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EXPRIMENTAL STUDY ON INFLUNCE AND PERFORMANCE OF PERVIOUS CONCRETE USING TITANIUM DIOXIDE

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Abstract— The objective of pervious concrete is measure the performance due to the clogging to study and experiment the permeability, void ratio and durability of the pervious concrete using the Titanium Dioxide. The study carried out of mix proportion will be use (1:6) and to reduce the clogging effect of pervious concrete using the Titanium Dioxide. For the mix proportion and the different size of aggregate use to prepare the cube for the check durability, and permeability effect using different proportion of Titanium Dioxide.

Keywords—Porosity, Different size of aggregate, Titanium Dioxide, Permeability, Durability

i. INTRODUCTION

Pervious concrete is a special type of concrete with a high porosity and used for concrete flatwork applications that allows water from precipitation and other sources to pass directly through, and it reducing the runoff from a site and allowing groundwater recharge.

Pervious concrete is made using large aggregates with no fine aggregates. Pervious concrete is traditionally used in parking areas, areas with light traffic, residential street, pedestrian walkways, and greenhouse.

In pervious normal weight Portland cement concrete is generally used for pavement construction. The impervious nature of the concrete pavements contributes the increased water runoff in to the drainage system, over-burdening the infrastructure and causing excessive flooding in built-up areas.
Pervious concrete has significantly popular during recent days because of its potential contribution in solving environmental issues. Pervious concrete is a tope of concrete with significantly high water permeability compared to normal weight concrete, It has been mainly developed far draining water from the ground surface, so that storm water runoff is reduced and the groundwater is recharged

Application of Pervious Concrete

Now-a-days, pervious concrete is considered as one of the best management practices and most important environmentally materials for managing storm-water runoff, recharging groundwater and improving water quality. The use of PC in specific applications requiring high permeability is very attractive. There is also an increasing interest for PC in low-traffic roads, parking lots, driveways and sidewalks to reduce the risk of flash flooding runoff. It can also be used for sustainable constructions because of its high insulation performance and noise reduction. The reduction of heat islands in town is another attractive property of this material. In terms of environmental performance, Pervious concrete can be also used to filter

Materials

Aggregate is the major component in permeable concrete which covers approximately 80% in weight. The effect of aggregates will be the major factor in the strength of porous concrete. In general, gradation size for porous concrete aggregate would be much smaller compared with conventional concrete aggregate. In our research only the coarse aggregate will use. In this the pozzolana Portland cement will use.

Objective

The main objectives of this paper is to study the effect of clogging on the aggregate of pervious concrete. For reduce the effect of clogging titanium dioxide will use by weight of cement inn two proportion.
In mixing of titanium dioxide in concrete for the check the flow of rate water in long duration, the effect of acidic and the strength of the pervious concrete.

ii. MIX PROPORTION AND EXPERIMENTAL WORK

Mix proportion

Pervious concrete is trial and error method. On the basis of reference journal the mix proportion is taken 1:6 (cement: aggregate). In mix proportion Portland pozzalona cement is used and the coarse aggregate is used.

For the experimental four size aggregate is to be taken like 10mm,12mm,16mm,18mm the water cement ratio is to be fixed 0.40. For experimental purpose titanium dioxide powder is use. Titanium dioxide is used weight of cement in mix proportion. There should be two type of dosage will use like 10% and 15%.

Casting methodology

For the experimental purpose cube is to be casted. The size of the cube is 150mm ×150mm×150mm. The casting of cube will be in a three phase for experimental purpose. Phase is to be like 10days, 28days and 56days after curing.

The experimental work is to be carried out like the smoke should be provided after a curing of 28 days by the coal. The everyday 1.5kg coal should be burn for 2 hour. For 10days, 28days and 56days smoke should be provide after curing for experimental purpose to check the effect of clogging due to gas.

The test should be performed like permeability and durability.

