EXPERIMENTAL STUDY ON BENDABLE CONCRETE

[1]G. Hymavathi, [1]Dr.K. Chandramouli, [2]J. Sree Naga Chaitanya, [4]A. Medhasri Mrunalini, [5]V.V.Gopinath

[1,3&4]Assistant Professor, [2]Professor & HOD, [5]UG Student
Department of Civil Engineering,
NRI Institute of Technology, Visadala (V), Medikonduru (M), Guntur, Andhra Pradesh, INDIA

***Abstract*: Bendable concrete is composed of all the ingredients of a traditional concrete minus coarse aggregates and is reinforced with polymer fibres.It contains cement, sand, water, fibres,and admixtures.ECC is 37%less expensive, consumes 40% less energy, and produces 39% less carbon dioxide than regular concrete. ECC incorporates high volumes of industrial wastes including fly ash. The bendable concrete is made of same ingredients as in regular concrete minus the coarse aggregate. It looks exactly like normal concrete, but under excusive strain, the ECC concrete allows, the specially coated net work of fibre in the cement to slide within the cement, thus avoiding the inflexibility that causes brittleness and breakage. The key factor is that ECC is engineered, means in addition to the reinforcing the concrete with micro fibres. In these, a literature study was carried out in order to prepare bendable concrete and comparing the bendable concrete to the traditional one. An experimental has been carried out for M30 concrete using the optimum percentage of partial replacement of cement with fly ash and incorporating with different percentages of Recron 3S fibre. Fly ash was partially replaced as cement by 0%,10%, 20% and 30% and Recron 3S fibre as 0%, 1% and 2%and 3% respectively. Conventional concrete cubes, cylinders were casted and tested for 7 days and 28 days. Unlike regular concrete, ECC has a strain capacity in the range of 3% – 7%, compared to 0.01% for Ordinary Portland Cement (OPC). ECC therefore acts more like a ductile metal than a brittle glass (as does OPC concrete), leading to a wide variety of applications. Engineered Cementitious Composite (ECC), was developed by the Professor Victorli at the University of Michigan.**

***Keywords*: ECC, bendable concrete, compressive strength, split tensile strength**.

I. INTRODUCTION

Bendable concrete is a ultra-ductile reinforced mixture is made to produce high ductility and more cracking control effect. In the present study the materials of cement, sand, fibres (Recron fibres), fly ash, water and admixture (SP 1040) is used to make bendable concrete mixture. The concrete specimens were casted and cured for 7days, 28 days strength calculations. The main advantages of ECC are Increase tensile strength, Controls cracking and Increases flexibility, Reduces permeability. When exposed to tensile strain, concrete has always been a brittle material that breaks easily. Researchers recently developed a novel type of concrete that is more ductile than standard concrete. When regular concrete is put under a tensile load, it cracks. As a result, scientists have long sought to make concrete more ductile or more prone to flex rather than break under weight. Engineered Cementitious Composite (ECC) has been shown to be 50 times more flexible and 40 times lighter than traditional concrete (Gandhiya,2015) 9.Additionally,ECC'ssuperior energy absorption qualities make it ideal for essential elements in seismic zones.

II. OBJECTIVES

The objectives of this study are as follows

I. To optimize the usage of cement with flyash
II. To optimize the usage of concrete with Recron 3s fibres.
III. To evaluate the compressive and spilt tensile strength of concrete.

III. MATERIALS

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.15
2	Fineness	9.89%

3.1Flyash: -Concrete manufacture necessitates a massive amount of natural resources including sand, stone, and water. Cement, which reacts with water to bond the particles together, is another important component of concrete formation. As a result, scientists have been testing the suitability of various extra cementing materials, such as flyash. As a by-product of the

coal combustion process,flyash is produced. Fly ash will not only minimize cement use but will also eliminate waste disposal expenditures. Because of its pozzolanic activity, low water consumption, reduced bleeding, and lower heat evolution,flyash has become a popular binder alternative in the building industry.

3.2 Recron 3s Fibre: As a secondary reinforcing material,Recron 3s fibre was used. It prevents shrink age cracks and improves water,abrasion,and impact resistance. It improves compressive strength, ductility, and flexural strength, as well as the ability to absorb more energy, by making concrete homogeneous. Segregation and bleeding are reduced using consistently scattered recron 3s fibres, resulting in a more homogeneous mix. This improves durability by increasing strength and decreasing permeability.Recron 3s prevents micro shrinkage cracks from forming during hydration, making the structure/plaster/component stronger from the start. Furthermore, when the weights put on concrete approach those that cause failure, cracks will form, sometimes quickly. Recron 3s is added to concrete and plaster to prevent cracking caused by volume change expansion and contraction. Recon 3s minimises the formation of tiny shrinkage fractures during hydration, making the building, plaster, or component intrinsically stronger. Furthermore, when the loads put on concrete approach the point of collapse, cracks will propagate quickly.Because1kg of Recron 3s contains millions of fibres that support mortar /concrete in all directions, adding it to concrete and plaster prevents cracking caused by volume change (expansion and contraction). 6 mm or 12mmcutlength

IV. EXPERIMENTAL INVESTIGATIONS

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2 .

