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Experimental Study on Young's Modulus of F. R. C. with Bottom Ash

S Ganesh, D Mohammed Rafi M.Tech, ABS Dadapeer, M.Tech
Department of Civil Engineering, St. Mark Educational Institution, Anantapur, Andhra Pradesh, India

ABSTRACT

Main objective of this paper is to determine the modulus of elasticity of fibre reinforced concrete with the addition of bottom ash .And also to determine the strength of concrete by using polyolefin and steel fibres. Based on this paper we can use this polyolefin in construction of pavements, light precast elements and tunnel lining etc. By the use of hybrid fibre reinforced concrete we can improve the residual values from small deformations. The experiment investigation has been carried out on (HFRC) (combination of hooked end polyolefin & steel fibre) get volume of aggregate fibre 0.6%, 1.1% and 1.3% was readied Workability conditions like blending, compaction and curing conditions. To adding of uniformly dispersed fibres to cementious concrete will give fitness to the construction and improve its dynamic, static properties.

Keywords : Hybrid Fibre, YOUNG'S MODULUS, Reinforced Concrete, HFRC, Bottom ash

I. INTRODUCTION

Fiber reinforced concrete (FRC) is concrete contains intense material which expands its basic unwavering quality. It contain short discrete filaments that are routinely circulated and arbitrarily arranged. Filaments incorporate steel strands, tumbler filaments, simulated filaments and common strands. Inside these divergent strands the characteristic of FRC solid changes with fluctuating cements, fibre assets, geometries, sharing, course and density.

FRC is essentially worn in grunting, but can also be worn in simple concrete. FRC are mainly utilized for on-ground floors and pavements, but it can be calculated for an extensive variety of development parts (pillar, pliers, footings and so forth) either unaided or with hands-tied rebar's.

1.1 FIBRE RESULTS IN CONCRETE

Ordinarily these are utilized as part of cement to oversee plastic lessening splits and drying diminishment splitting. They additionally minor the permits of cement with no checks and so that the flow of water is reduced. A choice of types of fibres make better effect, scraped spot and smash struggle in concrete. Typically filaments don't enhance the flexural force of concrete, so it can't re-establish minute opposing or structural steel reinforcement. In concrete Some filaments reduces strength. The quantity of fibres adding to a concrete blend is figured as an extent of the whole capacity of the consolidated (cement and fibres) named as amount portion (i.e. Vf). Volume fraction physically extends from 0.1 to 3%. Perspective proportion (length/depth) is considered by divides fibre length (l) by its measurement (d).

1.2 ADVANTAGES OF F R C

1. It increment the tensional potency of the concrete.
2. It decreases the climate voids and water voids the normal porosity of gel.
3. It expands the long tenureness of the solid.
4. Fibres , for example, graphite and glass have remarkable clash to creep, while the same is not correct for generally comes about. There after the introduction and quantity of fibres impact the creep execution of rebar/tendon.
5. Reinforced itself is a compound material, where the fortification go about as the reinforcing fibre and the solid as the grid. Along these lines its exceptionally critical that the execution under warm worries for the two assets be comparative so the stage of contrast misshapenings of cement & the rare reinforcement is minimized.

1.3 H F R C

There is a scarcely any one type of fibre that can get better all the needed properties of fresh and toughened concrete. To improve all property of concrete the mixture of two or more type of fibres is required. The compound cement of at least 2 fibres is known as "Hybrid strads reinforced concrete". The fundamental thought of utilizing half and half filaments is to control breaks at various size levels in various zones of solid, stretch levels and to improve the property of cement by joining the settlement that each demanding fiber sort can convey.

II. LITERATURE REVIEW

2.1 Naaman et al (1991) This study tests the pull out steel fibres with cement mortar. By using three various fibre shape (straight, deformed and end hooked), the added of additives such as latex, flyash and microsilica.

2.2 Han Zhao (1992) In his paper think about on testing systems for solid like materials under compressive effect stacking has utilized part Hopkinson weight test bar to explain the issues in testing of cement.

2.3 Bayasi et. al (1993) The research regarding the collision of various states of steel fibres in concrete. Those fibres were (straight, crimped and snared) with a point of view ratio of 60, by fiber volumes of 2%. In this examination it will be reasoned that layered steel filaments deliver a higher droop an incentive than the steel strands are straight or snared.

2.4 F.M kilnic kale, GG dogan (1993) This paper looks at the shear exchange instruments and extreme conduct of HFS System comprising of strengthened solid pillars associated with basic steel sections.

2.5 Dr. V. Bindiganivile, N. Banthia (1993) Fiber network bond quality assumes a vital part in Impact quality of FRC. High quality fiber grid brings about stiffer bond. The strands utilized were three polymeric fiber and one steel fiber.

2.6 Sideny Diomond et. Al (1995) In his paper studied that the tests did on the compressive property of diverse fiber-fortified cements at low volume parts of strands upto 0.5%. Contrasted with reference concrete without filaments, fiber expansion supposedly enhanced the prepeak and in additioning post-top locale of the heap diversion bend fundamentally.

