REFINING THE ASSET OF CONCRETE PAVER BLOCKS BY USING FLY ASH, GLASS FIBRE & GGBS -"A REVIEW"

ALETY. SHIVAKRISHNA
Assistant Professor, Dept. of Civil
Anurag Engineering College,
E-mail Id: aletyshivakrishna@gmail.com

PULIVARTHI VENKATA SHIVAKUMAR
Student, Dept. of Civil
Anurag Engineering College,
E-mail Id: shivaroyal1998@gmail.com

ABSTRACT:

In this trial examination compressive quality, flexural quality and water ingestion of paver piece were assessed by supplanting part of bond with the fly fiery debris in M35 review concrete. Glass filaments were additionally consolidated alongside the fly fiery remains to additionally improve the mechanical properties. Distinctive extents of glass fiber beginning from 0.1% to 0.4% by weight of bond in the paver square were included. The ideal fiber content from test comes about was observed to be 0.2% by weight of concrete. 10% to 40% by weight of concrete was supplanted with the fly fiery remains. From the test outcomes got the ideal fly slag and glass fiber content were observed to be 20% and 0.2% separately. Cost investigation of paver piece was done and was contrasted and customary paver square.

Keywords: *Compressive Strength, Glass Fibre, Fly ash, Flexural strength, Paver Block and Water Absorption.*

1.0 INTRODUCTION

General

Solid piece asphalts (CBPs) are shaped from singular strong hinders that fit firmly alongside each other to frame an asphalt surface. A run of the mill CBP is put on a thin bed of sand overlaying a sub base. CBP can be set with an assortment of shapes and examples. There are joint spaces between squares. These spaces are loaded with sand having reasonable reviewing. The pieces are controlled from two sides by edge limitations.

CPBs are produced from semi-dry blends. Amid assembling process vibration and weight is connected to the blend. By this procedure thick and solid CPB can be accomplished to shape solid and tough clearing surfaces. Besides inter locking conduct of CBP gives the capacity of spreading burdens to bigger regions.

History of Concrete Block Pavement:

Street clearing with firmly fitted stones laying on an adaptable granular base goes back to the Roman Empire. Despite the fact that, stones are as yet being utilized as clearing material the cutting edge variant of this street method Uses solid pieces. [Rada et. al. 1990]. The utilization of CBP for streets started in the Netherlands after the Second World War. Block clearing was the customary surface material in the Netherlands before the Second World War. In view of the coal deficiencies block had been inaccessible accordingly CBP had been utilized as a substitute.

Highlights of Concrete Block Pavements:

Solid clearing pieces are used in an assortment of business, city and modern applications. The essential purposes behind choosing CBP over other clearing surfaces are low support, simplicity of position and expulsion, reusage of unique pieces, style advance, and quick use after establishment or repair [Ghafoori and Mathis 1998].

Target of the work:

The targets of the present investigation are:

• To contemplate the impact on the properties of paver obstruct by including the diverse level of flly fiery remains, glass fiber and GGBS.

• To think about the impact on Compressive quality protection and Flexural Strength by including fiber, FLY ASH and GGBS blend in paver pieces.

• To diminish cost assessment of paver piece.

2.0 LITERATURE REVIEW

1. **K. Gupta.et.al., (2004).** They portrayed employments of pervious utilize concrete in development of asphalt for enhancing their execution and they at long last built up a solid and sturdy pervious cement blends for low-volume streets. The impacts of two sorts of fine totals i.e. squashed stone and stream sand, on different properties of pervious cement was contemplated. The fine total to coarse total proportion was as 1:5.720, contrasted with customary pervious bond concrete blends.

2. **Erdem Damci.et.al., (2008).** They portrayed the fly fiery remains and its impacts on the compressive quality, properties of Portland concrete. They at long last demonstrated that fly fiery remains tests in the proportion of 15% in clinker extraordinarily builds the compressive quality esteem (61.1 N/mm2) at 90 days and diminishing the molecule size of fly cinder in mixed Portland concrete causes an expansion in compressive quality.

3. **O. Kayali (2008)** learned about Fly fiery debris lightweight totals in superior cement and acquired that solid created utilizing fly cinder totals is around 22% lighter and in the meantime 20% more grounded than ordinary weight total cement. Drying shrinkage is around 33% not as much as that of ordinary weight concrete. Besides, the totals have high toughness qualities that are required for elite in structures.

