

# Compressive Strength Study of Pervious Concrete By Using Fibres And Hybrid Fibres

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**Abstract**—Pervious concrete is made using coarse aggregate without fine aggregates. This type of concrete with a high porosity allows rainwater to pass directly through, thereby helps to reduce runoff and improve ground water recharge. Generally pervious concrete has less strength and used for concrete pavements. Addition of fibres in pervious concrete gaining importance day by day. Crimped steel fibres with 60 mm length and 0.5 mm diameter and polypropylene fibres 6mm length and diameter were used. Fibre inclusion improved strength of pervious concrete. In this experimental research fibres added in varying percentage (0.5%, 1% and 1.5%) of cement weight to pervious concrete. Concrete casted with a mix ratio of 1:4 and effect of these fibres on strength of pervious concrete are studied.

**Keywords**—Steel Fibre; Polypropylene Fibre; Strength.

## I. INTRODUCTION

Pervious concrete is a special type of concrete with a high porosity used for various applications such as pedestrian walkway, parking areas with light traffic, ground water recharge etc. It is made using coarse aggregates (no fine aggregate) with cement and fibre mix.

Compared to conventional concrete, pervious concrete has a low strength, and high permeability characteristics. Addition of fibres in concrete is a new trend for increasing the strength. In this paper addition of fibres and hybrid fibers and its effect on pervious concrete is studied

## II. MIX DESIGN

Ingredient	Quantity (Kg/m <sup>3</sup> )
Cement	1440
Coarse Aggregate	1600

Mix proportions  
Cement : CA = 1:4

## III. OBJECTIVE OF WORK

This study aims to determine compressive strength of series of pervious concrete mixes.

## IV. EXPERIMENTAL PROGRAMME

### A. Materials

53 grade ordinary Portland cement, aggregates with combined grading, fibres (steel and polypropylene) were used.

Table (1): Physical properties of crimped fibres and polypropylene fibres

Type of fiber	Shape of fibre	Length L (mm)	Diameter d (mm)	Aspect ratio L/d	Density (Kg/m <sup>3</sup> )
Steel	Crimped	60	0.8	75	7850
Polypropylene	Straight	6	0.018	333.33	910

### B. Specimens

Cubes of size 150mm were casted and tested for compressive strength at the age of 7, 14 and 28 days.

## V. METHODOLOGY

### A. Testing of materials

Cement test conducted for determining specific gravity and setting time. Coarse aggregate specific gravity is determined.

B. Preparation and concrete testing

Concrete of mix proportion 1:4 is fixed and casted a series of test specimens like Normal Pervious Concrete, Steel Fibre Reinforced concrete, Polypropylene Fibre Reinforced Concrete and Hybrid Reinforced Concrete specimens with varying percentage of fibres (0.5%,1%,1.5%)

VI. RESULTS AND DISCUSSION

The results obtained from compressive strength test conducted on the hardened normal pervious concrete, steel fibre reinforced pervious concrete and hybrid fibre reinforced pervious concrete are reported.

Table (2):Result of compressive strength of Normal Pervious Concrete

COMPRESSIVE STRENGTH (MPa)						
SL No	Mix designation	7 <sup>th</sup> day	Average	14 <sup>th</sup> day	Average	28 <sup>th</sup> day
1	NPC1	8.22	24.96	9.47	9.48	10.35
2	NPC2	8.36		9.48		10.37
3	NPC3	8.38		9.50		10.39

Table (3):Result of compressive strength of Steel Fibre Reinforced Concrete

COMPRESSIVE STRENGTH (MPa)								
SL No	% of steel fibre	Mix designation	7 <sup>th</sup> day	Average	14 <sup>th</sup> day	Average	28 <sup>th</sup> day	Average
1	0.5	PSC11	16.31	16.35	20.13	20.15	22.42	
2	0.5	PSC12	16.35		20.14		22.45	
3	0.5	PSC13	16.40		20.18		22.46	
4	1	PSC21	20.4	20.35	24.1	24.1	26.2	
5	1	PSC22	20.35		24		26.24	
6	1	PSC23	20.3		24.2		26.15	
7	1.5	PSC31	19.43	19.45	23.21	23.33	25.40	
8	1.5	PSC32	19.45		23.33		25.25	
9	1.5	PSC33	19.47		23.44		25.45	

Table (4):Result of compressive strength of polypropylene Fibre Reinforced Concret

