

Study on Compressive Strength of Pervious Concrete for Higher Size of Aggregate

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Abstract— Water is the most important element for human existence. Out of total water available in earth, only 0.3% of it can be utilized for human use. In this context there is a need for conserving fresh water which can be collected from surface run-off. In order to conserve run-off from urban areas, where there is high demand of potable water, roads can act as catchment areas which should have special type of property called porosity which is achieved by pervious concrete. Earlier researchers have found that higher size of aggregate, i.e. greater 10 mm, have failed to attain higher compressive strength greater than 10 N/mm². So in this context, gradation plays an important role for producing compressive strength and also permeability properties of pervious concrete. Laboratorial experiments have been done to find the compressive strength of pervious concrete with nominal size of aggregate as 20mm while keeping gradation as single sized aggregate. A 0.35 W/C ratio was adopted for this research based upon previous experimental studies literature. The compressive strength values of the following gradation have been found in this research.

Keywords: Concrete, Aggregate

I. INTRODUCTION

Pervious concrete is an emerging technique in pavement industry for conserving surface run-off and to recharge ground water tables. For producing pervious concrete, a gradation should be gap graded so as to have inter connected void so as to have permeability. But these voids are leading to have lower compressive strength for the concrete mix. The other drawback of P.C is only lower size of aggregates which are less than 10 mm are capable of having desirable compressive strength. The mix which had produced are analyzed for compressive strength. Higher size of aggregate i.e. 20mm are used in this research to find the compressive strength performance of pervious concrete

II. MATERIALS AND MIX PROPORTIONS

A. Cement

In this research OPC 53 grade of cement is used for producing pervious concrete mix. Some of the important properties of cement which are tested in the laboratory are,

S.no	Property	Experimental values
1	Fineness of cement	6.50%
2	Specific Gravity	3.1
3	Normal consistency	29%
4	Initial setting Time	28 min
5	Final setting time	320 min

Table 1: Properties of Cement

B. Water

Water acts as a binder material in fresh concrete and on hydration produces a hard, dense concrete. Presence of harmful chemicals may result in producing low strength

concrete. So water used in this experimental work is tested laboratorial and concluded safe to use. The tested properties of water and its results are:

S.no	Property	Values
1	pH	7.1
2	Taste	Agreeable
3	Appearance	Clear
4	Turbidity (NT units)	1.75
5	Hardness (mg/l)	250

Table 2: Properties of Water

C. Aggregate

Both coarse aggregate and fine aggregate are used in this experimental study. The following results were observed when the coarse aggregate is tested in laboratory.

S.no	Property	Value
1	Specific gravity	2.71
2	Water absorption	1.4%
3	Aggregate impact value	23.6%
4	Flakiness index	14.1%
5	Elongation index	11.9%

Table 3: Properties Of Coarse Aggregate

D. Mix Proportions

The mix design of pervious concrete is made using the help of IRC-44 2017. A paste volume of 25% in the volume of concrete is adopted to produce P.C mixes. P.C mixes were made of 0.3, 0.33, 0.36 and 0.39 W/C ratio to find mechanical properties of P.C. The following are the mix proportions of P/C from 0.3 to 0.39 W/C ratios.

S.No	Material	Quantity per Kg/ M ³
1	Cement	401.64
2	Water	120.49
3	Coarse aggregate	1441.72

Table 4: Mix Proportions

III. EXPERIMENTAL SETUP AND METHODOLOGY

A. Compressive Strength

Cylinder specimens of size 100 mm diameter and 200 mm in length were casted to find the compressive strength. Gypsum capping is done to specimens. The specimens were tested on U.T.M and loaded at a rate of 140 Kg/cm²/min to find the compressive strength.

B. Sieve Analysis.

The coarse aggregates which are used in this mix are set into required gradation so as to achieve single sized aggregates there by having voids in them to achieve permeability property. Set of I.S sieves arranged order wise with respect to their sizes and aggregates are sieved through them. The required quantity of aggregates of different sizes are collected based upon required quantity.

IV. RESULTS

A. Gradation of Aggregates:

The gradation was set so as to achieve single sized aggregate. The following are the results observed:

19mm nominal size aggregate	
Size in mm	Passing %
20	100
19	92.5
9.5	10
4.75	0

Table 5: Gradation Table

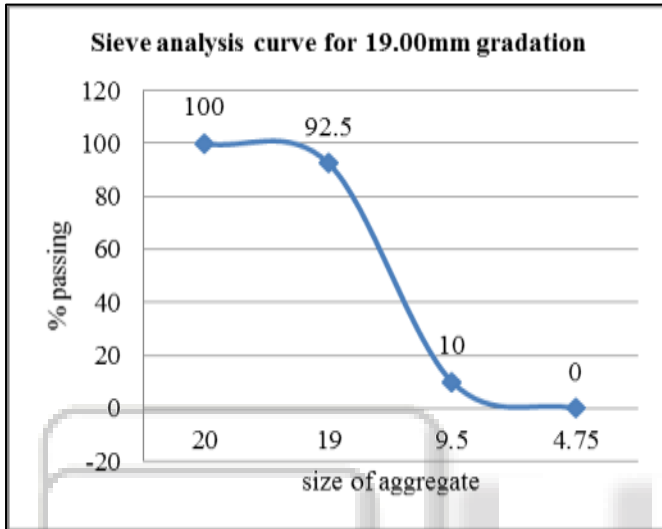


Fig. 1: Sieve Analysis Curve

Age of concrete	Compressive strength in N/mm ²
7 days	7.15
14 days	10.98
28 days	11.97

Table 6: Compressive Strength Results

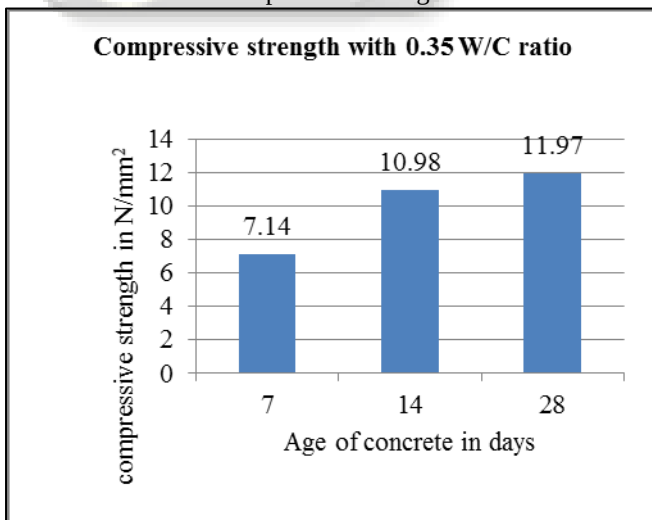


Fig. 2: Graphical Representation of Compressive Strength

V. CONCLUSIONS

It was found that higher size aggregates also gave compressive strength of 10N/mm². The compressive strength of pervious concrete can be increased by changes in gradation.

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