

Effects Of Admixture On Pervious Concrete

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Abstract: Sustainability has become one of the most important design factors for pavement engineers over the last several years. Much of this focus has been on reducing material costs for pavement infrastructure by using innovative materials into traditional pavement design. Pervious concrete pavement has the ability to offset the typical requirement for storm water management ponds for large paved areas. It can be considered as alternative to impervious pavement systems as the open void structure of pervious concrete pavement allows water to infiltrate very quickly through it and join the natural ground water table. As a result, it does not disturb the natural hydrological cycle or increase the demand on the local storm water management. Literature shows that there is no dedicated test method to assess the performance of pervious concrete, which is structurally substantially different from conventional concrete pavements. The increased use of pervious concrete in roads, walkways, and parking lots demands improved specifications, performance criteria, and acceptance test methods for evaluating structural performance and durability of this innovative concrete product.

In this research aggregate are replace with 20% tiles so as to compare properties and strength of normal pervious concrete to pervious concrete with crushed tiles. The main objective of this study is found that the effect admixture with reference to strength parameters such as compressive strength, flexural strength & propertise such as permeability, void ratio. Above all, this study attempts to establish test procedures and performance of pervious concrete pavement with crushed tiles. Initially the test methods available for conventional concrete were performed. Where concrete with tiles found more economical comparatively convensional concrete.

Keywords: Pervious Concrete, crushed tiles, compressive strength, flexural strength

I. INTRODUCTION

Pervious concrete is a composite material consisting of coarse aggregate, Portland cement, and water. It is different from conventional concrete. The porosity in PC is created by the reduction or elimination of fine aggregate from the concrete mix design. The aggregate usually consists of a single size coarsed aggregate and is bonded together at its points of contact by a paste formed by the cement and water. The result is a concrete with a high percentage of interconnected voids that, when functioning correctly, permit the rapid percolation of water through the concrete. Unlike conventional concrete, which has a void ratio anywhere from 3-5%, pervious concrete can have void ratios from 15-35% depending on its application. Pervious concrete characteristics differ from conventional concrete in several other ways. Compared to conventional concrete, pervious concrete has a lower

compressive strength, higher permeability, and a lower unit weight, approximately 70% of conventional concrete.

In this report various admixture like waste tiles, silica fumes and egg shell powder are used to improve the permeability of pervious concrete. Crushed tiles is industrial waste material and then reused it in construction field will reduced environmental pollution waste ceramic tiles are used as partially replacement of coarse aggregate which help to improve the property of pervious concrete and strength of concrete. Egg shell powder is also used as admixture, cement is partially replace with egg shell powder as 5% by weight of cement and compressive strength was determined after curing. Silica fumes are also used to enhance the strength of concrete mix with 5% egg shell powder as partially replacement for cement.

II. MATERIAL CHARACTERISATIONS

- ✓ Cement – In this study Ordinary Portland cement is used with following proerties,
Fineness : 4000 cm²/gm
Grade of cement : 43 Grade
Pervious concrete of mix proportion 1:6 in which cement is partially replaced with egg shell powder and silika fumes as 5%, by weight of cement.
- ✓ Course Aggregate: The general properties, such as the specific gravity, aggregate crushing test and impact test, of the aggregate were tested shown in table No.1.2.1
- ✓ Crushed Tiles: 20% aggregate were replaced in the concrete mix, in replacement percentage; W/C was changed as a parametric study to investigate their effects on slump and compressive strength.
- ✓ Eggs Shell Powder: The pervious concrete of mix proportion 1:6 in which cement is partially replaced with egg shell powder as 5%, by weight of cement
- ✓ Silica Fume - Silica fumes are also used to enhance the strength of concrete mix with 5% egg shell powder as partially replacement for cement.

Sr.No	Test	Aggregate	Crushed Tiles
1	Crushing value	18.43	17.34
2	Impact value	6.66 %	7.78 %
3	Specific gravity	2.35	2.16

Table 1.2.1: Basic properties of aggregate and crushed tiles

III. METHODOLOGY

Experimental investigation can be carried out on concrete to investigate the effect of admixture like waste tiles and egg shell powder, silica fumes as partial replacement of coarse aggregate and cement respectively. The compressive strength was determined at curing ages 7 days and 28 days.

A. DETERMINATION OF BASIC PROPERTIES

- ✓ Impact Test - The aggregate about one third full of mould and tamped by 25 strokes by tamping rod. The sample was subjected to a total 15 blows each derive red at an interval of not less than one sec.
- ✓ Crushing Value Test - The cylindrical measure is filled by the test sample of aggregate in three layer of approximately equal depth, each layer being tamped 25 times by the rounded end of the tamping rod. The cylinder with the test sample and the plunger in position is placed on compression testing machine. Load is then applied through the plunger at uniform rate of 4 tons per min unit the total load is 40 tones, and then load is released.
- ✓ Slum cone test - Prepare concrete mix with known proportions. Place the mould on a smooth flat and non absorbent surface. Repeat the procedure till the mould is filled completely and excess concrete is trimmed off. Remove the slump cone carefully in the vertical direction

and on the removal of the mould the concrete subsides. Measure the height of concrete after subsidence.

