MANTECH Publications

Journal of Ceramics and Concrete Technology
Volume 5 Issue 3
ISSN: 2457-0826 (Online)

Mixing Polyester Resin with Reinforced Concrete Beam: An Experimental Study

Juhi Patel
Assistant Professor
Department of Civil Engineering
Galgotias College of Engineering and Technology
Corresponding Author's Email id: *juhi_patel450@gmail.com*

Abstract

Concrete is a composite building material that is widely utilised across the world's society. It has a few limitations, including as limited malleability, brittleness under tension, and minimal resistance to splitting. Concrete is a structural material that is used as frequently as feasible. The breakdown of the structure is mostly due to the concrete in the beam failing. As a result, extra care should be used when constructing the steel in the beam, as well as while casting concrete in the beam.

Keywords*: - Polyester Resin, Concrete Beam, Fly Ash, Glass Fiber*

INTRODUCTION

Material Used

Fly Ash

Fly ash is a common pozzolanic substance that comes from power plants as a waste product. Stabilization of fragile soils, concrete manufacture, as a Portland cement and sand replacement material are widely employed in various structures.

Glass Fiber

One of the man-made fibres is glass fibre. Glass fibres are utilised as concrete reinforcement. Glass fibres are employed as a reinforcing ingredient in various polymer goods to create glass-reinforced plastic, often known as fibreglass, which is an extremely strong and relatively lightweight fiber-reinforced polymer composite material. Mats and textiles for thermal insulation, electrical insulation, acoustic insulation, high strength, and corrosion-resistant materials are among the applications for normal glass fibre.

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

Polyester Resin

Polyester resins are an unsaturated synthetic resins created when dibasic natural acids and polyhydric alcohols react. Maleic Anhydride is a diacid-capable uncooked cloth that is commonly utilised. Wall panels composed of polyester resins reinforced with fibreglass, often known as fibreglass reinforced plastic (FRP), are commonly used in restaurants, kitchens, toilets, and other locations that require low-renovation walls that can be washed.

SCOPE OF THE PRESENT INVESTIGATION

1. Determine compressive strength after 7 days, 14 days, and 28 days of cure.
2. The behaviour of a beam with glass fibre & polyester resin is described in this study.
3. Due to diverse needs, several forms of concrete have been produced in recent decades.
4. If concrete buildings are rebuilt, their efficacy will improve.
5. Concrete's strength will be improved as its durability improves, and its qualities will be examined.

RESULT AND DISCUSSION

Compressive Strength Test

The standard compression strength mix of the concrete which cures the specified number of days presented below in the graph, because the results of the concrete test hardened them.

As a standard concrete mix, this test was performed on the cube after 7 days, 14 days, and 28 days of curing.

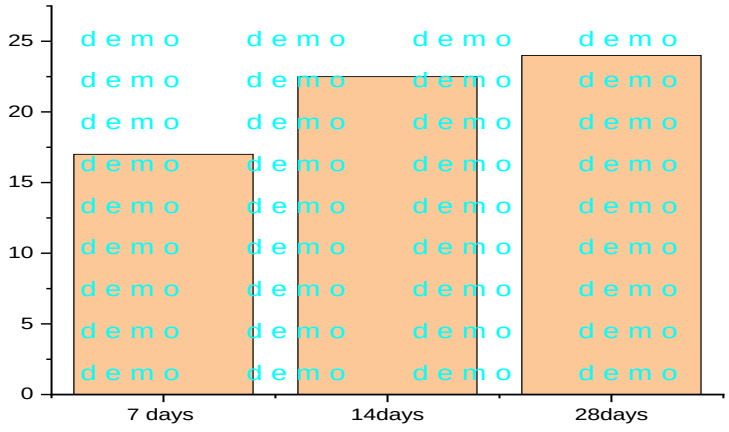


Fig 1: Compressive Strength for Cube

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

Strength Test on Beam

The beam specimen was subjected to a strength test. This beam is made of a traditional concrete mix with steel reinforcing.

1) *Conventional Mix Concrete*

This reinforcement is a basic arrangement of reinforcing steels and is utilised in the same way as traditional concrete. Figure 2 shows the situation.

