UTILIZATION OF BASALT FIBRE IN PAVER BLOCK

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ABSTRACT

Interlocking Concrete Block Pavement (ICBP) technology has been introduced in India in construction, a decade ago, for specific requirement namely footpaths and parking areas etc. Now ICBP is being adopted extensively in different uses where the conventional construction of pavement using hot bituminous mix or cement concrete technology is not feasible or desirable. In this investigation, various properties such as compressive strength, split tensile strength, bending strength and water absorption of paver blocks consisting of crushed *granite, unconventional materials such as kadapa and broken paver for various percentage replacements of coarse adisposal of fly ash, a waste product from thermal power plants, is a major problem in India. Many R&D and academic institutions are actively involved in the effective utilisation of fZvash in Civil Engineering applications. The Structural Engineering Research Centre (SERC), Chennai has carried out extensive research on utilisation of fly ash in concrete as partial cement replacement material (CRM) since 1975 . Recently, SERC has carried out extensive R&D work on development of High Performance Concrete (HPC) mixes using flyash(FA), ground granulated blast furnace slag(GGBS) and silica fume(SF) as mineral admixtures, especially to improve the durability characteristics of cement concrete. This paper presents the mechanical and durability properties of different HPC mixes containing fly ash. HPCs*

Keywords: Made from Basalt rock, High Tensile strength, Good electromagnetic, Resistance to acid, Low cost material.

I. INTRODUCTION

Concrete paver blocks were first introduced in Holland in the nineteen fifties as replacement of paver bricks. Paver block is solid, unreinforced pre-cast cement concrete paving units used in the surface course of pavement. Paver block has been extensively used in many countries.

The first proposal to use concrete paving blocks highway pavement material in 1973, the development of design procedure has been conditioned by the need to persuade engineers that concrete blocks are effective structurally. Compared to pavements designed according to western European practice, British pavements are frequently deeper and more accurately specified

In the recent days, the various fibers develop and used in the construction, industrial and highway engineering. The steel is mainly used in that various application. Also fiber glass polythene fibers, carbon fibers, polyamide fibers are now developed and also used in construction, industrial and infrastructure development. In that list new one fiber is added, called, as basalt rock fibers.

II. PAVING BLOCKAND BASALT FIBRE

2.1 Paving Block: Interlocking Pavers are modern day solution to the outdoor flooring versatility in applications. They are high strength concrete moldings in various shapes, sizes & colors to suit the imagination of landscape architects & nature's essence. Interlocking pavers are manufactured concrete product that is individually placed in variety of patterns. Pavers do not use mortar or grout the sharp angle bedding sand that they are placed on provide the interlocking feature of pavers which allow them to shift slightly with the earth without cracking or breaking. Paving stones are three times stronger than poured in place concrete. Different colures of paver blocks available in market

The first proposal to use concrete paving blocks highway pavement material in 1973, the development of design procedure has been conditioned by the need to persuade engineers that concrete blocks are effective structurally. Compared to pavements designed according to western European practice, British pavements are frequently deeper and more accurately specified.

2.2 Basalt Fiber : In the recent days, the various fibers develop and used in the construction, industrial and highway engineering. The steel is mainly used in that various application. Also fiber glass polythene fibers, carbon fibers, polyamide fibers are now developed and also used in construction, industrial and infrastructure development. In that list new one fiber is added, called, as basalt rock fibers.

Basalt originates from volcanic magma and flood volcanoes, a very hot fluid or semi-fluid material under the earth crust, solidified in the open air. Basalt is the name given to a wide variety of volcanic rock, which is gray. Brown or dark in color, formed from volcanic lava after solidification.

The heavily thickened lavas contain olivine, clino-pyroxene (salite), plagioclase and opaque metal oxides. Paleocene and pyroxene make up 80% of many types of basalts. Because of good hardness and thermal properties, basalt has been used in the construction, industrial and highway engineering, in the form of crushed rock. It is used as surfacing and filling in roads, the floor tiles in the construction and as the lining material in the pipes for transporting the hot fluids. This can be major replacement to the asbestos, which possess health hazards by damaging respiratory systems.