Table2: Compressive strength of concrete with Fly ash as partial replacement of cement in concrete by adding Recron 3s fibre.

Cement Sand Ratio	Flyash	Recron 3s Fibre	7days N/mm^2	28days N/mm^2
N.C			19.15	27.47
1.1.5	0%	0%	19.81	28.43
	10%	1%	21.45	30.72
	20%	2%	22.38	32.08
	30%	3%	21.83	31.43

4.2Split Tensile strength results

At the age of 7 and 28days, the cylindrical specimens (150mm diameter x 300mm height) were tested for evaluating the split tensile strength. The experiment is performed by putting a cylindrical sample horizontally between a compression testing machine loading surface and the load is applied until the cylinder fails along the vertical diameter

Table3: Split tensile strength of concrete with Fly ash as partial replacement of cement in concrete by adding Recron 3s fibre.

Cementsand Ratio	Flyash	Recron 3s Fibre	7days N/mm^2	28days N/mm^2
N.C			1.86	2.68
1.1.5	0%	0%	2.21	3.17
	10%	1%	2.64	3.78
	20%	2%	2.70	3.80
	30%	3%	2.61	3.18

V. CONCLUSION

In this study, the concrete ingredients like cement are partially replaced by Fly ash and Recron 3s fibre. Fly ash are varied different percentages of 0,10,20 and 30% and Recron 3s fibre is varied with different percentages like0,1,2and3%.

- The percentage increase of compressive strength of concrete with 20% of Fly ash and 2% of Recron 3s fibre at 7 and 28 days are 22.38 and 32.08 N/mm^2.

- The percentage increase of split tensile strength of concrete with 20% of Fly ash and 2% of Recron 3s fibre at 7 and 28 days are 2.70 and 3.80 N/mm^2.
- At 20% replacement of cement by Fly ash and 2% Recron 3s fibre the achieved compressive strength of concrete is 22.38 N/mm^2 for 7 days.
- At 20% replacement of cement by Fly ash and 2% Recron 3s fibre the achieved compressive strength of concrete is 32.08 N/mm^2 for 28 days.
- At 30% replacement of cement by Fly ash and 3% Recron 3s fibre the compressive strength of concrete is 21.83 N/mm^2 for 7 days.
- At 30% replacement of cement by Fly ash and 3% Recron 3s fibre the compressive strength of concrete is 31.43N/mm^2 for 28 days.
- At 20% replacement of cement by Fly ash and 2% Recron 3s fibre the split tensile strength of concrete is 2.70N/mm^2 for 7 days.
- At 20% replacement of cement by Fly ash and 2% Recron 3s fibre the split tensile strength of concrete is 3.80N/mm^2 for 28 days.
- At 30% replacement of cement by Fly ash and 3% Recron 3s fibre the split tensile strength of concrete is 2.61N/mm^2 for 7 days.
- At 30% replacement of cement by Fly ash and 3% Recron 3s fibre the split tensile strength of concrete is 3.18N/mm^2 for 28 days.

REFERENCES

1. Neeladharan, A. Muralidaharan, P. Sathish, Experimental Investigation On bendable concrete By using admixtures,8(11),2018,69-78,Spjmr.
2. Kallepalli Bindu Madhavi, Mandala Venugopal, V Rajesh, Kunchepu Suresh, Experimental Study on Bendable Concrete, 5(10), 2016, 501-504, Ijertv.
3. K.Selva Kumar, R.Kishore Kumar, A.Deivasiga mani,Ms.S.Amutha,Experimental Study On Bendable Concrete,1(4),2017,214-218,Icrtcetm.
4. Sagargadhiya,Tn Patel And Dineshshah,Bendable Concrete,4(1),2015,142-147,Ijscer.
5. Brinila Bright B, Beer Mohamed Sareef S, Basith P, Harish Priya Dharshan T,5(4),2018,127-136,Irjet.
6. Pavan S, Pavan kumar Gudagamanal, Preetham M, Rahul Sand Chandra Shekar Vc, Experimental Study On Brndable Concrete,8(5),2021,1349-1353,Irjet.
7. Ganeshs.Ghodke,Nileshsdaphal,Yogeshs.Bandgar,Dattatrayas.Gadekarsagara.Chavan,Ashwiniwaghule,Experimental Study On Bendable Concrete By Using Admixture And Fiber, 4(9),2017,1743-1746,Ijtre.
8. Srinivasach, Dr. Venkatesh, Experimental Study On Un axial Tensile Strength Of Bendable Concrete,11(9),2020,260-271, Ijaret.
9. Vipul Solanki, Dr.Khadeeja Priyan, Dr.J.R.Pitroda,A Review On Bendable Concrete,6(8),2021,247-252,Jeitr.
10. Bikkineni Ravi Teja, Gude. Ramakrishna, Dr. J. S. R. Prasad, An Experimental Study On Mechanical Properties Of Bendable Concrete By Using Fly Ash And Recron 3s Fibers,5(20),2021,1-7,Ilkogretim.