4. **Rafat Siddique, (2003)** [22] contemplated the conduct of fly slag by supplanting sand and acquired outcome which says that compressive quality, part rigidity, flexural quality, and modulus of flexibility of fine total (sand) supplanted fly powder solid examples were higher than the plain solid (control blend) examples at all the ages.

5. **Charles Berrymana et.al., (2005)** [6] contemplated fly fiery remains trade for bond in strengthened solid pipe with the water diminishing admixtures and the outcomes uncovered that the most extreme 7 days compressive quality was

6. **A. K. Gupta.et.al., (2004).** They portrayed employments of pervious utilize concrete in development of asphalt for enhancing their execution and they at long last built up a solid and tough pervious cement blends for low-volume streets. The impacts of two sorts of fine totals i.e. squashed stone and waterway sand, on different properties of pervious cement was contemplated.

7. **Erdem Damci.et.al., (2008).** [18] They described the fly cinder and its impacts on the compressive quality, properties of Portland concrete. They at long last showed that fly powder tests in the proportion of 15% in clinker extraordinarily builds the compressive quality esteem (61.1 N/mm2) at 90 days and diminishing the molecule size of fly fiery remains in mixed Portland bond causes an expansion in compressive quality.

3.0 METHODOLOGY

Material Specification

Bond Ordinary Portland concrete (OPC) of 53 review fitting in with IS: 12269-1999 was utilized for throwing the paver squares. Physical properties of OPC were given in table .

FLYASH

Physical Requirement of Fly Ash

Physical Requirement of Fly Ash		
Specific gravity	2.25	
	Requirement grade of fly ash	
	F	C
Fineness-specific surface in kg/m^2	320	250
Lime reactivity	4.5	3.0
Compressive strength at 28 day in N/mm^2, min.	Not less than 80 percent of the strength of corresponding plain cement mortar cubes	

GGBS

GGBS was gotten by pounding the extinguished impact heater slag to fine powder. Substance organization of GGBS utilized was given in the accompanying table.

Synthetic creation of GGBS

Chemical	Percentage
SiO2	35.46
Al2O3	19.47
Fe2O3	0.8
MgO	8.69

Glass fibers

Salt safe E Glass strands were utilized and the properties of glass filaments were appeared in table

Property	Diameter (μm)	Specific Gravity	Failure Strain	Elasticity (GPa)	Tensile Strength (GPa)
Value	12	2.60	3.0%	80	2.5

Experimental setup

Paver pieces were threw complying with the blend extents and following the suggestions set down in IS: 15658:2006.Casting and testing process was done in two phases. In the primary stage paver pieces were threw for control blend S, and blend with glass strands SGF 0.1 SGF 0.2 SGF 0.3 SGF 0.4. The examples were cured in water for 7 and 28 days. For deciding the compressive quality, specimens were tried in compressive testing machine. In compressive quality test the heap should be connected without stun and expanded consistently at a rate of 15 +/ - 3 N/mm2/min until the point that no more prominent load can be supported by the example or delamination happens. Flexural quality test was directed utilizing widespread testing machine. In flexural quality test stack might be connected without stun and expanded ceaselessly at a uniform rate of 6 KN/min. The compressive, flexural and water assimilation tests were led according to Seems to be: 15658:2006. Presently from brings about first stage ideal consideration of glass fiber (%) was resolved. In the second stage bond was supplanted with GGBS and Fly powder alongside this ideal level of glass filaments and paver pieces were threw for SGFG10, SGFG20, SGFG30, SGFG40 blend. The examples were tried at 7, 28 and 56 days. The compressive, flexural and water retention tests were led according to May be: 15658:2006 and ideal glass fiber and GGBS was resolved

