National Conference on Recent Research in Engineering and Technology (NCRRET-2015)
International Journal of Advance Engineering and Research Development (IJAERD)
e-ISSN: 2348 - 4470 , print-ISSN: 2348-6406

An Experimental study of high volume flyash concretewith Recron fibers-3 S

Hiren D Talati
Civil Engineering Department
DJMIT
Mogar, Gujarat, India
hirentalati84@yahoo.com

Vatsal N Patel
Civil Engineering Department
ADIT
New V. V. Nagar, Gujarat, India
vatsalnpatel@yahoo.com

Abstract—**Fly Ash Concrete applies to engineered concrete systems which have fly ash as a partial replacement of cement. Concrete which has fly ash content more than 35% by mass of the cementitious materials content is termed as High Volume Fly Ash Concrete.Itis recommendedovertheordinaryconcreteasitconsiderably savescementandalsopreventsenvironmental pollution.Theuseoffibersimprovesspecificmaterialproperties oftheconcrete,impactresistance,flexural strength,toughness,fatigueresistance, andductility.Inthispaperanattempt ismadetostudythemechanical propertiesofHighVolumeFly-AshConcretewithadditionoffibersat0.1,0.2,and0.3%ofcement andwith50%flyashreplacementwithcement.Itisfoundthatfiber additions haveincreaseditsstrengthcharacteristics considerably overtheordinarycementconcrete.**

Keywords—component; formatting; style; styling; insert (key words)

I. INTRODUCTION

Concreteis the most extensivelyused materialin civil engineeringconstructionso that considerable attentionistakenforimproving theproperties of concrete with respect to strength and durability. India's totalinstalledcapacity ofcementstoodat380milliontonsperannum (mtpa).High volume fly ash concrete is one of the major developments since last decade leading to utilization of fly ash in a bulk quantity and thereby reducing cement consumption and ultimately reducing CO2 in order of one ton per a ton of cement. The past research has been given due weight age for application of HVFA in different sectors like mass concrete, foundation, transportation etc. but the limitations of HVFA like ductility, poor performance towards expansion and contraction, flexural property, impact resistance have made its use limited. Useofindustrywastelikeflyashtopartly replace cementing materialinconcretesystem addressesthe sustainability issuesanditsadoptionwillenablethe concreteconstruction industrytobecomemore sustainable. Fiberreinforced concreteisconsideredasamaterial ofimproved Properties andnotasreinforcedcement concretewherein Reinforcementisprovidedforlocal Strengtheningofconcreteintensionregion.Sincein Fiber Reinforcedconcrete, fibersaredistributed uniformlyin concrete,ithasbetterpropertiesto resist internalstresses duetoshrinkage.Fibersimprove specificmaterial properties oftheconcrete, impact resistance, flexuralstrength,toughness,fatigue resistance,andductility.Fibersgenerally usedin cementconcrete pavements aresteelfibersand organicpolymerfiberssuch as polypropyleneand polyester.

II. METHODOLOGY

A. Experimentalinvestigation:

Materialsused

The followingmaterialswereusedinthe study.

Cement

Ordinary Portlandcement,53Grade conformingto IS12269– 1987 was used in work.

Fine aggregate

Locally available river sand conformingto GradingzoneII ofIS383–1970 was used in work.

Coarseaggregate

Locallyavailablecrushedblue granite stones conformingtograded aggregate of nominalsize12.5mmasperIS383–1970 was used in work.

Fly Ash

Fly ash class F obtained from VanakboriThermalPowerPlantwhichconfirms asperIS3812- 2000 was used in this work

Fibers

PolypropyleneRecron3S fiberwasused with properties shown inTable I.

Superplasticizer

Acommercially available sulphonatednaphthaleneformaldehyde basedsuper plasticizer (CONPLAST SP430)wasusedas chemicaladmixture toenhancetheworkabilityofthe concrete.Thepropertiesare giveninTable II.

Water

Fresh potable water free from acid and organic substances Was used for mixing and curing the concrete.

TABLEI.PROPERTIES OFRECRON-3S

Property	Values
Cutlength	6mm,12mm
Aspectratio(L/d)	300
Specificgravity	0.91
TensileStrength	6000kg/cm^2
Meltingpoint	>250ºC
Dispersion	Excellent
Acidresistance	Excellent
Alkaliresistance	Good

TABLEII.PROPERTIES OF SUPER PLASTICIZER

Colour	Brown
SpecificGravity	1.22to1.225
ChlorideContent	Nil
SolidContents	40%

B.CastingandCuring ofSpecimens

Mixing of ingredients was done according to specifications given in Indian Standardby machine mixing. The concrete was filled into the moulds in layers approximately 5cm deep and compacted by vibrator. The specimens were removed from mould after 24 hours and were kept submerged in curing tank. After curing for a period of 7, 28, and 56 days specimens were taken out and dried before testing.

C.Testing

Compression Test

Compression Test on cubes of size 150mm×150mm×150mm was conducted on the compression testing machine. The load on cube was applied upto the failure of specimen. Average compressive strength of three cubes was taken after7,28, and 56 days curing.