The consequences of the beam's strength are seen in Figure 3. Load VS deflection is used to represent these curves. At 7 days, this graph depicts section type reinforcement. The specimen's ultimate load is 1800 KN. According to this graph, the initial crack occurs with a stress of 1400 KN and results in a deflection of 2 mm. The ultimate load occurs at 1800 KN and results in a deflection of 3mm.

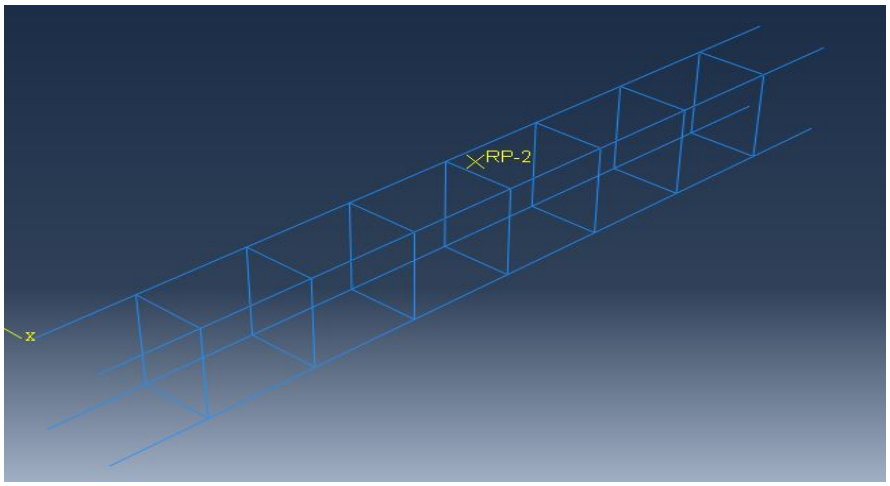


Fig 2: A section type of reinforcement

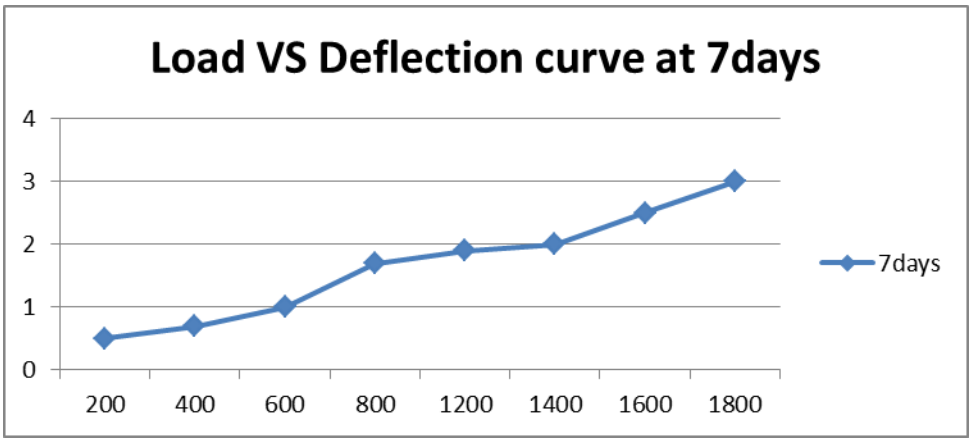


Fig 3: Load VS Deflection curve at 7 days

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

The consequences of the beam's strength are seen in Figure 4 below. Load VS deflection is used to represent these curves. At 14 days, this graph depicts section type reinforcement. The specimen's ultimate load is 2000 KN.