COMPRESSIVE STRENGTH (MPa)								
S L N o	% of polypropylene fibres	Mix designation	7 <sup>th</sup> day	Average	14 <sup>th</sup> day	Average	28th day	Average
1	0.5	PPC11	12.47	12.50	14.44	14.48	19.27	19.43
2	0.5	PPC12	12.50		14.50		19.50	
3	0.5	PPC13	12.52		14.51		19.51	
4	1	PPC21	13.13	3.20	15.19	15.20	20.23	20.25
5	1	PPC22	13.33		15.20		20.25	
6	1	PPC23	13.14		15.21		20.26	
7	1.5	PPC31	13.11	3.18	15.10	15.15	20.14	20.15
8	1.5	PPC32	13.21		15.17		20.15	
9	1.5	PPC33	13.23		15.18		20.17	

Table (5): Result of Hybrid Fibre Reinforced Concrete

COMPRESSIVE STRENGTH (MPa)									
S L N o	% of steel and polypropylene fibres	Mix designation	7 <sup>th</sup> day	Average	14 <sup>th</sup> day	Average	28th day	Average	
1	0.5	HFPC11	15.32	12.50	14.44	14.48	19.27	19.43	
2	0.5	HFPC12	15.45		14.50		19.50		
3	0.5	HFPC13	12.52		14.51		19.51		
4	1	HFPC21	13.13	13.20	15.19	15.20	20.23	20.25	
5	1	HFPC22	13.33		15.20		20.25		
6	1	HFPC23	13.14		15.21		20.26		
7	1.5	HFPC31	13.11	3.18	15.10	15.15	20.14	20.15	
8	1.5	HFPC32	13.21		15.17		20.15		
9	1.5	HFPC33	13.23		15.18		20.17		

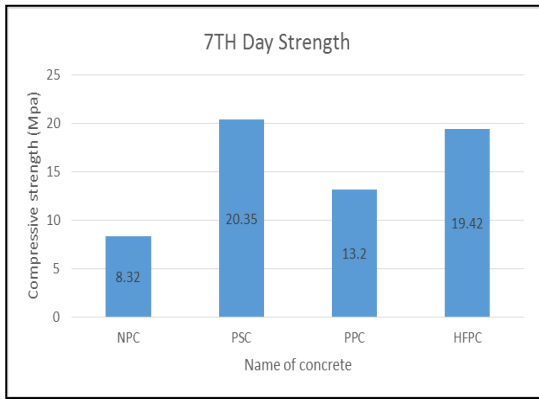


FIG (1) : 7TH DAY COMPRESSIVE STRENGTH

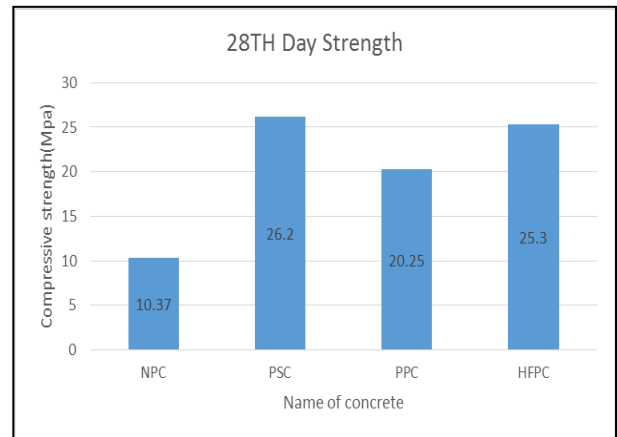


Fig (3) : 28<sup>TH</sup> DAY COMPRESSIVE STRENGTH

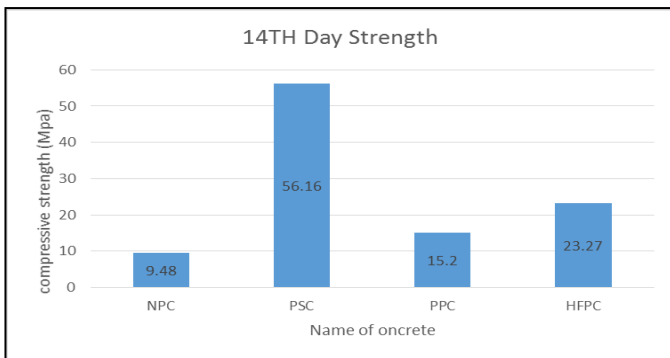


FIG (2) 14<sup>TH</sup> DAY COMPRESSIVE STRENGTH

### VII. CONCLUSION

The test results showed that greater compressive strength achieved in Steel Fibre Reinforced Concrete than Hybrid Fibre Reinforced concrete ,Polypropylene reinforced concrete and Normal Pervious Concrete.

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