However, it is not commonly known that basalt can be used in manufacturing and made into fine, superfine ultrafine fibers. Basalt is an alternative raw material for fiber forming because of its relatively homogeneous chemical structure, its large availability throughout the world, its freedom from impurities and of course, its ability to form fibers in the molten state.

Basalt fiber offer prospect of completely concrete. They have potential to high performance and cost effectively replace of fiberglass, steel new range of composite materials and product. Low cost high performance fibers offer potential to solve the largest problem in the cement and concrete industry, cracking and structural failure of concrete. They have potential to high performance and cost effectively replace of fiberglass, steel

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III. IDENTIFICATION AND EQUATION

EQUATION

fck = f'ck+1.65s …….s=5N/mm^2

Total strength = 48.5N/mm^2

Calculation :

Trail No.. 1 for 0%

Sample No.	Compressive Strength (N/mm^2)
1.	48.5
2.	47.7
3.	49

Trial No. 2 for 0.10%

Sample No.	Compressive Strength (N/mm^2)
1.	53.71
2.	54.1
3.	53.1

Trial No. 3 for 0.20%

Sample No.	Compressive Strength
1.	59.73
2.	58.8
3.	60.33

IV. FIGURES AND TABLES

Fig. No. 4.1 Paver blocks.

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Fig. No.4.2BF roving Fig.No 4.3 BF Filamen

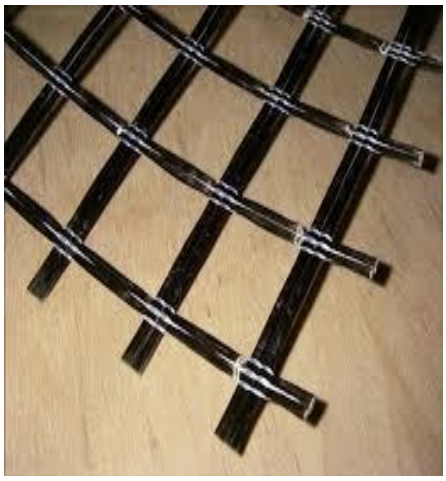

Fig No.4.4 Basalt fibers mesh

Table No.4.1 Testing of cement

Sr. No.	Characteristics	Standard Value
1.	Normal consistency (%)	26%-33%
2.	Initial setting time (min.)	Not less than 30
3.	Final setting time (min)	Not less than 600
4.	Fineness (%)	<10

TableNo1.2 Properties of basalt fibre

Capability	Basalt fibre
Tensile strength, M Pa	3000 – 4840
Tensile strength, M Pa	3000 – 4840
Elastic modulus, G Pa	79.3 - 93.1
Elongation at break, %	3.1 – 6
Specific gravity	2.65 - 2.8

Diameter of filament, mμ	6 - 21
Temperature of application, °C	-260 - +500
Melting Temperature, °C	1450

V. CONCLUSION

1. Addition of basalt fibre will increase properties of the paver block like compressive strength and satisfy limit of water absorption.
2. As % addition of basalt fibre to concrete increases there is increment in compressive strength.
3. A (0.40) addition to basalt fibre will increased compressive strength by 48.91%.
4. These fibres will most effective and economical in paver block use for heavy traffic areas.
5. Water absorption capacity is within permissible limit .
6. Basalt can be used in manufacturing and made into fine, superfine ultrafine fibers. Basalt is an alternative raw material for fiber forming because of its relatively homogeneous chemical structure, its large scale availability throughout the world, its freedom from impurities and of course, its ability to form fibers in the molten state.
7. Basalt Rock fibers have no toxic reaction with air or water, are non-combustible. When in contact with other chemicals they produce no chemical reactions that may damage health or the environment. So it is ecological friendly material.
8. Basalt rock fibers have new range of material in building construction, road construction, concrete industry and agriculture field. They have potential to high performance and cost effectively replace of fiberglass, steel and carbon fiber product in many applications. As per case study, concrete beam reinforced with BFRP bars achieved tensile strengths that are consisting with the relevant properties of the constituent materials. Concrete beams reinforced with BFRP bars behave in ductile manner exhibiting large deflection at failure.
9. Basalt is well known as a rock found in virtually every country round the world. Basalt rock is more in India (especially in Maharashtra). The cost of basalt is 10 times lower than that of raw materials for fiberglass.

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