

# Implementation of Precast Pervious Concrete for Design a Smart Pavement

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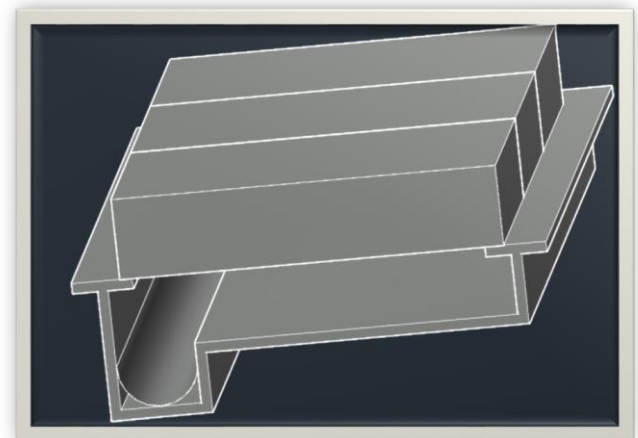
**Abstract** - Pervious concrete is one of the type of concrete it's have a property to allow a water flow through concrete. Pervious concrete is a lightweight concrete which mainly comprised by cement, water, coarse aggregate and glass fiber threads. Size of aggregate near about  $9\text{mm} < 12.5\text{mm} \leq$  or minimum 9.6mm. Size of glass fibre threads 70-80mm and the size of sample cube of testing is 150\*150\*150mm. The pervious concrete has a ratio of mix proportion 1:2.25:0.45, 1 part of cement, 2.25 part of coarse aggregate and 0.45 part of water. The problem that society going to face unwanted surface water or storm water collected on road so the pervious concrete have the ability to pass directly through the drainage system.

**Key Words:** Pervious concrete, glass fibre threads, porosity, drainage system, cost.

## 1. INTRODUCTION

Pervious concrete is also called as "porous concrete", "permeable concrete", "no fines concrete" and it's made up by using the cement, coarse aggregate and water, with addition of glass fibre threads. Pervious concrete is traditionally used in parking areas, areas with light traffic, residential street, pedestrian walkway, and greenhouses.

It is an important application for sustainable construction property application for sustainable construction. Property of the pervious concrete is to allow water thought itself because it's a porous concrete and adding a drainage system and collecting tank below the previous pavement. Collecting the storm water for domestic usage. Pervious concrete functions like a storm water and can reduce pollutant load entering into stream, pond and rivers. The ratio of mix proportion 1:2.25:0.45 and the ratio of glass fibre threads 0.50% of concrete. Increase strength of pervious concrete pavement by using a glass fibre threads.



- Pervious pavement block.
- Ply base.
- Drainage pipe.

## 2. LITERATURE REVIEW

B. Radha Kiranmaye, D. Tarangini, K. V. Ramana Reddy

- Length of Glass Fibre used is 12mm.
- Compressive Strength of M20 grade of concrete for 28 days - 25-30 MPa

Megha N Belagal, Ramya B V

- Pervious Concrete Specimens with 0.50% Glass fibre allow the water to pass quickly as compared to that of specimens of mix containing 2% glass fibres.

Paul D Tennis, Michael L Leming, David J Akers

- Pervious Concrete as a paving material has seen renewed interest due to its ability to allow water to

flow through itself to recharge groundwater and minimize storm water runoff.

Jing Yang, Guoliang Jiang

- In this paper, a Pervious Concrete Pavement material used for roadway is introduced.
- Using the common material and method, the strength of the pervious concrete is low.

Ashok Kumar, Aghila B, M Samule Thanaraj

- Use 0.50 feet depth of pervious concrete layer that means 15.24 cm (0.1524 m)
- It will give higher amount of porosity that allows water to percolate into ground water.

Andrew Dawson, Nick Thom, Xuanxuan Chu

- Only free water can be removed by draining under gravity.

Zeinab Yazdanfar, Ashok Sharma

- Extra water storage.
- Future stick water harvesting.

**3. CONCLUSION**

- From literature review we can say that we want the compressive strength of M20 grade of concrete for 28 days its 25-30 Mpa.
- From literature review we can say that the project is eco-friendly and reduces the cost of construction.
- We are provide 0.50 feet depth of pervious concrete layer that means 15.24 cm (0.1524 m).
- We use glass fibre sheet for better observation and strength.