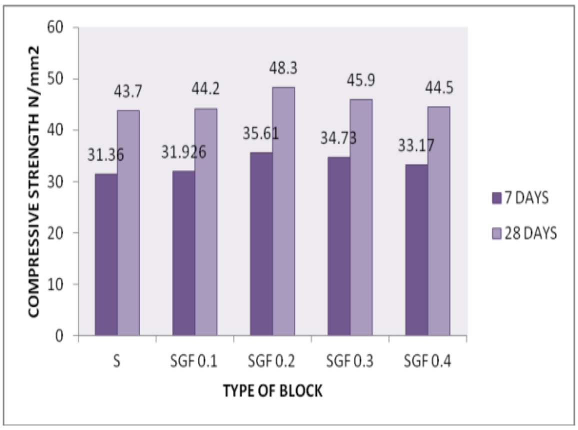
Flexural strength test

Paver blocks in oven

Compressive strength test

4.0RESULTS & DISCUSSION

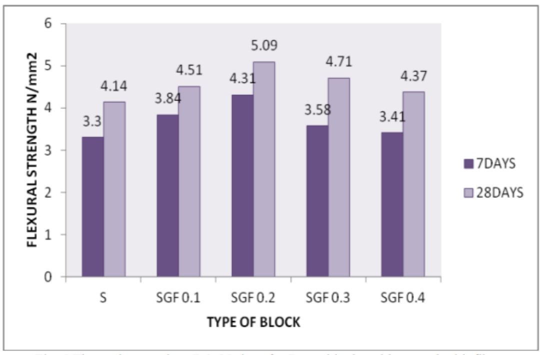
Compressive quality: The compressive quality estimations of the standard cement paver square and paver hinder with glass strands were exhibited in figure.



Compressive quality at 7 and 28days for Paver obstructs without and with strands

It was watched that the compressive quality of cement paver piece was expanding with the incorporation of strands contrasted with standard cement paver obstruct at 7 and 28 days .The chart shows that compressive quality at 7 and 28 days increments with the consideration of glass fiber till 0.2% fiber incorporation and later it diminishes. There was an expansion of 10.52% in compressive quality at 0.2% glass fiber incorporation contrasted with standard paver hinder at 28 days.

Flexural quality: The Flexural quality estimations of the standard cement paver piece and paver hinder with glass strands were displayed in figure.

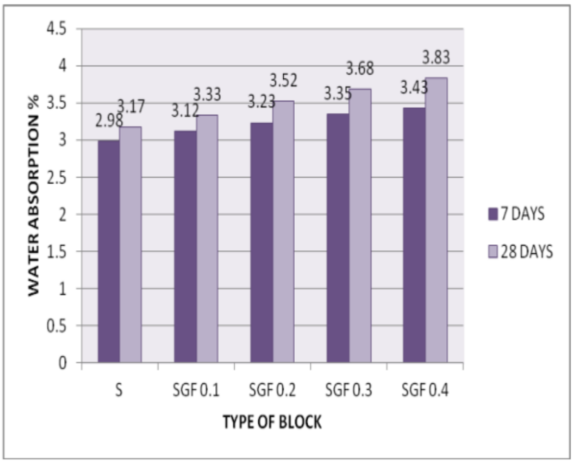


Flexural quality at 7 and 28 days for Paver hinders without and with filaments

It was watched that the flexural quality of cement paver square was expanding with the incorporation of filaments contrasted with standard cement paver obstruct at 7 and 28 days. The diagram shows that flexural quality at 7 and 28 days increments with the incorporation of fiber till 0.2% glass fiber consideration and later it diminishes. There was an expansion of 22.94% in flexural quality at 0.2% glass fiber consideration contrasted with standard paver hinder at 28 days.

Water assimilation:

The Water assimilation estimations of the standard cement paver piece and paver hinder with glass filaments were introduced in figure

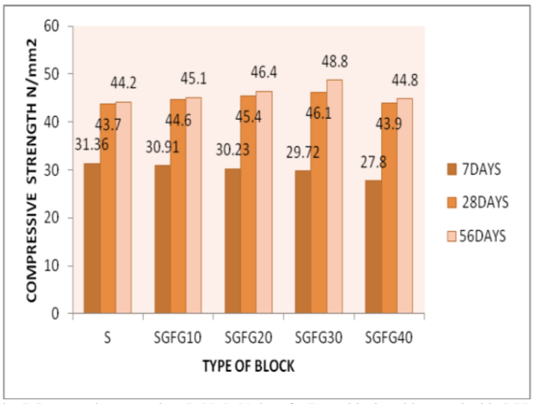


Water assimilation at 7 and 28 days for Paver hinders without and with filaments

Fig. delineates that water assimilation at 7 and 28 days increments with the expansion in glass fiber content. The expansion in water ingestion was because of the hydrophilic idea of the glass strands. However the most extreme water ingestion at 0.4% fiber incorporation got was 3.83% which is inside the farthest point of 6% stipulated by code IS 15658:2006.