Flexural Test

Flexural test was performed on beams of size 100mm×100mm×500mm by placing them in flexural testing machine. The load was increased until beam fails and maximum load applied was recorded to find flexural strength.

D. Results and Discussions

Slumpcone

Forapavementslabworkabilityrequiredisinthe rangeof20to25mm.Inthisexperiment waterbinder ratiohasbeenkeptconstant.FromtheTableIII.,itisclearthat slumpismoremixA1.Onfiber additions (A2,A3,A4)anominaldecreasein workability isobserved as slump is reduced.

TABLEIII. SLUMP TEST RESULTS

Mix	Fly Ash (%)	Fiber %	Slump Value (mm)
A0	0	0	28
A1	50	0	29
A2	50	0.1	27
A3	50	0.2	25
A4	50	0.3	26

Compressive and Flexural Strength

The results of thecompressive tests of various mixes attheage of 28and 56 days. Theinfluences of flyashreplacementof cementat50%and varying percentages of fiber additionsat 0.1, 0.2and 0.3%andthecontrol mixare shown. Though the 28 day compressive strengthis more forcontrol mix,i.e.A0 the 56 day compressive strength is more forA3. In thelongtime period fly ash base fiberadded concrete gains more strength than fibreless flyashlessconcrete. A1 mix values are higherthanM0 by 6.3%. With the use of fibers, compressive strengthshowsfurther increase, the maximum being for (A3) 0.2% fiberadded flash concrete. Theincrease overcontrol mixis 11.4%.

Theinfluenceofflyashreplacementofcementat 50%(A1)andvaryingpercentages offiberadditions at0.1%(A2),0.2%(A3)and0.3%(A4)alongwith controlmixA0areshownintableIII. Comparativelyhigherstrengt hcomparedtomixA0 anA1.Onaveragefiberaddedmixes (A2,A3,and A4)has2%and5.3%increase overthecontrolmix A0andfiberlessflyashbasedconcrete A1 respectively

E. Conclusions

1. Slumpvaluedecrease with Fiberaddition.
2. Thestrengthgainingat28daysisfoundtobe less forflybased(A1)and fiberadded(A2,A3 andA4)concrete by12.5%and9.2% respectively oncomparingtoOPCbased concrete(A0).
3. Thestrengthgainingat56daysishigherfor fiberaddedflyashbasedconcrete thanOPC basedconcrete.
4. Flyashbasedconcreteperformswellatlater stagethanatearlydays.

5. Fiberadditionstotheflyash based mixA2, A3 and A4 hashigherincrease instrengthover 50% flyAsh addedconcrete A1.Fiberaddition of0.2%(A4)has Themaximum compressive andFlexuralstrength Comparedtofiberless A1 mix.

6. Comparison of predicted and experimental values Onaverageshowsavariationof2.65%, 4.65%and Respectivelyforcompressive strengthandflexural Strength.

References:

[1] 'Relation betweenStrengthProperties (Flexural andCompressive) andAbrasionResistanceof Fiber(SteelandPolypropylene) ReinforcedFly AshConcrete', JournalofMaterials inCivil Engineering,Vol.21,No.8,August1, 2009.

[2] Desai,J.P.,'ConstructionandPerformanceof High Volume Fly Ash Concrete Roads in India', ACI SP-221, V.M.Malhotra, ed., 2004,pp.589-603

[3] IndrajitPatel,Modhera,C.D.,'Studybasic propertiesoffiberreinforcedhighvolumefly ashconcrete',JournalofEngineering and Science/Vol.I/IssueI/July-Sept.2010/60-70.

[4] IS:8112-1989. 'Grade43ordinaryPortland cementBISSpecifications'. BureauofIndian Standards,1990

[5] PraveenKumar,ShalendraPratapSingh, 'Fiber- Reinforced FlyAshsubbasesinRuralRoads'. Journal of Transportation Engineering, Vol.134,No.4,April1,2008.

[6] Sikdar, P.K., Gupta, Saroj, Kumar Satander, 'Application of Fiber as Secondary ReinforcementinConcrete'.CivilEngineering and Construction Review, December issue, 2005,pp32- 35.

[7] IS: 516(1959), Methods of Tests for Strength of concrete. Bureau of Indian Standards, New Delhi.

[8] IS: 12269 (1987), Specification for 53 grade ordinary Portland cement .Bureau of Indian Standards New Delhi.

[9] IS: 9103(1999), Concrete Admixtures-Specifications.Bureau of Indian Standards, New Delhi.

TABLEIV.COMPRESSION AND FLEXURAL TEST RESULTS

Mix	**Fly ashin %of cement**	**Fiber%**	**Compressive strengthin MPa**			**Flexuralstrengthin MPa**		
			7 days	28 days	56 days	7 days	28 days	56 days
M0	0	0	30	36	40	3.54	4.26	4.12
M1	60	0	16	31	43	3.01	3.55	4.01
M2	60	0.1	20	32	45	3.1	3.94	4.48
M3	60	0.2	21	32	46	2.95	3.45	4.18
M4	60	0.3	21	33	43	3.24	3.56	4.14