

PERFORMANCE OF CONCRETE IN THE REPLACEMENT OF CEMENT & SILICA RESPECTIVELY IN THE DIFFERENT POLYMER WITH FIBER REINFORCED MATERIAL

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Abstract

In the current research work, polymer and steel fibers have been utilized in the blend for some enhancement in the properties of review M-25 concrete. Because of the outcomes, ends have been drawn. In present work, Portland cement has been utilized to make the concrete blend. In some concrete examples, the proportions of polymers with cement are made by utilizing in 2.5%, 5.0%, 10%. In expansion, in other concrete examples, the proportion of steel fibers with the polymer has been readied blend by taking 0.5% and 1.0%. The proportion of water/cement to in making these examples made by has been taken 0.43. Compressive quality and flexural quality have been tested in the concrete example, individually, in 7, 14 and 28 days. The reason for ebb and flow research is to ponder the impact of polymers and steel fibers in contrast with typical concrete.

Keywords: *Silica , concrete composite ,material performance , compressive vs tensile strength , Flexural strength .*

1. Introduction

[1] In late time, it has been discovered that common concrete gets broke because of the nearness of water flood and regular cataclysm like the earthquake. We have utilized polymer and steel fiber to enhance the properties of flexural quality alongside compressive quality, solidness, and split control in concrete in the momentum research. What's more, to see their belongings, we have appeared alongside Compressive Strength and Flexural Strength on these concrete examples, their outcomes are appeared in the following outcomes chapter.[2] In current work, the proportion of polymers to 2.5%, 5.0%, 10% and steel fiber proportion have been taken 0.5% and 1.0%. By and large, keeping up concrete quality and flexural quality in building construction is vital.[3] On one hand, in type of bond in polymer cement, then again, steel fiber is useful in keeping up the toughness. Consequently, the concrete structures end up feeble .That is the reason the nature of concrete should be moved forward. We have done made replacement with cement and sand to separately polymer and steel fiber.[4] So as to keep up the strength

and sturdiness in concrete after some time, research has been done to enhance the properties of concrete now and again.

2. Concrete – polymer composite

[5] Concrete which depends on polymer composite material produced because of the polymerization by utilizing monomer blend. A polymer concrete property is relying upon water/cement content, water clammy curing, and concrete trademark conditions and so forth.[6] For the most part, cement and polymer are utilized in concrete amid blending period. The most regularly utilized polymers concrete is methyl methacrylate, polyester, polyurethane, Latex polymer and Acrylic polymer. Like the ordinary concrete and polymer concrete used to additionally enhance the sturdiness properties and durability. [7] Utilization of materials like polyethylene, poly (tetra-fluoro-ethylene), polypropylene, polyiso-butylene, acrylic polymer have been accounted for in the writing survey part. [8] The polymer as a replacement for cement and polymer concrete utilized for in view of water wet curing, high quality, and great attach to concrete properties.

3.Natureal Fibers

[9] Reinforcement raises the concrete behavior. According to previous literary surveys by and large, steel fiber helps in controlling flexure cracks, disintegration, and sturdiness. Just as enhanced in concrete quality and properties of the concrete blend.[10] Steel fiber lessens concrete usefulness droop contrasting with alternate fibers. In the event that the steel fibers are solid, increment the opposition of splitting and decline the break width. [11] Steel fibers carrying low carbon and employments of such fibers help in the change of properties both in plastic just as in the solidified phase of concrete cover material.

3.MATERIALS AND METHODS

3.1 Experimentation of procedure

The framed concrete is for the most part alluded as M-20 review concrete and was made by Indian Standard code IS: 10262-2009. Furthermore, another concrete example arranged from the diverse steel fiber differing replacements level to be specific 0.5% and 1.0% by mass of all out sand content. Moreover, some examples were set up from the distinctive acrylic polymer changing replacement level to be specific 0%, 2.5%, 5%, 10% by mass of absolute cement content[12].