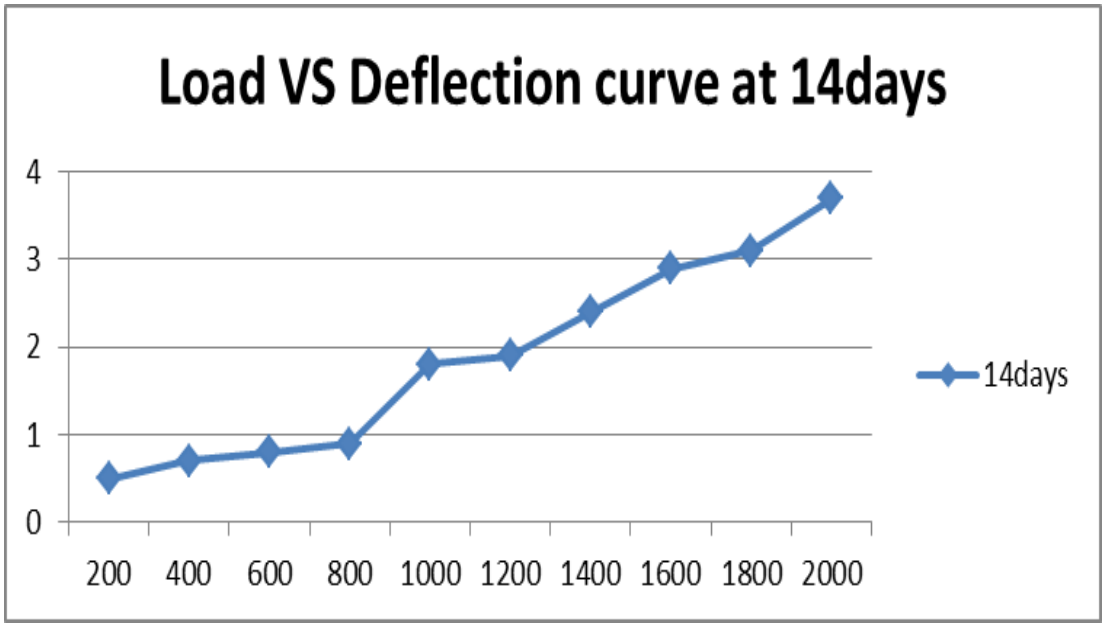


Fig 4: Load VS Deflection curve at 14 days

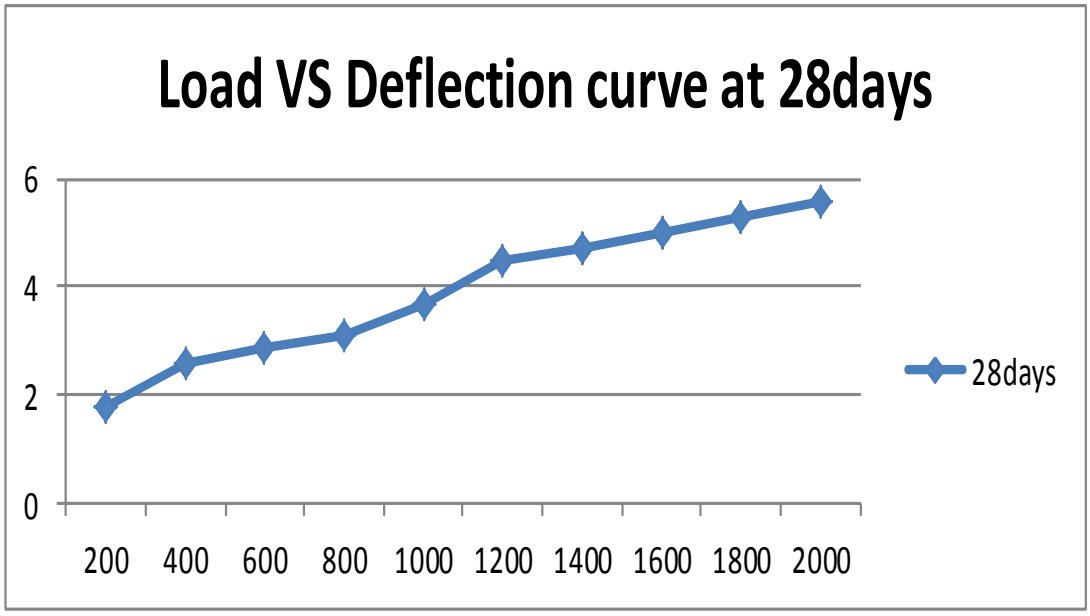


Fig 5: Load VS Deflection curve at 28 days

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

Comparison Strength of Beam

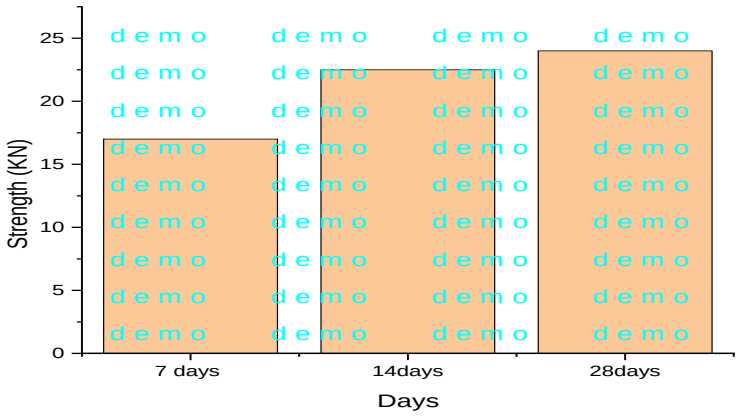


Fig 6: Comparison strength of conventional concrete

The comparative strength of the beam for standard concrete is shown in Figure 6.

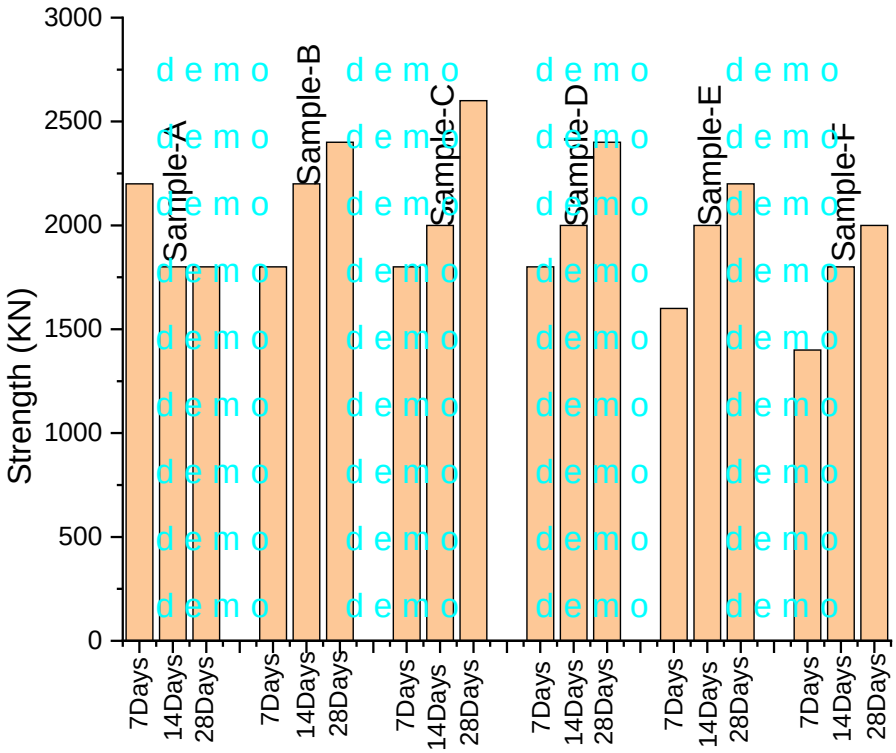


Fig 7: Comparison strength for concrete beam with glass fiber

The comparative strength of the concrete beam with glass fibre is shown in Figure 7.

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

CONCLUSION

The strengthening of the beam using glass fibre, polyester resin, and fly ash was examined in this experimental inquiry, and the test findings were compared to the analytical report.

With a suitable curing duration, this result depicts the beam's final strength at six distinct percentage details.

1. At 7 days, the ultimate load of the sample "A" type beam without fibre is 1800KN, while the ultimate load of the sample "A" type beam with 0.1 percent glass fibre, 1% polyester resin, and 50% fly ash is 2200KN. At 14 days, the ultimate load of the sample "A" type beam without fibre is 2000KN, while the ultimate load of the sample "A" type beam with 0.1 percent glass fibre, 1% polyester resin, and 50% fly ash is 1800KN.