Quantity of material

- Cement for one cube :- 1.05 kg
- Aggregate for one cube :- 6.3 kg
- For 180 cube cement quantity :- 190 kg
- For 180 cube aggregate quantity :- 1120 kg
- For 10mm :- 283.5 kg
- For 12mm :- 283.5kg
- For 16mm:- 283.5 kg
- For 18mm:- 283.5 kg
- For 180 cube Titanium Dioxide quantity :- 16 kg

Testing methodology

A. Permeability

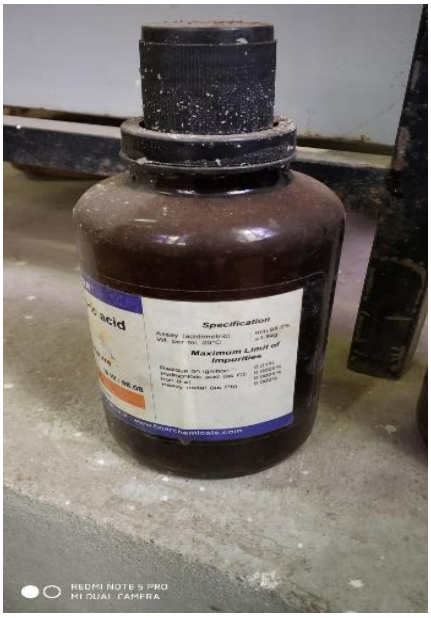
Permeability is to b perform to check the rate of flow of water in concrete. The passing ability of the water from the concrete should be measure.

For the pervious concrete manually setup will be done. The pressure of water will be fixed is 5kg/cm^2 on every phase of concrete. For the testing the 1 litter water should be passed on to a block .the passing water should be collected in to a container and measure the permeability.

Permeability measurement setup

B. Durability

The concrete cube of 150mm ×150mm×150mm size immersed in sulphuric acid (H_2SO_4) of 5% of water after a one day of durability for 56days. Using 95% concentration sulphuric acid (H_2SO_4) for durability.



Cube immersed in H_2SO_4 acidic water

iii. RESULT AND SUMMARY

❖ **RESULT**

A. **POROSITY**

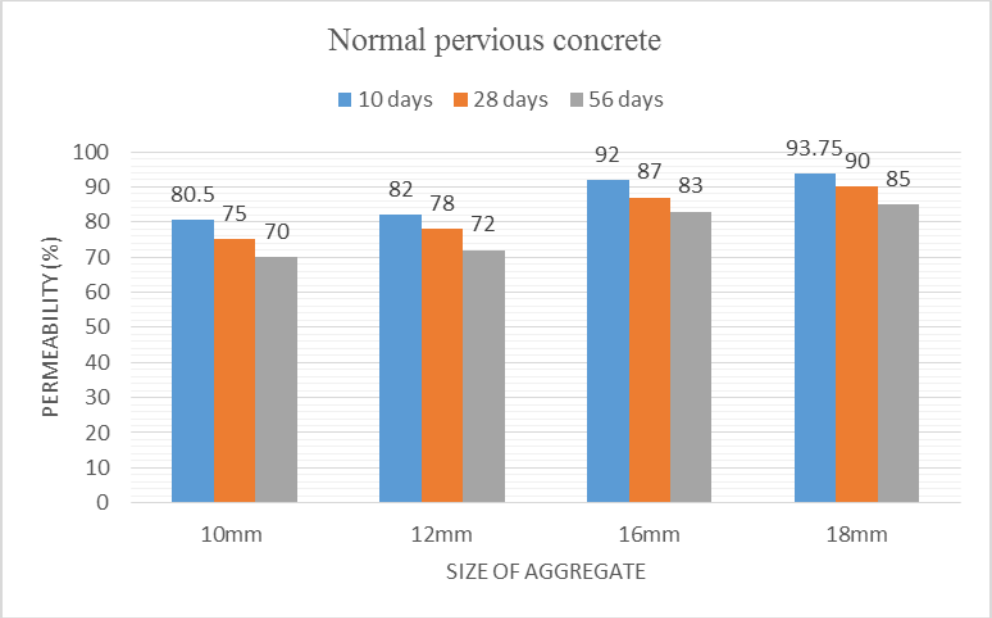
		Different size of aggregate			
SR NO.	**TEST**	**10MM**	**12MM**	**16MM**	**18MM**
1	**Bulk density (kg/mm^3)**	1.48	1.50	1.58	1.62
2	**Particle density (kg/mm^3)**	2.8	2.58	1.8	1.78
3	**porosity (%)**	53	58	88	90

Porosity is to be high in the 16mm and 18mm size aggregate comparatively 10mm & 12mm.

