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NFLUENCE A RECRON -3S FIBER ON PERMEABILITY AND SHEAR STRENGTH OF PERVIOUS CONCRETE

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ABSTRACT

The large places covered with impermeable surfaces such as concrete and bitumen impart major impact on ground water table. In many developed nations, the utilization of pervious concrete for the development of vehicle parks and carports, is becoming popular. Moreover, pervious concrete has an important application for the sustainable construction. It is one of the many low impact development techniques and it has several environmental benefits as it allows surface runoff to infiltrate into the ground to replenish ground water. With the aim of development of material specification for pervious concrete, it is necessary to conduct tests to evaluate its performance of this new type of high-performance concrete.

The pervious concrete is produced by using conventional cementitious materials, aggregates, and water. Laboratory tests were conducted for testing the performance of pervious concrete such as permeability tests, split tensile strength, density and compressive strength. The pervious concrete highly depends on its water permeability factor. In India, the rainfall intensity is less at some region and the evaporation losses are more. Therefore, the result of this investigational study provides a useful information about pervious concrete and its application as permeable pavement. Adding fibres into concrete mix enhances the properties of concrete. Short fibres manufactured from steel, glass and "synthetic" materials are used to enhance the cracking resistance of concrete. This is known as Fibre Reinforced Concrete Naturally happening vegetable fibres, including sisal and jute, are also used. Recron-3s fibre is a polypropylene fibre used in enhancing the tensile strength of concrete. Combination of polypropylene fibre and pervious concrete is a unique concept that has been used in this project. Mix – concrete aggregate and concrete with variation in the Recron-3s fibre content. After investigation for varying percentage content of the fibres in the pervious concrete, with the increase in the fibre content, increase in the split tensile strength & compressive strength and decrease in its permeability have been observed.

Keywords- Pervious, fiber, permeability, synthetic, reinforced.

1. INTRODUCTION

Normal Concrete is defined as homogeneous, multiphase material which is composed of binding material called cement along with aggregate particles. Here I have explained different types of concrete with advantages and disadvantages of concrete. It is the widely used construction material and is obtained by mixing cementitious material, sand, aggregate, water, and admixture (if necessary) in the required proportion. It is prepared at site at the place of building structure or maybe pre-casted before to save time as well as space of working area at the site. After preparing it, it should be cured for some days generally 28 days to get full strength. In a technical word, it has been given a name according to their state of formation. In the wet state, it is known as green concrete and when it gets matured it is known as hardened concrete. Pervious concrete pavement is an opportunity paving surfaces that seize and briefly keep the Storm water Retention Volume (SWRv) with the aid of using filtering runoff via voids within side the pavement floor into an underlying stone reservoir. Filtered runoff can be accumulated and again to the conveyance system, or allowed to partly infiltrate into the soil. Pervious concrete is a zero-slump, open-graded material along with cement, coarse aggregate, admixtures and water. Pervious concrete carries very little satisfactory aggregates inclusive of sand; its miles occasionally noted as "no-fines" concrete. Pervious concrete is the unique sort of concrete which includes interconnected voids and those voids or pores lets in hurricane water to percolate underground. The advantages of pervious concrete are it eliminates untreated storm water and creates zero runoff. It directly recharges groundwater. It mitigates "first flush" pollution. It also protects streams, watersheds, and ecosystems. Also Mimics the drainage and filtration of bioswales and natural soils. It also reduces surface temperatures and heat island effects.

The limitations of pervious concrete are it cannot be used in pavements with heavy traffic flow. It requires longer curing time. Conventional concrete tests like slump test, compaction factor test, are not applicable in pervious concrete. It also requires specialized construction practice.

2. OBJECTIVES

1. To produce pervious concrete using Recron 3-s fiber.
2. To evaluate 7 and 28 days compressive strength of recron 3-sfiber concrete with % of fiber 0.1,0.2and 0.3.
3. To evaluate the shear strength of recron 3-s fiber concrete.
4. To compare the results and optimized the % of fiber best on the experimental results of concrete.

2.2 ADVANTAGES

1. It helps in increased ductility.
2. It provides resistance to thermal and moisture stresses.
3. It provides resistance to crack propagation.
4. It decreases mix-water bleed rate.
5. Rebound loss reduced by 40-70% result in saving of expensive mortar, cement and sand. Time taken for plastering is reduced and work is completed faster.
6. Reduces water seepage and protects steels in concrete from corroding and walls

2.3 APPLICATIONS

1. Foundation
2. Flooring grade slabs
3. Retaining walls
4. Water retaining structures
5. Parking slabs
6. Bridge decks
7. Roof slabs
8. Pavement quality concrete
9. RCC and PCC like Lintel, Beam, Column, Flooring and Wall Plastering.
10. Foundation, Tanks, manhole cover and tiles.
11. Roads and Pavements.
12. Hollow blocks and Precast.
13. Various Ready-mix Concrete application.

