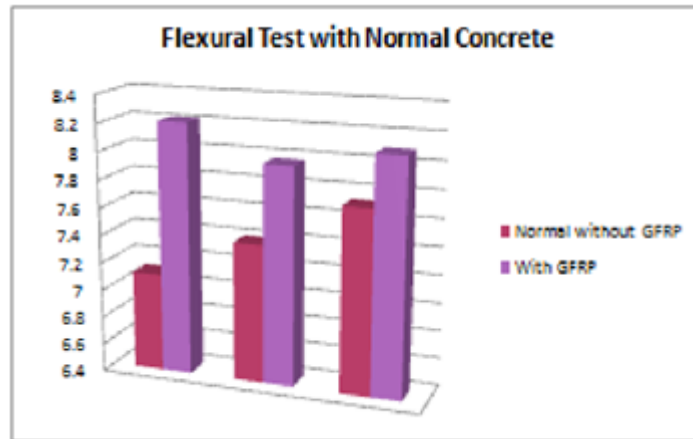
Hybrid Fiber Re-inforced Concrete With Wrap GFRP Results

S.NO	Load TN	Strength in NMM ²	Avg Strength NMM ²
1	2.1	10.3	9.51
2	1.815	8.90	
3	1.9	9.32	



In flexural strength the percentage is increased 0.68 N/mm² of normal concrete.

With and without of hybrid concrete is varied 1.18%.



6. CONCLUSIONS

Form the above study the following conclusion are listed below

- i. For hybrid M30 mix concrete, workability is poor so super plasticizer is used for increase in workability of concrete.
- ii. Adding of two fiber (SF+GF) is increased in compressive strength, not much in Flexural test.
- iii. The results of normal cubes with and without GFRP is increased of about 5N/mm² and wrapped GFRP of cube is increased comparing without GFRP. The average strength in 11.50% high.
- iv. GFRP laminating with and without fiber the concrete has shown tremendous increase in strength characteristics compared to conventional concrete.

7. REFERENCES

- Reinforced concrete using domestic waste plastics as fibres” ARPNI vol 6 no 3, (March Manaswini C, Vasudeva “Fibre re-inforced concrete from industrial waste- review” IJIRSET, vol 4, (Dec 2015).
- Khilesh sarwve “Study of strength property of concrete using waste plastics and steel fiber IJES vol 3 (Nov 2014).
- RavikumarG, Manjunath M “Investigate on waste plastic fibre reinforced concrete using manufactured sand as fine aggregate” IRJET, vol 2 (July 2015).
- Dr PB Nagarnaik, Dr dk Parbat, RN Nibudy, Dr AM Pandey “Strength prediction of plastic fiber reinforced concrete(M30) IJERA vol 3,(Jan- Feb 2013).
- R Kandasamy, R Murugesan “Fibre 2011)
- Deepak kumar, Govind Ravish “USE of GFRP(glass fiber reinforced polymer) for strengthening of reinforced concrete beam” SSRG-IJCE (April 2015)
- M.S.Shetty, “Concrete Technology and Theory of Practice”, S.Chand & Co.Ltd : 2004
- IS: 12269 – 1987. “Specifications for 53 grade ordinary Portland cement”. BIS, New Delhi, India.
- IS 516:1959 “ Methods of tests for strength of concrete” BIS New Delhi, India.
- IS 383:1970 (re affirm1997) Specification for Coarse and Fine aggregate from natural sources for concrete. BIS New Delhi
- IS 456:2000 Plain and Reinforced Concrete- Code of Practice(Fourth Revision)
- IS 10262-2009 Concrete Mix Proportioning – Guidelines (First revision).Bureau of Indian Standards, New Delhi.
- Wikipedia
- Internet Search engines

BIOGRAPHIES

Prof. Brijbhushan S received B.E in Civil Engg. And M.Tech Degree in Construction Technology from VTU, Karnataka, India. He is presently working as Assistant Professor in the department of construction technology in the centre for PG studies, regional office Kalaburagi, karnataka. He has published many research papers. He has two years professional work experience in Construction industry and five years teaching experience



Dr. D. K. Kulkarni Received the B.E Civil Degree and M. Tech Degree in Structural Engineering Walchand College of Engineering, Sangli, India. He is presently working as Professor in the department of Civil Engineering S.D.M Collage of Engineering Dharwad, karnataka. He has published many research papers. He has three years professional work experience in Construction industry and More than twenty four years teaching experience.