**4. PROJECT WORK**

❖ Conducted test on aggregates are as follows:

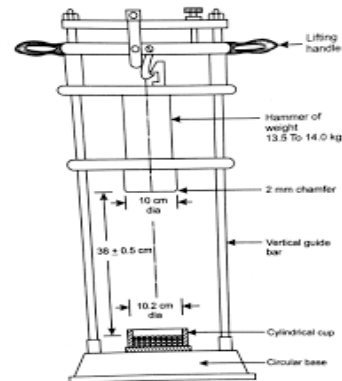
**Sieve analysis of coarse aggregate:**

Fineness modulus =  $\sum$  cumulative weight retained in % / 100

$$\begin{aligned} \text{Weight of sample taken} &= 3000\text{g} \\ &= 2430 / 100 \\ &= 24.3 \end{aligned}$$

This test is used to collect accurate size of aggregate for concrete mixture ( $9 < 12.5\text{mm} \leq$ ).

**Sudden impact test on coarse aggregate:**



A.I.V (Aggregate Impact Value)

$$\begin{aligned} &= W_2/W_1 \times 100 \\ &= 11.36 + 11.25 + 12.26 / 3 \\ &= 11.62 \% \end{aligned}$$

[Exceptionally strong]

**Table -1**

Description	Test 1	Test 2	Test 3
Wt. of surface dry sample pass through 12.5mm sieve, retained on 10mm sieve (W1)	440g	480g	530g
Wt. of fraction pass 2.36mm sieve after test (W2)	50g	54g	65g
Wt. of fraction retained on 2.36mm sieve after test (W3)	426g	426g	465g
AIV=W2/W1X100	11.36%	11.25%	12.26%

**Specific gravity test on coarse aggregate:**

Weight of empty pycnometer of glass

$$W_1 = 650 \text{ g}$$

Weight of pycnometer + Aggregate of mass

$$\begin{aligned} W_2 &= 650 \text{ g} + 600 \text{ g} \\ &= 1250 \text{ g} \end{aligned}$$

Weight of pycnometer + Aggregate mass + Water of mass

$$W_3 = 650 \text{ g} + 600 \text{ g} + 270 \text{ g}$$

$$= 1520 \text{ g}$$

Weight of pycnometer + Water mass

$$W4 = 650 \text{ g} + 525 \text{ g}$$

$$= 1175 \text{ g}$$

Specific gravity test

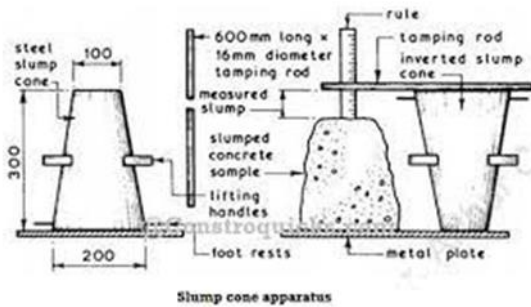
$$= \frac{W2 - W1}{(W2 - W1) - (W3 - W4)}$$

$$= \frac{1250 - 650}{(1250 - 650) - (1520 - 1175)}$$

$$= 2.35$$

$$= 2.4$$

Slump cone test on pervious concrete:



Collapse concrete height = 210mm

Slump cone height = 300mm

Slump Value = 300-210

$$= 90 \text{ mm}$$

$$= 0.9 \text{ cm}$$

Compressive strength testing for a 14 days and 28 days.

We use (CTM) Compressive Test Machine for compressive testing for pervious concrete cubes. Grade of concrete M20, mix ratio of pervious concrete 1:2.25:0.45, used of glass fibre 0.50% of concrete.

Cross section area of one cube =  $150 \times 150 \text{ mm}^2 = 22500 \text{ mm}^2$

$$\text{Stress (MPa)} = \frac{\text{force N}}{\text{Area mm}^2}$$

Table -2 Compressive strength for 14 days

Sr.no	Age of cube	Compressive strength
1	14 days	17.77N/mm <sup>2</sup>
2	14 days	18.88 N / mm <sup>2</sup>
3	14 days	18.88 N / mm <sup>2</sup>