3. METHODOLOGY

1. Tests on cement and coarse aggregates

a) Fineness Of Cement
b) Consistency Of Cement
c) Initial And Final Setting Time
d) Specific Gravity of Coarse Aggregate
e) Bulk Density
f) Sieve Analysis
g) Water Absorption Test

2. Mix design using coarse aggregates (no fine aggregates)
3. Slump Cone Test on fresh concrete
4. Casting of cubes (33 cubes)
5. Permeability Test on cubes
6. Compressive Strength Test on cubes
7. Shear Strength Test on cubes

The experimental work is planned systematically by performing various tests on all ingredient of concrete.

4. TESTING AND RESULT

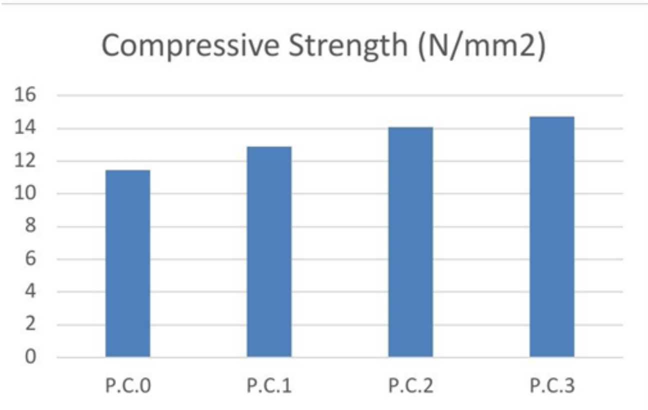
As the casting was done, testing was performed on the cubes. Normal and concrete with different percentage of fibre was added in the concrete mix with respect to the weight of cement taken. Various tests were performed on the cubes such as slump cone test, compressive strength test and shear strength test. Readings were recorded and noted. Different types of cubes were made of no fibre, 0.1, 0.2, 0.3% addition of fibre.

4.1 Compressive Strength Test (7 Days):

A Compressive Strength Test (7 Days) is an essential procedure in the construction industry used to evaluate the early strength of concrete. This test measures the ability of concrete to withstand axial loads and provides an early indication of the material's performance and potential long-term strength. The standard procedure involves several critical steps:

Table 4.1 Compressive Strength Test (7 Days)

P.C.0	Weight (kg)	Dimensions(mm)	Breaking load after 7 days of curing	Compressive strength
1	7.094	150×150×150	297kN	13.2
2	6.987	150×150×150	159kN	7.06
3	6.837	150×150×150	319kN	14.17
Average	6.97			11.47
P.C.1	**Weight**	**Dimensions**	**7 days strength**	
1	7.322 kg	150×150×150	286kN	12.71
2	7.558 kg	150×150×150	282kN	12.53
3	7.350 kg	150×150×150	302kN	13.42
Average	7.41			12.88
P.C.2	**Weight**	**Dimensions**	**7 days strength**	
1	7.366	150×150×150	334kN	14.84
2	7.358	150×150×150	289kN	12.84
3	7.462	150×150×150	328kN	14.57
Average	7.395			14.08
P.C.3	**Weight**	**Dimensions**	**7 days strength**	
1	7.256	150×150×150	233kN	10.35
2	7.442	150×150×150	333kN	14.8
3	7.758	150×150×150	429kN	19.06
Average	7.485			14.73



4.2 Compressive Strength Test (28 Days):

Table 4.2 Compressive Strength Test (28 Days)

P.C.0	Weight (kg)	Dimensions (mm)	28 days Load(kN)	Compressive Strength
1	7.178	150×150×150	252	11.2
2	7.222	150×150×150	345	15.33
3	7.160	150×150×150	240	10.66
Average	**7.18**			**12.42**
P.C.1	**Weight (kg)**	**Dimensions (mm)**	**28 days Load (kN)**	**Compressive Strength**
1	7.590	150×150×150	470	20.88

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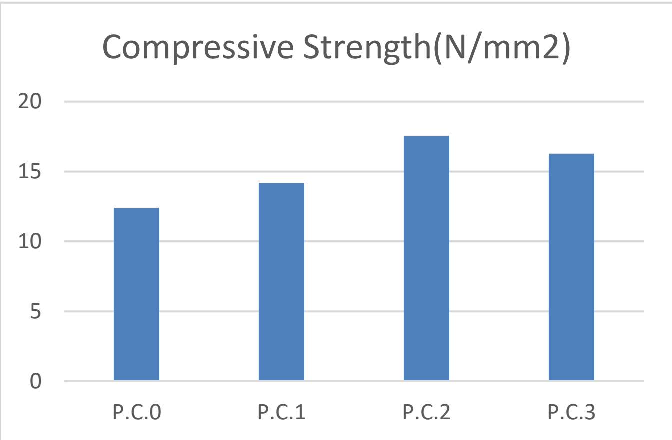
2	7.164	150×150×150	271	12.04
3	7.360	150×150×150	358	15.91
Average	**7.37**			**14.19**
P.C.2	**Weight (kg)**	**Dimensions (mm)**	**28 days Load (kN)**	**Compressive Strength**
1	7.230	150×150×150	338	15.02
2	7.278	150×150×150	456	20.26
3	7.280	150×150×150	390	17.33
Average	**7.26**			**17.56**
P.C.3	**Weight (kg)**	**Dimensions (mm)**	**28 days Load (kN)**	**Compressive Strength**
1	7.200	150×150×150	365	16.22
2	7.468	150×150×150	291	12.93
3	7.106	150×150×150	302	13.42
Average	**7.258**			**16.27**