2.7 M.R Nokken, RO hooton(1998) Hybrid fiber can give support at all the scope of strains. Blend of lesser and higher modulus filaments can capture breaks at minimised scale level & additionally full scale level. To overcome downside of minor workability caused because of consumption of just most noteworthy level of steel strands. conceivable favourable position in enhancing solid properties and also diminishing the entire cost of solid creation for the economic need.

2.8 Ibrahim Turkmin(2004) Its deliberate that the Fiber reinforced self-compacting concrete (FRSCC) contains just a single kind of fiber. The utilization of at-least two sorts of strands in a reasonable blend

may possibly not just enhance the general properties of self-compacting concrete, however may likewise bring about execution cooperative energy.

2.9 S. Chandrasekhar (2005) This paper displays a compressive trial think about on the near conduct of the strengthened cement (RC) and the crossover fortified cement (HFRC) shield TBM (Tunnel Boring Machine) burrow lining portions presented to flame. The tests were led utilizing a recently created test office, which is fit for pleasing diverse mechanical stacking and limit molded under various fire situations.

2.10 Swami B.L.P (2006) In their experimental investigation the sudden of expansion of mono strands and crossover filaments on the involuntary properties of solid blend is contemplated in the presents examination. Steel filaments of 1.1% and polypropylene strands 0.0360% were added exclusively to the solid blend as mono strands and after that they were included to shape a half and half fiber fortified cement.

III. MATERIALS & MIX PROPORTIONS

The materials used are Cement, fine aggregate, coarse aggregate, Bottom ash, Steel fibres, Polyolefin fibres, Water and Super plasticizer.

Materials are Cement, Fine Aggregate, Coarse Aggregate, Superplasticizer,Steel fibre, Polyolefin fibre,Bottom Ash.

Fig 1: Steel fibre

Fig 2: Polyolefin fibre

3.1 Without bottom ash

Table1 : Specimen Detailing

Sl no	Name of Specimen	Volume Fraction	Steel fibre(vf)	Polyolefin Fibre(vf)
1	PC1	0	0	0
2	SC1	0.6	0.6	0
3	SPC1	0.6	0.4	0.2
4	SPC2	0.6	0.3	0.3
5	SC2	1.1	1.1	0
6	SPC3	1.1	0.8	0.3
7	SPC4	1.1	0.7	0.4
8	SC3	1.2	1.2	0
9	SPC5	1.2	1	0.2
10	SPC6	1.2	0.7	0.5

3. 2 15% adding With BA

Table 2 : Specimen Detailing

Sl no	Name of Specimen	Volume Fraction	Steel fibre(vf)	Polyolefin Fibre(vf)
1	PC2	0	0	0
2	BSC1	0.6	0.6	0
3	BSPC1	0.6	0.5	0.1
4	BSPC2	0.6	0.3	0.3
5	BSB2	1.1	1.1	0
6	BSPC3	1.1	0.8	0.3
7	BSPC4	1.1	0.6	0.5
8	BSC3	1.2	1.2	0
9	BSPC5	1.2	1	0.2
10	BSPC6	1.2	0.7	0.5

IV. RESULTS AND DISCUSSIONS

This section examine the exploratory outcomes which are introduced. Each of the compressive quality test information plotted in tables and bar graphs relates to the modulus estimation of compressive worth of concrete cylinders in an arrangement. The anxiety of stress & strain practices of high quality mixture fiber strengthened cement with & without Bottom ash.

4.1 COMPRESSIVE STRENGTH

The Strength is the limit of a material or structure to survive loads having a tendency to lessen size. Compressive quality estimations were performed on a CTM machine with a stacking limit of 3000 kN under a heap control administration with a stacking rate of 4.5KN/S for cubes specimen of size 150mm x150mm x150mm as per Indian standards.

Fig 1: Cube

4.2 STRESS AND STRAIN BEHAVIOUR

An endeavor has been finished to produce the entire anxiety strain bend tentatively for High Strength FRC of review M25 utilizing steel and polyolefin strands compressive quality. The collision of fiber expansion to concrete on a segment of the real parameters to be specific pinnacle push, endure top anxiety, the sturdiness of cement and the idea of stress– strain curve is considered.

