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Research Article

Structural Behaviour Of Pervious Concrete By Using Synthetic Glass Fibre As Reinforcement

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Abstract : Pervious concrete is a combination of basic concrete material only consisting of cement, coarse aggregate & water. Because pervious concrete will not contains fine aggregate, it is also calledas "nofines " or "porous" or "permeable "concrete. Pervious concrete also comes under special concretes and willhave more void contentof about 30%. Now a day it is more popular for concrete flat work applications. In this project various literatures has been studied and understand the effects and application of pervious concrete. The main focus of the project is to investigate the behavior of pervious concrete by using synthetic glass fibre mesh as reinforcement and to improve the flexure behavior. Similarly we canfind the compressive strength comparison of pervious concrete by compression strength test using cube specimen with standard size of 150mm x 150mm x150mm) and flexure strength of the pervious concrete is determined by conducting the flexural test on slab specimen of size (600mm x 300mm x 100mm). The synthetic glass fiber mesh is placed in the slab on three different locations, 1. Bottom of the slab, 2.Top of the slab and 3.Both bottom and top of the slab. The flexural test are carried out on three slab specimen and compare the results for determine the structural behavior of slab using synthetic glass fibermesh.

Keywords: pervious concrete, synthetic glass fibre mesh, Compression, flexure.

I INTRODUCTION

I. PERVIOUS CONCRETE: Pervious concrete is nothing but "no fines" concrete. It was first introduced in 18th century and used as load bearing walls. Later in 1920's used in two storey homes. Following 2nd worldwar it becomes most efficient in Europe because ofshortage of cement. In general, for making porous concrete we will utilize coarse aggregate which passing through 12.5 mm sieveand retained on 10mmsieve which is also known as permeable concrete. Its void content ranges from 15 – 35%. The infiltration rate of water in pervious concrete is 80 to 720 litres per minute per square metre. Compressive strength is ranges from 3.5 Mpa to 28 Mpa.

II. APPLICATIONS OF PERVIOUS CONCRETE It is commonly used in parking lots, pathways, sideways, tennis court, swimming pool decks, slope stabilization, zoo areas, shoulders, drains, friction course for highway pavement, noise barriers, and low volume roads. Reduce the impact of development on trees.

III. SYNTHETIC GLASS FIBREMESH

It is an artificial fibre made by human by using chemicals. Generally, synthetic fibre is made by extracting fibre–forming materials through spinnerets. This process is called polymerization.

2.1 synthetic glass fibre mesh

IV. GENERAL PROPERTIES OF SYNTHETIC GLASS FIBREMESH

1) Specific resistance is greater than steel to make high-performance.
2) It is good electrical insulator even in low thickness.
3) It will not support flame & it is naturally- incombustible.
4) It has low coefficient of linear expansion.
5) It has ability to combine with any synthetic resin.
6) Low thermal conductivity.

V. USES OF SYNTHETIC GLASS FIBRE MESH:

1) High strength fabrics & corrosion resistance fabrics.
2) Sound and thermal insulation.
3) Used in tent poles, arrows, bows & cross bows.
4) Hockey stick and translucent roofing panels

VI. ADVANTAGES OF SYNTHETIC GLASS FIBREMESH

This fibre can be molded into any shape. High mechanical strength i.e., so strong and stiffer its weight. Low maintenance, fire resistant, good electrical insulator And weather proof.