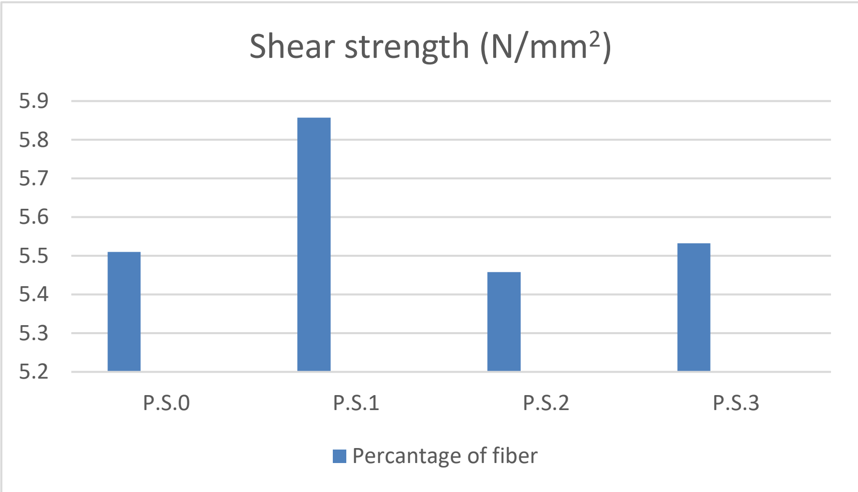


4.3 Shear strength test (28 days)

Table 4.3 Shear Strength Test (28 Days)

P.S.0	Dimensions(mm)	Weight(kg)	Shear load (kN)	Shear strength test (N/mm^2)
1	150×150×90	10.830	393.16	5.64
2	150×150×90	10.886	392..46	5.55
3	150×150×90	10.774	378.34	5.35
Average		**10.84**		**5.51**
P.S.1				
1	150×150×90	11.171	52.77	5.848
2	150×150×90	11.167	54.15	5.99
3	150×150×90	11.130	51.75	5.733
Average		**11.156**		**5.857**
P.S.2				
1	150×150×90	10.903	48.13	5.33

2	150×150×90	11.102	50.90	5.639
3	150×150×90	11.067	48.80	5.406
Average		**11.024**		**5.458**
P.S.3				
1	150×150×90	10.876	51.65	5.722
2	150×150×90	11.146	48.84	5.411
3	150×150×90	10.702	49.33	5.465
Average		**10.908**		**5.532**

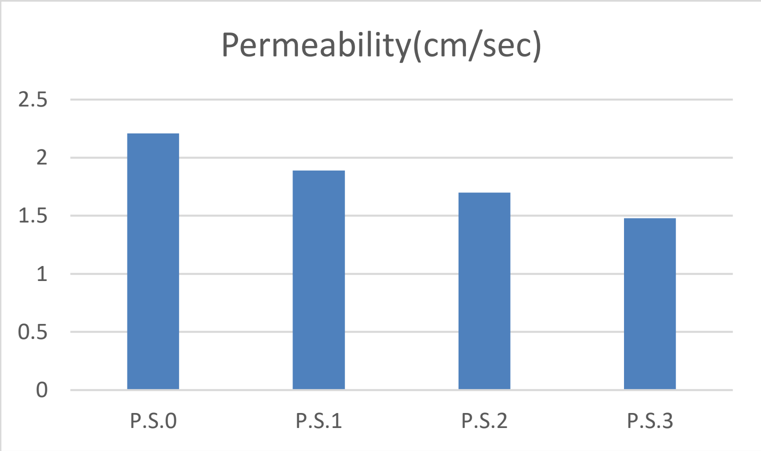


4.4 Permeability (28 days)

Table 4.4 Permeability (28 Days)

Cubes	**Permeability (cm/sec)**
P.S.0	
1	2.23
2	2.16
3	2.26
Average	**2.21**
P.S.1	
1	1.86
2	1.89
3	1.93
Average	**1.89**
P.S.2	
1	1.70
2	1.76
3	1.60
Average	**1.70**

P.S.3	
1	1.45
2	1.53
3	1.47
Average	**1.48**



5. CONCLUSIONS

Based on experiments conducted and observations, following conclusion are being drawn:

- The 7 days compressive strength slightly of pervious concrete increases as the percentage of fibre in the concrete increases.
- Permeability decreases with the increase in percentage of fibres.
- The average decrease in permeability is 12% approximately, with respect to the addition of the fibre in the mix.
- From the experiment performed we can say that at 0.2% of fibre addition with respect to cement, gives the maximum strength corresponding tensile strength and permeability of the pervious concrete.
- From the experiment performed we can say that at 0.2% of fibre addition with respect to cement, gives us the optimum strength and permeability of concrete.

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