

# Pervious Concrete by Using Silica Fume

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## ABSTRACT

Pervious concrete system deals with the permeability. The compressive strength of the pervious concrete before adding the silica fume is less but when we add the 10% of silica fume replace by the cement then the compressive strength of concrete is increases simultaneously the permeability rate is also increases we also investigated the prior study on the pervious concrete as it related to the water-cement ratio, aggregate-cement ratio, aggregate size and compaction.

**Keywords:** Silica Fume, Aggregate-Cement Ratio, Water-Cement Ratio, W/C Ratio,  $\text{SiO}_2\text{Z}$

## I. INTRODUCTION

Pervious concrete is also called as no fine concrete or porous concrete. Pervious concrete is special type of concrete with contain high porosity rang from 15 to 35 % and presence of inner contact large pore system allow the water flow easily though the pervious concrete pervious concrete is the mixture of gravel or stone, cement, water and admixture which create open cell structure and that allow the water flow easily through the pervious concrete.

The w/c ratio is more important consideration for maintaining the strength and voids structure of concrete. W/C ratio between the ranges of 0.35 to 0.4 preferred for pervious concrete. W/C ratio less than 0.35 can result in very low workability for pervious concrete.

We add the silica fume in the previous concrete for increase in the workability and for increasing the strength.

## II. METHODS AND MATERIAL

**Aggregate:** we used the aggregate in the range between 10 mm to 20 mm size and the shape of aggregate is irregular in size.

Test	Result
Bulk density	1.51kg/lit
Specific gravity	2.81
Crushing value	14%
Impact value	5.70%
Water Absorption	0.75%

**CEMENT:** cement is the binding material and we used the 53 grade of ordinary Portland cement.

Following are the results got from various tests of cement which is given below:

Test	Result
Consistency of cement	35%
Fineness of cement	2%
Initial setting time	33 minutes
Final setting time	580 minutes
Specific gravity	3.17

### Silica Fume:

1. It is the byproduct of silicon metal.
2. Silica fume consists primarily of amorphous silicon dioxide ( $\text{SiO}_2\text{Z}$ )
3. It is approximately 100 times smaller than cement hence its binding property is very good.

4. In previous concrete silica fume use 5 to 12% in the replacement of cement.

**Mix Design:**

For pervious concrete we designed on trial and error basis mix design proportions.

Following are the trial mix proportion for various ratios.

Ratio	1:3	1:4	1:5
Cement (kg/m <sup>3</sup> )	405	324	270
Silica fume (kg/m <sup>3</sup> )	45	36	30
Aggregate (kg/m <sup>3</sup> )	1453.125	1550	1624.58
Water (kg/m <sup>3</sup> )	162	129.6	108

Where,

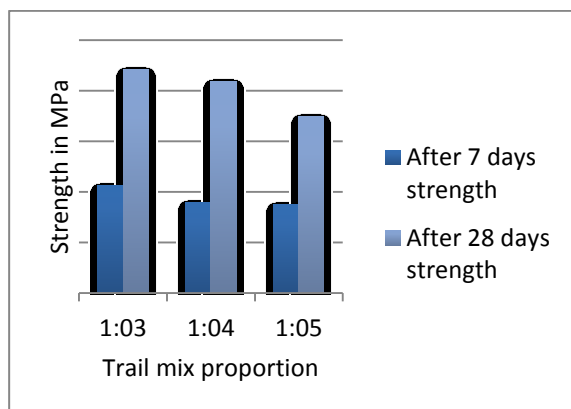
1 : N- 1 indicates the one part of cement and N indicates the N parts of aggregate.

We used the W/C of 0.36.

**III. RESULTS AND DISCUSSION**

Results	After 7 days mean strength (MPa)	After 28 days mean strength (MPa)
Ratio 1:3	10.67	22.07
Ratio 1:4	8.96	20.88
Ratio 1:5	8.74	17.48

**Graphical representation of strength**



**Advantages:**

- 1) Does not absorb and store heat due to its light colure and porous structure.
- 2) Reduces the risk of flooding and top soil wash away.
- 3) There is no need of installing storm drain and under piping
- 4) Filter petroleum hydrocarbon from water
- 5) Allow rain water to enter into sub-grade naturally hence recharge groundwater aquifer.

**Disadvantage**

- 1) Compressive strength is low.
- 2) Limited use in heavy vehicle traffic.
- 3) Frequent maintenance is required.
- 4) Life of pervious concrete is less than the conventional concrete.

**IV. CONCLUSION**

- 1) The slump of pervious concrete is found to be zero i.e. true slump irrespective of aggregate size and addition of fine aggregate.
- 2) The compressive strength of pervious concrete largely depend upon size of course aggregate used in the concrete mix and percentage of fine aggregate used in the mix.

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