Table 1 Mixture design ingredients apply in concrete

Materials	Properties
Cement	545.21
Fine /coarce aggregate	654 / 2134
calculates proportions	1 ; 2;2.5

3.2 Material formation

For understanding the material properties, the Pycnometer and fineness test has been done in the fine and coarse total material. Steel fiber viewpoint proportion (L/d) is 40/0.5 and 60/0.5, and S.F. proportion of 0.5%, 1.0 and Polymer proportion of 2.5%, 5.0%, and 10% has been utilized. Portland Pozzolana cement (PPC), acrylic polymer, and steel fiber are utilized in the current work.

1. Specific gravity – Fine [3.21] / Coarse [3.54]
2. Amount of density – Fine [2520] / coarse [2672]

3.2 Process of formation

The specimen of concrete which was in the size of 250 mm x 250 mm x250 mm and pillar estimate is 200 mm x 200 mm x 500 mm is set up for various extent of concrete material. Are appeared in Figures 1, and 2 ,3. The impact of the synthesis of the completed 3D square surface and the impact of the concrete example's quality made by the diverse blend proportion is to see.



Figure 1 mixer of with and without polymer with steel fiber

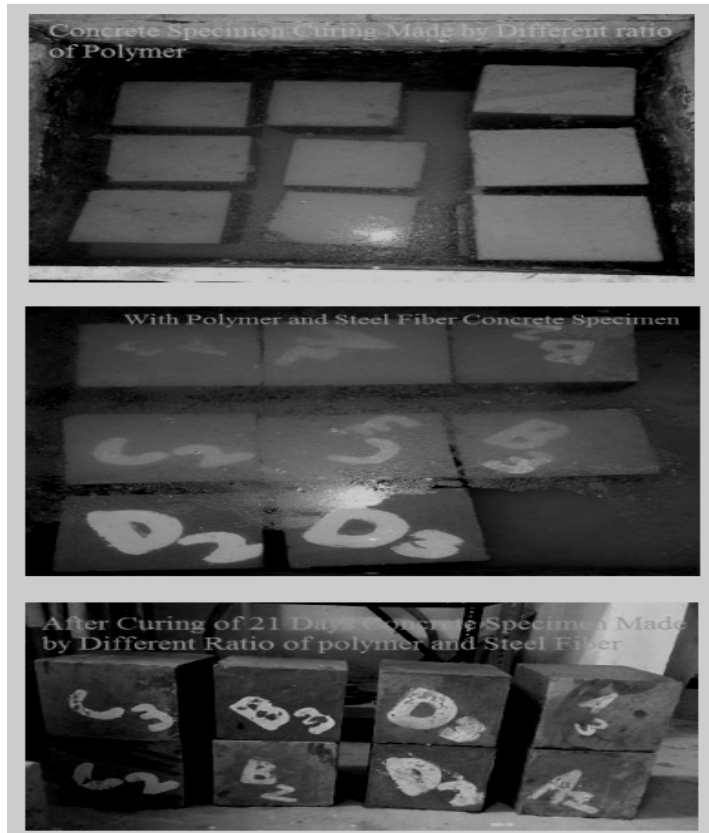


Figure 2 Cube Specimen



Figure 3 Beam specimen

3. RESULTS AND DISCUSSION

3.1 Compressive strength test:

Following 6, 13, and 20 days of water curing treatment, the compressive quality of these concrete example has been settled at age 7 days, 14 days and 28 days. Results are appeared in tables 1.

Table 1 Polymer with cement ratio Vs Compressive/Flexural strength

Polymer + cement ratio	Material with fiber	Compressive strength			Flexural strength		
		7 days	14days	28days	7days	14days	28days
0%	0%	8	15	27	1.23	1.54	2.5
	2%	9.5	15.2	27.5	1.42	1.86	3.5
	4%	11	16	28	2.32	2.11	4.1
25%	0%	8.5	16.5	28.5	2.45	2.31	4.2
	2%	10	17	30	2.32	2.43	4.5
	4%	12	17.2	30.2	2.4	2.54	5.1
50%	0%	9	18	32	2.49	2.62	5.3
	2%	10.5	18.5	32.5	2.52	2.87	5.6
	4%	14	19	34	2.8	3.1	5.8
100%	0%	9.5	19.3	34.5	3.1	3.2	6
	2%	11	20	35	3.2	3.6	6.1
	4%	15	21	35.5	3.5	4	6.5