B. **Permeability**

1. Permeability of Pervious Concrete Normal Titanium Dioxide

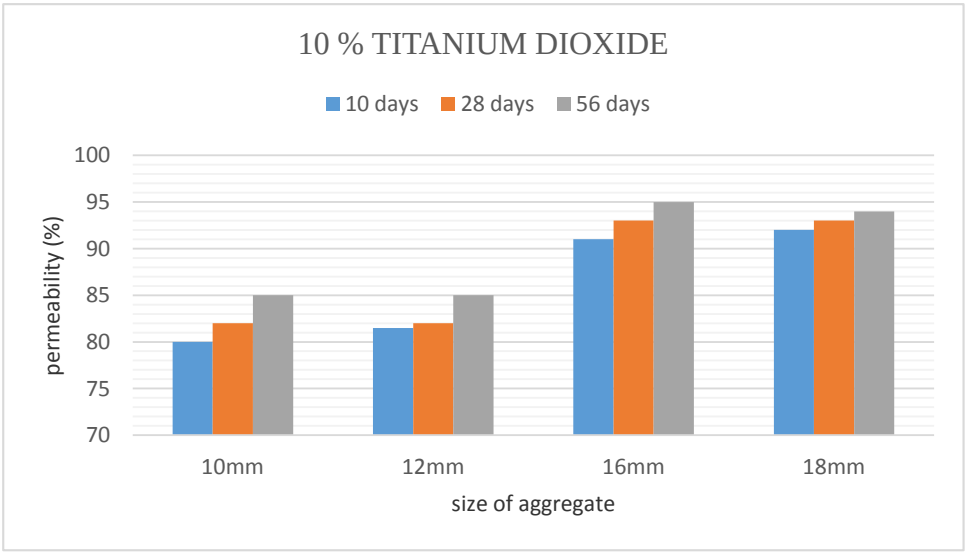
Aggregate size	**w/c ratio**	**Permeability % (for 10 days)**	**Permeability % (for 28 days)**	**Permeability % (for 56 days)**
10mm	0.40	80.5	75	70
12mm	0.40	82	78	72
16mm	0.40	92	87	83
18mm	0.40	93.75	90	85



In the normal concrete permeability is to be decrease in all size of aggregate in 56 days. The permeability of concrete is high in 18mm size of aggregate compare to other size of aggregate. The permeability is comparatively decrease in experimental days

2. Permeability of Pervious Concrete with 10% Titanium Dioxide

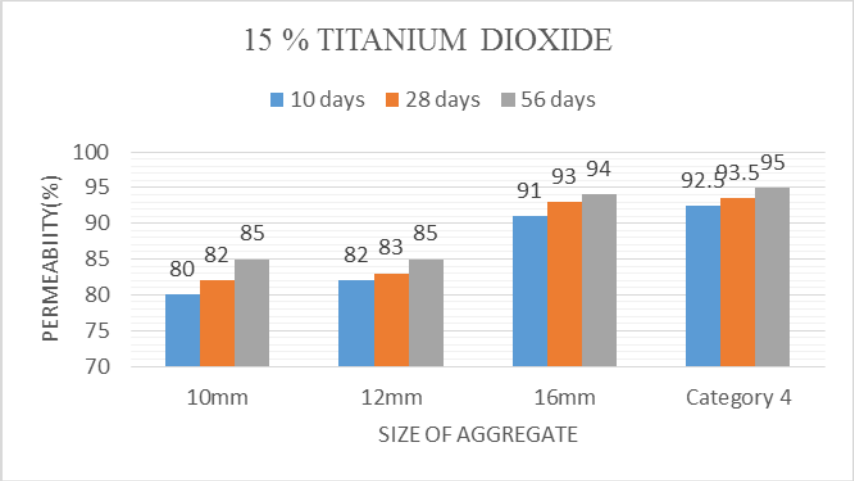
Aggregate size	w/c ratio	Permeability % (for 10 days)	Permeability % (for 28 days)	Permeability % (for 56 days)
10mm	0.40	80	82	85
12mm	0.40	81.5	82	85
16mm	0.40	91	93	95
18mm	0.40	92	93	94



In pervious concrete using 10% of titanium dioxide permeability increase day by day. The maximum permeability is governed in 18mm aggregate. 10mm and 12mm aggregate permeability is low compare to 16mm and 18mm aggregate. Using 10% of titanium dioxide permeability is increased comparatively normal concrete.