Compressive quality:

The compressive quality estimations of the standard cement paver piece, paver obstruct ith glass strands and GGBS and Fly fiery remains blend were introduced in figure.

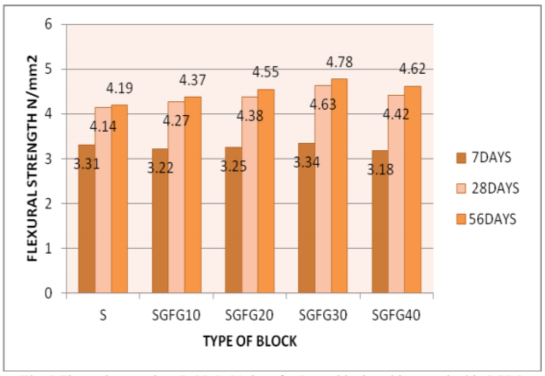


Compressive quality at 7, 28 and 56 days for Paver obstructs without and with GGBS and FLY ASH blend

Fig demonstrates the variety of compressive quality at the age of 7, 28&56 days for standard, 10%, 20%, 30%, 40% GGBS and flyash blend supplanting with concrete alongside ideal fiber incorporation i.e 0.2%.. The chart delineates that compressive quality at 7 days diminishes with the expansion in level of GGBS and flyash blend substitution because of low reactivity of GGBS and flyash blend at beginning periods. At 28 days compressive quality marginally increments at 30% GGBS and flyash blend substitution by 5.49% contrasted with standard paver square. At 56 days 10.4% expansion in compressive quality can be seen at 30% GGBS and Flyash blend substitution contrasted with standard paver piece.

Flexural quality:

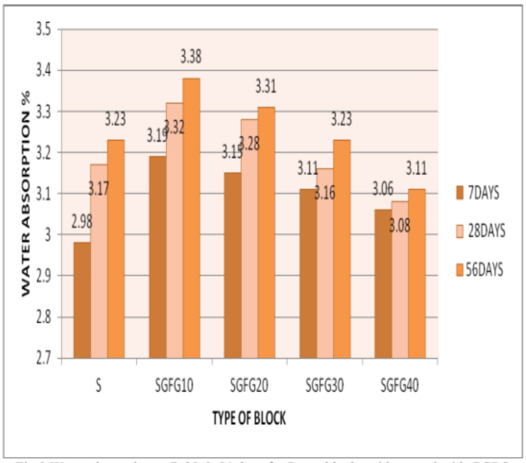
The Flexural quality estimations of the standard cement paver square, paver hinder with glass filaments and GGBS and Fly cinder blend were displayed in figure.



Flexural quality at 7, 28 and 56 days for Paver obstructs without and with GGBS and flyash blend.

Fig demonstrates the variety of flexural quality at the age of 7, 28&56 days for standard, 10%, 20%, 30%, 40% GGBS and Fly fiery debris blend supplanting with bond alongside ideal fiber incorporation i.e. 0.2%. At 7 days Flexural quality marginally increments at 30% GGBS and Fly fiery remains blend substitution. At 28 days flexural quality was greatest at 30% GGBS and Fly cinder blend substitution .There was an expansion of 11.83% in flexural quality at 30% GGBS and Fly powder blend substitution contrasted with standard paver hinder at 28 days. At 56 days 14.08% expansion in flexural quality can be seen at 30% GGBS and Fly slag blend substitution contrasted with standard paver square. Water assimilation

The Water retention estimations of the standard cement paver piece, paver obstruct with glass strands and GGBS and Fly fiery remains blend were displayed in figure demonstrates the variety of Water assimilation at the age of 7, 28&56days for typical, 10%, 20%, 30%, 40% GGBS and Fly cinder blend supplanting with bond alongside ideal fiber consideration i.e. 0.2%. The diagram outlines that water retention at 7, 28&56 days diminishes with the expansion in GGBS content



Water retention at 7, 28 and 56 days for Paver hinders without and with GGBS and Fly fiery debris blend