3.2 Flexural Strength Test –

Recently, colossal advancement happened in the field of concrete technology. Numerous scientists, architects, scholars and researcher have been created a few strategies to enhance quality parameter of the concrete. The present examination researches the impacts of Metakaolin and Super plasticizer on quality properties of M-20 review concrete. Prior it was utilized straightforwardly to frame silica flume mortar as a coupling material in construction. Various examinations have been completed to explore the likelihood of using an expansive scope of materials as halfway replacement material for cement in the creation of concrete. For all blends compressive quality is resolved at 3, 7, 28 days for 250 X 250 X 250 mm estimate shapes.

Conclusion

The utilization of advantageous cementitious material underway of concrete can result in significant sparing of vitality and cost. Current trial consider demonstrates that 12% replacement of cement by metakaolin gives higher strength. The creation of Portland cement isn't just exorbitant and vitality serious, yet it additionally delivers vast measure of carbon emanation. The trial program is intended to locate the compressive quality of

concrete by somewhat replacing the cement in concrete creation. Limestone is a crude material accessible in nature; it is essential requirement for generation of cement material. It likewise enhances strength, durability, impermeability and substance opposition of concrete. The replacement dimensions of cement by metakaolin are chosen as 2%, 4%, 8%, 10% for steady water cementitious material proportion of 0.43. The generation of one to of Portland cement creates roughly one ton of CO₂ in the air.

Reference

- [1] Reis, J. M. L. "Fracture and flexural characterization of natural fiber-reinforced polymer concrete." *Construction and building materials* 20.9 (2006): 673-678.
- [2] Venkateshwaran, N., and Ayyasamy Elayaperumal. "Banana fiber reinforced polymer composites-a review." *Journal of Reinforced Plastics and Composites* 29.15 (2010): 2387-2396.
- [3] Arisoy, Bengi, and Hwai-Chung Wu. "Material characteristics of high performance lightweight concrete reinforced with PVA." *Construction and Building Materials* 22.4 (2008): 635-645.
- [4] Pacheco-Torgal, Fernando, and Said Jalali. "Cementitious building materials reinforced with vegetable fibres: A review." *Construction and Building Materials* 25.2 (2011): 575-581.
- [5] Taly, Narendra, Hota VS GangaRao, and P. V. Vijay. *Reinforced concrete design with FRP composites*. CRC press, 2006.
- [6] Barbuta, Marinela, and Maria Harja. "Properties of fiber reinforced polymer concrete." *Buletinul Institutului Politehnic din Iasi. Sectia Constructii, Arhitectura* 54.3 (2008): 13.
- [7] Shokrieh, M. M., et al. "Effects of thermal cycles on mechanical properties of an optimized polymer concrete." *Construction and Building Materials* 25.8 (2011): 3540-3549.
- [8] Bărbuță, Marinela, Maria Harja, and Irina Baran. "Comparison of mechanical properties for polymer concrete with different types of filler." *Journal of Materials in Civil Engineering* 22.7 (2009): 696-701.
- [9] Hu, Kexu, and Guisheng He. "Experimental study on fire protection methods of carbon fiber reinforced polymer strengthened reinforced concrete beams." *JOURNAL-TONGJI UNIVERSITY* 34.11 (2006): 1451.
- [10] Bobadilla-Sánchez, E. A., et al. "Effects of polyester fibers and gamma irradiation on mechanical properties of polymer concrete containing CaCO₃ and silica sand." *Express Polym Lett* 3 (2009): 615-620.
- [11] Thiruchitrabalam, M., et al. "A review on the natural fiber-reinforced polymer composites for the development of roselle fiber-reinforced polyester composite." *Journal of Natural Fibers* 7.4 (2010): 307-323.
- [12] Hota, Gangarao, and Ruifeng Liang. "Advanced fiber reinforced polymer composites for sustainable civil infrastructures." *Proceedings of the International Symposium on Innovation & Sustainability of Structures in Civil Engineering*. Xiamen University, 2011.

