UTILIZATION OF POROUS CONCRETE IN GROUND WATER RECHARGE

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Abstract - *Today water stress is a major concern in many urban areas. The core aspect of urbanization is the rapid urban population growth together with inadequate planning, pollution, poverty, competing demands on the resource, all contribute to water stress.*

Worldwide urbanization has progressed with unprecedented speed over the past 50 years. It is predicted to rise from 75% of people in developed countries in 2000 to 83% in 2030 and from 40 to 56% in less developed countries over the same period. Rapid development of urban areas has led to the replacement of natural vegetation coverage with impervious surfaces such as buildings, paved roads, and parking lots. Anthropogenic land cover has total to 40% of the Earth's surface and caused environmental degradation in the world. Of particular concern in many urbanizing regions is the increasing impervious surface area (ISA), which is a key environmental indicator and has resulted in less precipitation, more dryness and higher.

Pervious concrete pavement is a effective means to address important environmental issues and support green, sustainable growth. By capturing storm water and allowing it to seep into the ground, porous concrete is instrumental in recharging groundwater, reducing storm water runoff. Storm drainage with porous concrete base can infiltrate rain water into the ground and recharge the ground water effectively.

1. INTRODUCTION

Porousconcrete (also called Pervious concrete, permeable concrete, no fines concrete and porous pavement) is a special type of concrete with a high porosity used for concrete flatwork applicationsallows water from precipita tion and other sources to pass directly through, thereby reducing the runoff from a site and allowing groundwater recharge.Pervious concrete pavement is a unique and effective means to address important environmental issues and support green, sustainable growth. By capturing storm water and allowing it to seep into the ground, porous concrete is instrumental in recharging groundwater, reducing storm water runoff.

Storm drainage with porous concrete base can infiltrate rain water into the ground and recharge the ground water effectively, it will not affect the aesthetic view of the city.

In porous concrete, carefully controlled amounts of water and cementitious materials are used to create a paste that forms a thick coating around aggregate particles. A pervious concrete mixture contains little or no sand, creating a substantial void content. Using sufficient paste to coat and bind the aggregate particles together creates a system of highly permeable. Typically, between 15% and 25% voids are achieved in the hardened concrete, and flow rates for water through pervious concrete are typically around 480 in./hr (0.34 cm/s, which is 5 gal/ft^2/ min or 200 L/m^2/min).

1.1 OBJECTIVES

- To construct porous concrete base drainage to recharge ground water effectively.
- To determine the suitability of porous. Concrete drainage with various types of soil.
- This will be accomplished through extensive experiments on the test cubes created for this purpose. Experiments include specific gravity test, compressive test and infiltration test.
- To evaluate the performance characteristics of the pervious concrete such as porosity, compressive strength, infiltration and density.

1.2 METHODOLOGY

PREPARATION OF POROUS CONCRETE: Mould of 400*400*150mm is used for preparation of porous concrete slab. Different proportions of slabs are prepared that is CA:FA: copper slag 100:00 , 80:20, 80:10:10.Coarse aggregate and fine aggregate are weighed and mixed thoroughly then the cement is weighed and mixed properly. Little water of 0.36 W/C ratio is added before and the the complete required and measured amount of water is mixed. To check the consistency concrete boll should be prepared by hands, if the ball is formed the consistency is good. Mixed concrete is poured into the slab mould .concrete is compacted using tamping rod, tamping should be less than normal concrete. De moulding is done after 24 hours, 7 and 28 days of curing is done.

2. TEST ON POROUS CONCRETE

2.1COMPRESSION TEST

Compressive strength is the ability of material or structure to carry the loads on its surface without any crack or deflection. A material under compression tends to reduce the size, while in tension, size elongates.

Table -1: Results of Compression Test

RATIO M20	Compressive strength Mpa(W/C=0.36)	
	7days	28days
CA:FA 100:00	9.23	16.1
CA:FA 80:20	11.04	18.5
CA:FA:COPPER SLAG 80:10:10	13.2	19.5

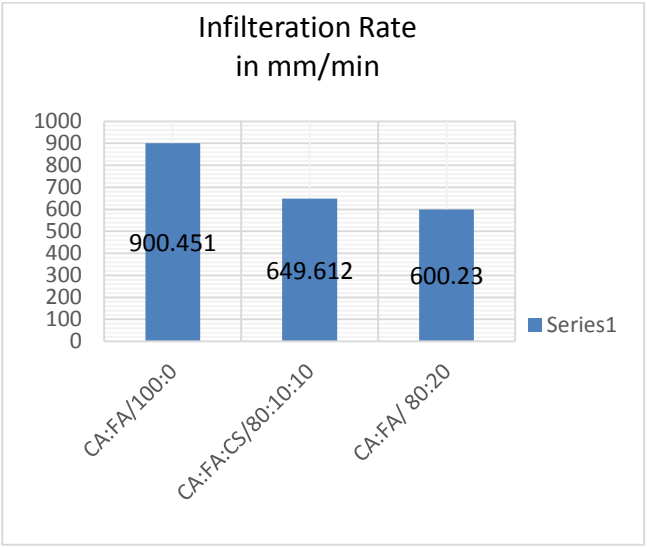

Chart -1: Graph showing the infilteration rate

2. 2 INFILTRATION TEST

ASTM C1701 is the standard infiltration test for pervious concrete. The test consists of four main components To install the infiltration ring, first clean the surface. The infiltration ring must meet certain size requirements and be marked with two lines on the interior to correctly perform the test. The ring is then placed on the cleaned surface and secured in place with plumber's putty. Once secure, pre-wet the concrete and infiltration ring with 8 pounds (3.6287 liters) of water maintaining the head of water between the two marks on the interior of the ring. Begin timing as soon as the water hits the pervious concrete surface. When water is no longer present of the surface, record the elapsed time of the pre-wetting. The time elapsed determines the amount of water to be used in the actual test.

Results of Double ring Infiltration Test

Ratio	Infiltration mm/min
CA:FA 100:00	900.451
CA:FA:COPPER SLAG 80:10:10	649.612
CA:FA 80:20	600.23

SUMMARY

Pervious concrete storm drainage was investigated to study infiltration rates of pervious concrete and to determine the effectiveness of various pervious concrete maintenance methods. In addition, construction specifications for use in the placement of pervious concrete were developed. A literature search was conducted and data collected from the laboratory explorations. In addition to the data collection we conducted Basic tests on materials used and tests on Pervious concrete of different mix proportion. Compression test was conducted to analyze the property of materials used in our project. It maintains storm water to percolate and recharges ground water table. It is very useful in the urban cities like Bangalore to adopt these techniques to generate the water to the locality.

3. CONCLUSIONS

1. Compressive strength of pervious concrete increases and water permeability decreases with the increase of fine aggregates in pervious concrete.

2. Pervious concrete with maximum compressive strength can be obtained by using 10mm size aggregates along with use of fine aggregate in small quantity.

3. Infiltration rate decreases with increase in fine aggregates.

4. The ratio of CA 80:FA10:CS 10 gives considerable compressive strength as well as highest infiltration rate. It is the efficient ratio to be adopted for storm drainage system.

5. The ratio CA 100:FA 00 gives highest infilteration rate but the compressive strength comparitevely low than other two proportions.

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