II METHODOLOGY

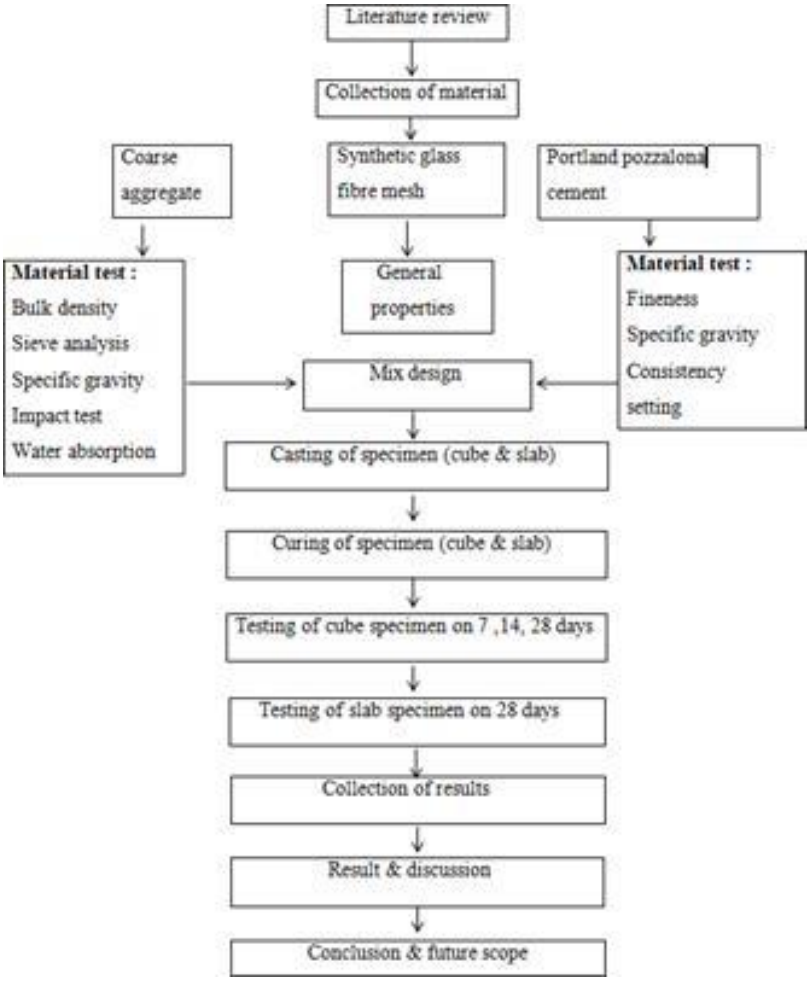


Fig. 2.1 Methodology flow chart

III MATERIAL USED

- CEMENT
- COARSEAGGREGATE
- WATER

a) Cement (PPC): It is a variation of OPC. Which is intergrinded with opc clinker, gypsum and pozzolonicmaterial in some proportions? The materials are fly ash, volcanic ash, etc. These materials are added to cement in the ratio of 15% to 35% by itsweight.

Specific gravity	3.1
Fineness	2.90 gm
Standard consistency	30%

Setting time	Initial = 45 min Final = 690 min

b) Coarse aggregate (10mm): The aggregate is sieved through 4.75mm size sieve, and retained on 10mm sieve. So, we 10mm size aggregate is used.

Specific gravity	2.84
Sieve analysis	3.45
Bulk density	Loose = 1 kg/m^3 Rodded = 1.10 kg/m^3
Impact	32 %
water absorption	3 %

IV EXPERIMENTALINVESTIGATION

i) Volume of cube = 0.012 m^3 (150mm x 150mm x 150mm)
Cement content = 7.4 kg
Coarse aggregate = 18.57 kg water content = 2.22 L

ii) volume of slab = 0.018 m^3 (600mm x 300mm x 100mm)
Cement content for slab = 11.50 kg
Coarse aggregate for slab = 28.86 kg
Water content for slab = 3.45 L

iii) Mix ratio (1 : 2.51)

iv) Slump cone value = 29.1 cm = 100mm

V CUBE & SLAB TEST

I. COMPRESSION TEST

The compression strength of concrete is very important mechanical properties of concrete. It is often used to measure the compressive strength. In practice compressive strength increases when the specimen size decreases. The cube specimen is of size 150mm x 150mm x 150mm Compressive strength =P/A

Fig: 2.2 compression test

CONCRETE MIX	7 days			STRENGTH
	LOAD KN	AREA mm^2	N/mm^2	(N/mm^2)
PERVIOUS CONCRETE	232	22500	10.31	17.59
	553	22500	24.57	
	403	22500	17.9	

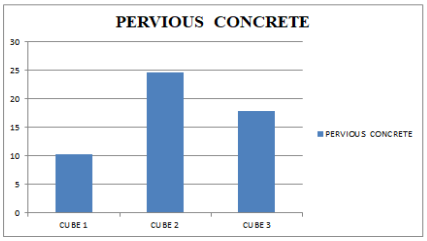


Fig: 2.3 compression test for 7 days

CONCRETE MIX	7 days			STRENGTH
	LOAD KN	AREA mm^2	N/mm^2	(N/mm^2)
PERVIOUS CONCRETE	637	22500	28.31	20.9
	337	22500	14.97	
	437	22500	19.42	

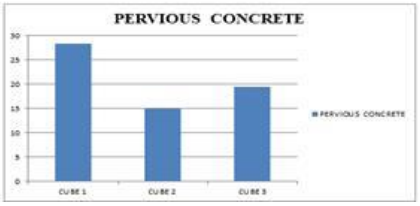


Fig: 2.4 compression test for 14 days

CONCRETE MIX	28 days			STRENGTH
	LOAD KN	AREA mm^2	N/mm^2	(N/mm^2)
PERVIOUS CONCRETE	534	22500	23.7	23.78
	516	22500	22.9	
	557	22500	24.75	

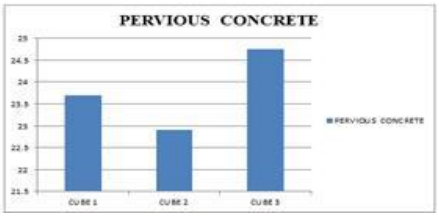


Fig: 2.5 compression test for 28 days

II. FLEXURE STRENGTH

In flexural strength test, were used the beam specimen size of 600mm x 300mm x 100mm. Kept the specimens in open air to get dry after 28days curing and exposed to flexure strength test under flexural testing setup. Apply the load at constant rate will increases the stress to maximum level up to rupture occurs. As well as fracture indicatesin the tension surface with equal parts of span length at the middle third of span length. The formula for flexural strength is $R = Pl/bd^2$.