Cost Evaluation:

Cost details of materials used

S.No	Materials	Cost (Rs/kg)
1	Cement	7.60
2	Sand	0.80
3	Quarry Dust	0.40
4	Coarse aggregate	1.20
5	Dolomite Powder	1.40
6	Sikament FF	82
7	Glass Fiber	150

Cost details of Paver blocks

S.No	Type of paver block	Cost per unit (Rs)	Cost per cubic meter (Rs)
1	S	9.54	4971
2	$SGF_{0.1}$	9.65	5028
3	$SGF_{0.2}$	9.76	5085
4	$SGF_{0.3}$	9.87	5142
5	$SGF_{0.4}$	9.98	5199
6	$SGFF_{10}$	9.21	4797
7	$SGFF_{20}$	8.65	4508
8	$SGFF_{30}$	8.10	4220
9	$SGFF_{40}$	7.54	3931

Table demonstrates that the cost of paver square increments with increment in glass fiber content. On supplanting of concrete with GGBS and fly cinder blend the lessening in cost can be watched. There was an expansion of 7.69% in cost at 0.2% consideration of filaments. On supplanting of bond with 20% fly fiery debris alongside consideration of 0.2% fiber it is watched that there is diminish in taken a toll by 9.31% contrasted with regular paver piece.

5.0 CONCLUSIONS

A. Compressive quality and flexural quality of paver pieces increments by expansion of glass fiber and ideal substance of fiber consideration is 0.2% by weight of bond.

B. On expansion of 0.2% glass strands there was 10.52% expansion in compressive quality and 22.94% increment in flexural quality contrasted with customary paver obstruct at 28 days.

C. Test comes about at 90 days on supplanting of concrete with GGBS and fly powder blend shows an expansion of 9.48% in compressive quality and 3.71% in Flexural quality at 20% Fly fiery debris blend substitution contrasted with traditional paver piece.

D. Water assimilation rate is found to diminish with supplanting of concrete with fly fiery remains blend and the abatement was 1.5% contrasted with customary paver obstruct at 90 days .

E. On supplanting of bond with 20% fly cinder blend alongside consideration of 0.2% fiber it was watched that there was diminish in taken a toll by 9.31% for every unit contrasted with customary paver piece.

F. Consolidated impact of GGBS and fly slag and glass strands brought about improvement of quality properties with concurrent lessening in cost, making the paver square efficient.

REFERENCES

[1] Ritesh Mall, Sharda Shrama and R.D.Patel(2014) "Investigations of the Properties of Paver Block utilizing Fly Ash" IJSRD - International Journal for Scientific Research and Development ,Vol. 2, Issue 10.

[2] Som Nath Sachdeva,Vanita Aggarwal,S. M. Gupta (2014) "High Volume Fly Ash Concrete for Paver Blocks" International Journal of Civil, Architectural, Structural and Construction Engineering, Vol:8 No:3.

[3] Rama Mohan Rao.P, Sudarsana Rao.H and Sekar.S.K (2010) "Impact of Glass Fibers on Fly slag Based Concrete" International diary of common and auxiliary designing Volume 1, No 3.

[4] V. M. Sounthararajan and A. Sivakumar(2013) "Fortifying proficiency of glass strands in low volume class F fly slag concrete"JCECT Vol. 4(6), pp. 184-191 .

[5] G. Navya, J. Venkateswara Rao. (2014) "Test Investigation on Properties Concrete Paver Block with the Inclusion of Natural Fibers" IJERA, ISSN: 2248-9622, Vol. 4, Issue 8(Version 6), pp.34-38.

[6] G. Navya, J. Venkateswara Rao. (2014) "Impacts of polyester fiber on concrete paver squares" IOSR, ISSN: 2278-1684 Volume 11, Issue 4 Ver. VII.

[7] Thakur, Saxena and Arora T.R., (2014) "Impact of Partial Replacement of Cement by Fly Ash with Using Nylon Fiber in Concrete Paver Block" (IJERT) Vol. 3 Issue 1,.

[8] K. Vamshi Krishna and J. Venkateswara Rao (2014) "Impact of Glass Fibers In Rigid Pavement" International Journal Of Scientific Research And Education, Volume2, Issue9Pages1797-1804