2. At 28 days, the ultimate load of the sample "A" type beam without fibre is 2000KN, while the ultimate load of the sample "A" type beam with 0.1 percent glass fibre, 1% polyester resin, and 50% fly ash is 1800KN. The sample "A" type beam with 0.1 percent glass fibre, 1% polyester resin, and 50% fly ash has a higher strength than the standard type.

3. These ultimate loads are compared to the ABAQUS analysis, with the ultimate load from the experimental being 2000KN and the analysis being 2100KN for fibre, and the ultimate load from the experimental being 2200KN and the analysis being 2400KN for steel.

4. At 7 days, the ultimate load of a sample "B" type beam with 0.1 percent glass fibre, 1.5 percent polyester resin, and 50% fly ash is 1800KN. At 14 days, the ultimate load of the sample "B" type beam with 0.1 percent glass fibre, 1.5 percent polyester resin, and 50% fly ash is 2200KN. At 28 days, the sample "B" type beam with 0.1 percent glass fibre, 1.5 percent polyester resin, and 50 percent fly ash has an ultimate load of 2400KN. The sample "B" type beam, which contains 0.1 percent glass fibre, 1.5 percent polyester resin, and 50 percent fly ash, has a higher strength than the usual kind.

REFERENCES

I. Mechanical properties of fibre reinforced concrete with recycled

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

fibers Filip Grzymski, Michał Musiał, Tomasz Trapko.

II. Axial compressive behavior of confined steel fiber reinforced high strength concrete Muhammad Usman a, Syed Hassan Farooq a, Mohammad Umair a, Asad Hanif b.

III. Comprehensive analysis of Fibre Reinforced Concrete beams with conventional reinforcement Paula Folinoa.b, Marianela Ripania.b, Hernán Xargaya.b.c, and Nicolás Roccaa.

IV. Effect of pozzolanic materials on mechanical properties and aging of glass fiber reinforced concrete Morteza Madhkhan, Roozbeh Katirai.

V. Experimental Study on Strength Properties of Aluminium Fibre Reinforced Concrete Sabapathy Y.K1, Sabarish S, Nithish C N, Ramasamy SM, Gokul Krishna.

VI. Impact resistance of fiber-reinforced concrete – A review Doo-Yeol Yooa, Nemkumar Banthiab.

VII. Long-term behavior of cracked fiber reinforced concrete under service conditions D.H. Monetti a, A. Llano-Torre b, M.C. Torrijos a, G. Giaccio a, R. Zerbino a, J.R. Martí-Vargas, P. Serna.

VIII. Performance evaluation of ultrahigh performance fibre reinforced concrete – A review Faiz Uddin Ahmed Shaikh a, Salmabanu Luhar b, Hasan Sahan Arel c, Ismail Luhar d.

IX. Shear behavior of two-span fiber reinforced concrete beams Julita Krassowska a, Marta Kosior-Kazberuk a, Piotr Berkowski b.

X. The influence of steel fiber properties on the shrinkage of ultra-high performance fiber reinforced concrete Chengfeng Fang, Mohamed Ali, Tianyu Xie, Phillip Visintin, and Abdul H. Sheikh.

XI. Effect of high temperature on the strength and thermal conductivity of glass fiber concrete Wei-Chien Wanga, Her-Yung Wangb, Kao-Hao Chang c, Shao-Yu Wangd.

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved

XII. Glass fiber sizing: A review J.L. Thomason, composite part A: Applied science and manufacturing, 127, [105619].

XIII. Preparation and characterization of continuous fly ash derived glass fibers with improved tensile strength Qian Ma, Linfeng Ding, Qingwei Wang, Ye Yu, Lida Luo, Hong Li.

XIV. Study on the long-term behaviour of glass fibre in the tensile stress field Dapeng Wang, Qingzhao Wang, Zhiming Wang, Huanying Jiang, Zhao Zhang, Peng Liu, Chao Xu, Longyang Gao.

XV. Eco-friendly approach to enhance the mechanical performance of geopolymer foams: Using glass fibre waste coming from wind blade production Author links open overlay panel L.Senffa R.M.Novaisb, J.Carvalheirasb, A.Labrinchab.

Page 14-21 © MANTECH PUBLICATIONS 2020. All Rights Reserved