Fig 2: Testing of Cylindrical mould

Table 3: Calculating Young's Modulous

Specimen Name	Stress N/mm²	Strain	Youngs modulus N/mm²
PC1	8.45	0.00021	40238
AC1	8.45	0.00022	38409
SPC1	8.45	0.00025	33800
SPC2	9.93	0.00027	36777
SC2	8.49	0.00023	36913
SPC3	8.49	0.00025	33960
SPC4	8.49	0.00026	32653
SC3	8.49	0.00018	47166
SPC5	8.49	0.00021	40428
SPC6	9.93	0.00024	41375
AC2	9.92	0.00025	39680
BSPC1	9.98	0.00027	36962
BSPC2	11.28	0.00028	40285
BSB2	11.31	0.00028	40392
BSPC3	9.92	0.00025	39680
BSPC4	11.32	0.00028	40428
BS3	8.45	0.00022	38409
BSPC5	8.42	0.00021	40095
BSPC6	8.41	0.00022	38227

V. SUMMARY AND CONCLUSION

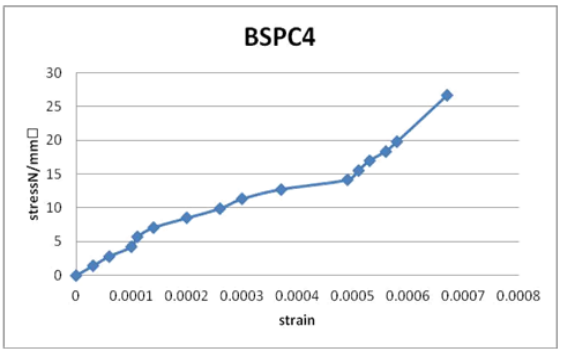
5.1 SUMMARY

This investigation deals about the compressive quality of stress strain conduct of high quality HFRC. On off chance that the fibres are adequately solid, adequately attached to material, and allow the FRC to convey huge worries over a generally expansive strain limit in the placement-split stage. The test outcomes were arrived at the midpoint of over every one of sorts of strands to conclude the compressive anxiety strain relationship, the assessment and meaning of the anxiety strain relationship of cement are required. It is likewise known to most examiners this is for the reason that of the way that anxiety strain relationship significantly affected by various components. In this work compression tests was conceded on FRC using steel and polyolefin fibres with the replacement of 15% with bottom ash and the stress strain relationship is studied.

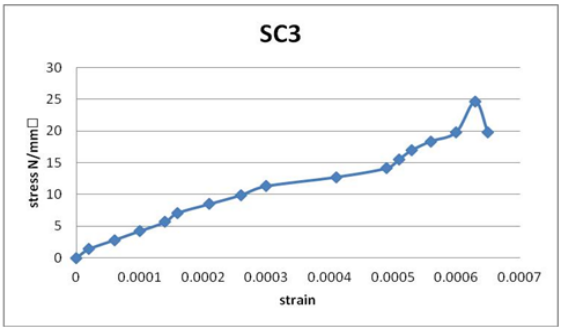
5.2 CONCLUSION

From the compression tests carried out it shows that optimum strength is obtained by adding 15% of bottom ash.

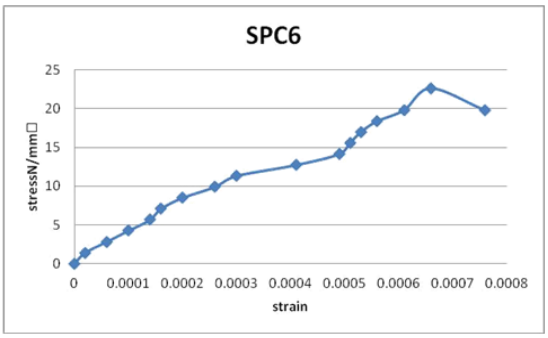
- ✓ Though the strength does not increase with that of the manage mix with hybrid fibres but its posses acceptable compressive strength.
- ✓ By the addition of hybrid fibres the compression strength varies with different combinations of fibres , the modulus of steel fibres in reinforced concrete observed to increase the compressive strength of the concrete.
- ✓ It was pragmatic that condition of steel fibres increases the ultimate stress and the corresponding ultimate strain with respect to the plain concrete.
- ✓ It shows that when the specimen suffers the load and reaches the highest stress, the concrete will express that the crack or breakages, however it does not come to pieces which result in good bonding on steel & polyolefin fibre.
- ✓ The obtained highest modulus of elasticity of FRC with bottom ash throughout the project were:



Graph 1: 0.6steel, 0.5%polyplefin



Graph 2: 1.2steel, 0%polyplefin



Graph 3: 0.7steel, 0.5%polyplefin

0.6% steel and 0.5% polyolefin along with the addition of 15% bottom ash and the corresponding stress strain curve is represented in Graph no: 1

1.2% steel and 0% polyolefin and the corresponding stress strain curve is represented in Graph no: 2

0.7% steel and 0.5% polyolefin and the corresponding stress strain curve is represented in Graph no: 3

VI. FUTURE SCOPE

§ The study even can be carried out by using of different fibres like glass fibre, carbon fibres and asbestos fibre etc.

§ The study of this project poleyofin can be used in the infrastructure application such as constructions of pavements, light precast elements, tunnel lining, water pipe lines high modulus of elasticity is required.

§ The mixture of steel and poleyofin fibres is a good solution that improves residual values for small deformations.

§ Whereas steel fibres can be used for hydraulic constructions, shortcreting methods of fabrication.

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