PRR	LOAD (KN)	DEFLECTION (mm)
1	3.8	25
2	7.2	56
3	11.4	60
4	15.2	150
5	19	157

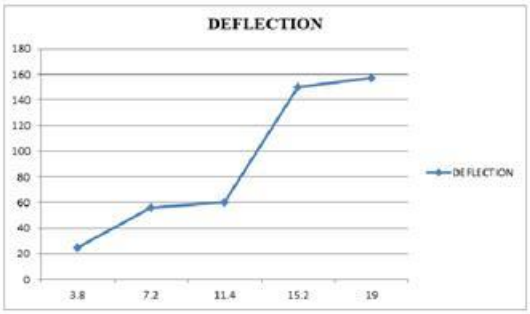


Fig: 2.6 flexure test for 28 days (mesh at top)

PRR	LOAD (KN)	DEFLECTION (mm)
1	3.8	14
2	7.2	24
3	11.4	31
4	15.2	38
5	19	57

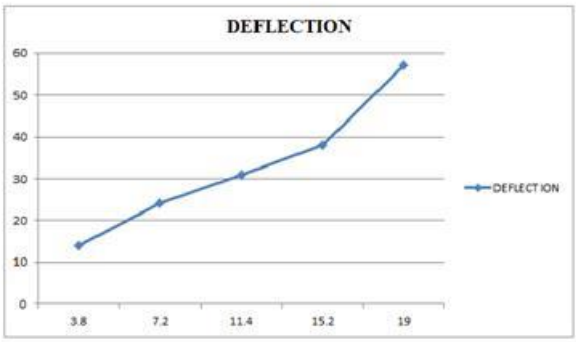


Fig: 2.7 flexure test for 28 days (mesh at bottom)

PRR	LOAD (KN)	DEFLECTION (mm)
1	3.8	21
2	7.6	67
3	11.4	132
3.5	13.3	148

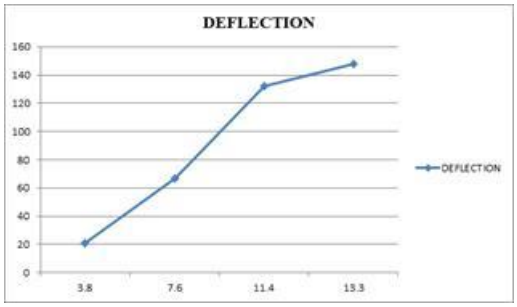
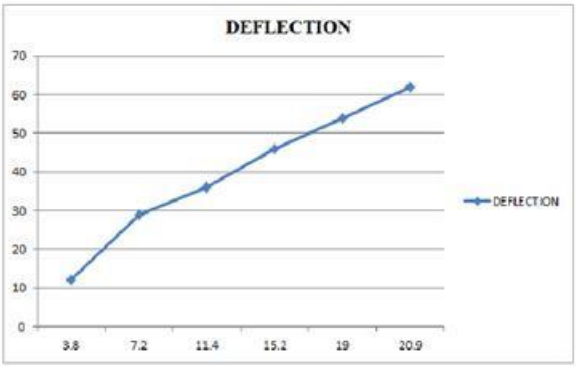


Fig : 2.6 flexure test for 28 days (conventional concrete flexure test)

PRR	LOAD (KN)	DEFLECTION (mm)
1	3.8	12
2	7.2	29
3	11.4	36
4	15.2	46
5	19	54
5.5	20.9	62



CONCRETE MIX	28 DAYS		STRENGTH (N/mm^2)
	LOAD	N/mm^2	
CONVENTIONAL CONCRETE	3.8 7.6 11.4 13.3	0.96 1.52 2.28 2.66	1.855
PERVIOUS CONCRETE (MESH AT TOP & BOTTOM)	3.8 7.2 11.4 15.2 19 20.9	0.76 1.44 2.28 3.04 3.8 4.18	2.58

CONCRETE MIX	28 DAYS		STRENGTH (N/mm^2)
	LOAD	N/mm^2	
CONVENTIONAL CONCRETE	3.8 7.6 11.4 13.3	0.96 1.52 2.28 2.66	1.855
PERVIOUS CONCRETE (MESH AT TOP)	3.8 7.2 11.4 15.2 19	0.76 1.44 2.28 3.04 3.8	2.264

Fig: 2.6 flexure test for 28 days (mesh at top & bottom)

V CONCLUSION

From the above result we achieve both compressions. The flexure strength is achieved in the top and bottom mesh slab when compared with conventional flexure strength of slab .so; this can be used as slab, pavement or walking path etc…

S.NO	COMPRESSION TEST	7 DAYS	14 DAYS	28 DAYS
1	CUBE	17.59 N/mm^2	20.9 N/mm^2	23.78 N/mm^2

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