3. Permeability of Pervious Concrete with 15% Titanium Dioxide

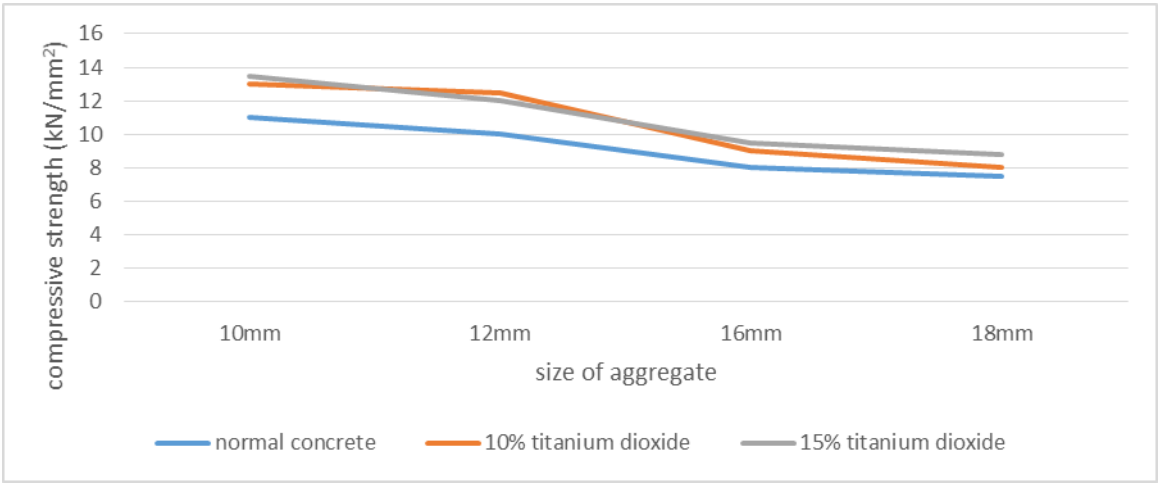
Aggregate size	w/c ratio	Permeability % (for 10 days)	Permeability % (for 28 days)	Permeability % (for 56 days)
10mm	0.40	80	82	85
12mm	0.40	82	83	85
16mm	0.40	91	93	94
18mm	0.40	92.5	93.5	95



In pervious concrete using 15% of titanium dioxide permeability increase day by day. The maximum permeability is governed in 16mm & 18mm aggregate.10mm and 12mm aggregate permeability is low compare to 16mm and 18mm aggregate. Using 15% of titanium dioxide permeability is increased comparatively normal concrete.

C. Durability

Aggregate size	w/c ratio	Normal concrete Strength (kN/mm^2)	10% titanium dioxide Strength (kN/mm^2)	15% titanium dioxide Strength (kN/mm^2)
10mm	0.40	11	13	13.5
12mm	0.40	10	12.5	12
16mm	0.40	8	9	9.5
18mm	0.40	7.5	8	8.8



iv. CONCLUSION

Fixed the porosity ratio of different size of aggregates for compressive strength and permeability test.
Comparative to normal pervious concrete, permeability increases by 13% in 16mm and 18mm size of aggregate after adding Titanium Dioxide (10% & 15%) at the end of 56 days of experimental work.

Comparative to normal pervious concrete, compressive strength increases by 12 % in 16mm and 18mm size of aggregate after adding Titanium Dioxide (10% & 15%) at the end of 56 days of experimental work.
Comparative to normal pervious concrete, durability decreases by 10% in 16mm and 18mm size of aggregate after adding Titanium Dioxide (10% & 15%) at the end of 56 days of experimental work.

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