- ✓ Void Ratio Test - Weigh the dry concrete sample. Weight the empty container. Fill the container with water at initial level and weigh it. Place the dry sample inside the water container (approx. 5 min). Empty the water up to initial level and weigh it
- ✓ Specific Gravity Test - Take a empty weight of pycnometer i.e.W1. Pour distilled water into it until it is full. Wipe out the outer surface of pycnometer and weigh it (w4). Take a sample of aggregate 1\3 of pycnometer and place it in the pycnometer and weight it i.e.w2. . Refill the pycnometer with distilled water to the same level and fill the aggregate 1\3 of the pycnometer. Find out the weight (w3).

B. DETERMINATION OF STRENGTH PROPERTIES

- ✓ Compressive Strength of Concrete: The cement and coarse aggregate was mixed to uniform colour by towel Water is mix up 42% by weight of dry material and mix it to obtain uniform grey color. The mould surface should coated from inside and joint is sealed with grease so that no water shall escape during compaction. Keep the mould at room temp about 24 hrs. Keep the mould in water for 7day and 28 day. Test the cube specimen on compressing testing machine for different Curing.
- ✓ Flexural Strength Method: Take suitable quantity of cement and mix with of coarse aggregate\CT. The cement and coarse aggregate was mixed to uni form color by towel. Take suitable quantity Water and mix it to obtain uniform grey color. The mould surface should coated from inside and joint is sealed with grease so that no water shall escape during compaction. Keep the mould at room temp about 24 hrs. Keep the mould in water for 7day. Test the cube specimen on flexural testing machine for different curing.

IV. RESULTS AND DISCUSSION

A. COMPRESSIVE STRENGTH

The compressive strength of pervious concrete after curing period of 7 days and 28 days. The compressive strength after 28 days is increased by 28 % than of 7 days.

The compressive strength of pervious concrete with admixture after carrying test on 7 days and 28 days curing. The compressive strength after 7 days to 28 days increased by 29 %.

Fig. No. 4.1 shows the comparative results of concrete with admixutre and without admixture.

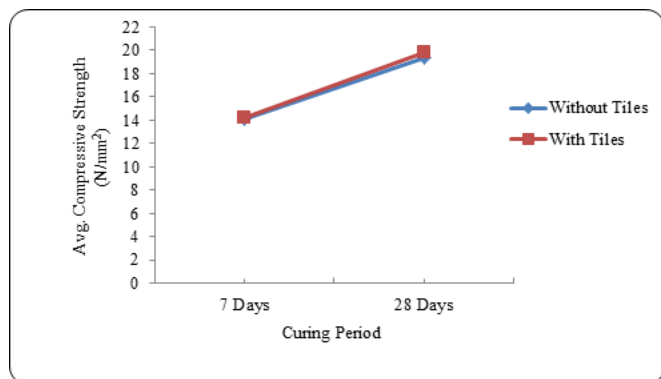


Figure 4.1: Comparison between Compressive strength of concrete without tiles and 20% tiles

B. FLEXURAL STRENGTH

Comparison between flexural strength of normal pervious concrete and pervious concrete with replacing 20% crushed tiles. Following result shows that the flexural strength of pervious concrete is slightly decrease after adding admixture.

Fig No. 4.2 shows the comparative study of flexural strength of concrete with admixture without admixture.

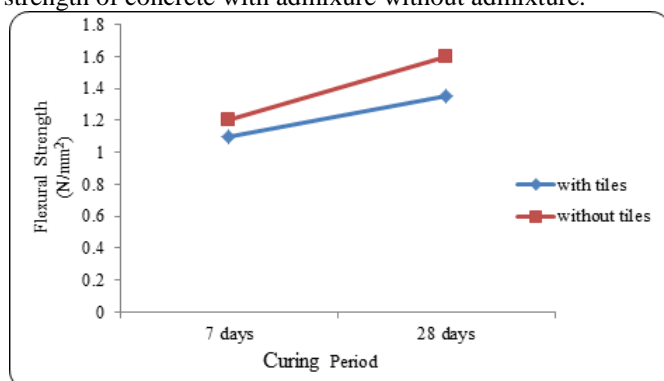


Figure 4.2: comparative study of flexural strength of concrete with admixture without admixture

V. CONCLUSION

- ✓ On performance, we observed that the compressive strength of pervious concrete is slightly increased by 1.20% and 2.60% after 7 days and 28 days respectively by adding admixture & the flexural strength is slightly decrease by adding admixture in pervious concrete.
- ✓ The permeability of pervious concrete is slightly decrease by using admixture in it.

- ✓ Based on the finding, silica fumes & egg shell powder could be used as a best alternative for cement.
- ✓ It has been found that addition of silica fumes and egg shell powder to OPC in concrete improves the properties of fresh concrete and enhance parameters of which indicate durability.
- ✓ The present investigation was undertaken to study the economy & environmental friendly manufacturing of pervious pavement, By replacing natural aggregates by using waste materials.
- ✓ Use of crushed tiles as admixture reduces cost of concrete effectively.

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