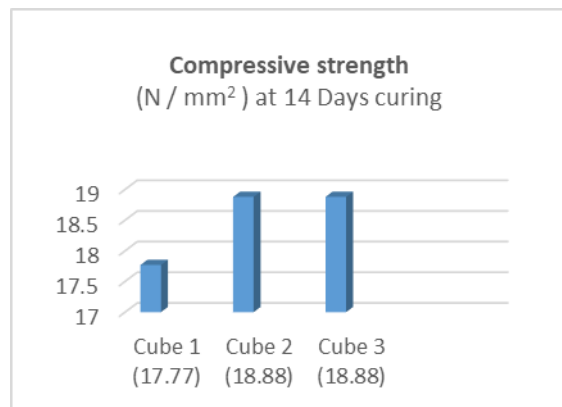


Chart -1 Compressive strength 14 days

Table -2 Compressive strength for 28 days

Sr.no	Age of cube	Compressive strength
1	28 days	26.67 N / mm <sup>2</sup>
2	28 days	22.22 N / mm <sup>2</sup>
3	28 days	26.67 N / mm <sup>2</sup>

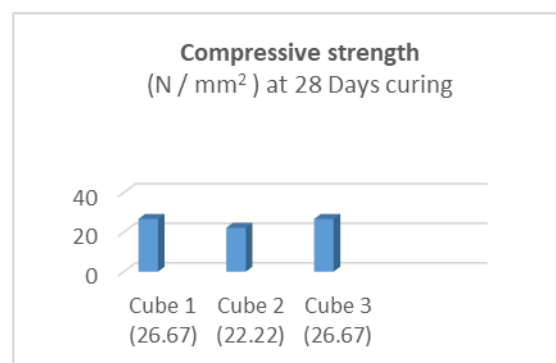


Chart -2 Compressive strength 28 days

Mean compressive strength (14days) = 18.51 N /mm<sup>2</sup>

Mean compressive strength (28days) = 25.18 N/mm<sup>2</sup>

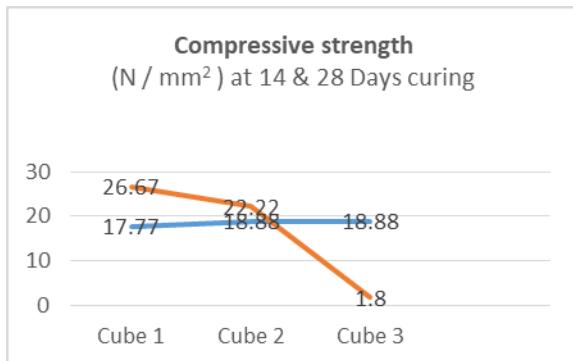


Chart -3 Compressive strength 14& 28 days

## 5. DESIGN

### Pervious concrete pavement

Size of Pervious concrete pavement (488mm\* 304mm\* 122mm) l\*b\*h weight of aggregate 74.850kg, weight of cement 33.26 kg, weight of water 14.96 kg for three (3) pervious concrete pavement blocks.

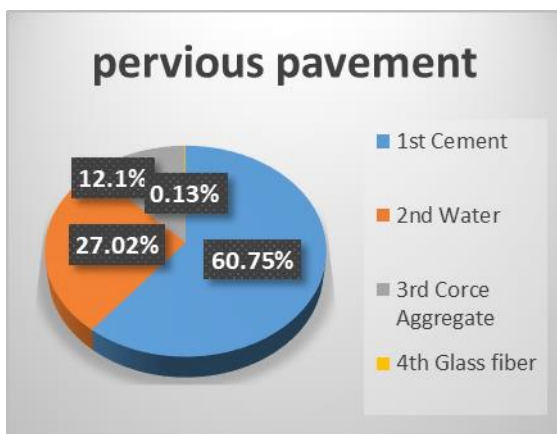


Chart -4 Pervious Pavement materials Quantity

### Permeability test

Dry pavement weight = 29.890 kg

Water =1000g

Water pass = 840g

Pavement absorb water = 160g

## 6. CONCLUSION

It's reduce a storm water and collect a rain water for domestic use.

- Do a permeability test, the weight of the dry pavement is 29,890 kg, 1000 g of water spreads on the surface, 840 g of water passes through the pavement and 160 g of water is absorbed into the pavement.

(On a dry condition its percolate 82 to 85 % of water)

(On a wet condition its percolate above 90 % of water)

- As we use, we recommend this model to collect water.
- Its reduce cost of construction and maintenance.
- Its time saving because we use precast blocks and it has less maintenance required it reduce the rainwater fast.
- We use storage water for a multiple domestic uses like watering lawns and garden, fire water extinguisher etc.

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