STORM WATER CONTROL WITH PERVIOUS CONCRETE

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ABSTRACT

Since the late twentieth century, ground water resources have been disappearing at a quicker rate than reforestation and construction of asphalt and cement concrete roads, inhibiting percolation of water. Pervious concrete presents a viable solution to this problem. Pervious concrete can help replenish ground water and reduce storm water runoff in sites with light moving loads or dead loads, such as footpaths, sidewalks, and two-wheeler parking lots.Pervious concrete has increased void contents and porosity in its original form, which increases the rate of water infiltration through the concrete, but lowers the concrete's strength. The goal of this project was to improve the strength of pervious concrete. By adding polypropylene fibres to pervious concrete, a mix design was created that kept all of the desirable features of the pervious concrete. Using ACI 522R, a mix design for pervious concrete with and without fibre was created. The compressive strength and workability of pervious concrete trail mixes were tested, and a comparison was conducted between the two samples. The void content, porosity, and infiltration rate of the pervious concrete mix were all tested.

*KEYWORDS:*infiltration rate, pervious concrete, compressive strength, workability

INTRODUCTION

Pervious concrete is similar to conventional concrete, except it has a network of interconnected voids that allows water to pass through it. These voids typically make about 15-35 percent of the total volume of the concrete. By using gap graded coarse aggregate and a viscous cement paste that prevents paste and aggregate separation during placement and compaction, the voids are retained. Fine aggregate is frequently excluded from pervious concrete because it increases paste volume while reducing interconnected void volume.

Pervious concrete is used in parking lots, low-traffic areas, residential streets, pedestrian pathways, and greenhouses. It is an important application for environmentally friendly construction and one of the groundwater recharge strategies. Pervious concrete pavement is a unique and effective solution to address important environmental issues and encourage green, sustainable growth in rural areas. By absorbing storm water and allowing it to soak into the ground, porous concrete helps recharge groundwater and prevent storm water runoff.

NEED OF STUDY

A significant part of precipitation falls on impermeable surfaces such as parking lots, driveways, walkways, and streets, rather than soaking into the soil. Rainwater sweeping across concrete surfaces picks up anything from oil and grease spills to de-icing salts and chemical fertilisers, disrupting the natural ecology and causing erosion, flooding, groundwater depletion, and river contamination.

Simply cease erecting impermeable barriers that hinder natural water infiltration into the soil to avoid these problems. Instead of typical concrete, we should employ Pervious Concrete or Porous Pavement, which has the inherent durability and low life-cycle costs of regular concrete while also retaining storm water and replenishing local watershed systems. Instead of preventing water from infiltrating the soil, Rainwater is collected in a network of spaces in pervious pavement, allowing it to soak into the soil underneath.

THE OBJECTIVE OF STUDY

The study's objectives are as follows:

a) Strengthen the existing road by using appropriate strengthening materials.

b) Pervious concrete costs less per cubic metre than impervious concrete.

METHODOLOGY

The literature review covers pervious concrete applications, design approaches, material characteristics, moisture proportioning, construction methods, testing, and inspections. Pervious concrete is an open-graded, near-zero-sump material consisting of cement, coarse aggregate, additives, water, and fibre. When these chemicals are mixed together, they form a solid substance with interconnected pores ranging in size from 2 to 8mm, allowing for simple transit. The void content could range from 15 to 35 percent with a compressive strength of 3 to 28 MPa. Pervious concrete drainage rates vary based on aggregate size and mixture density, but they typically range from 81 to 730 1/min/m3.

(a) Flow chart of methodology

PROBLEM IDENTIFICATION

LITERATURE REVIEW

MATERIAL PROCUREMENT FOR EXPERIMENT

CALCULATION & DESIGN

MIXING

CASTING

CURING

TESTING

RESULT&ANALYSIS

(b) Problem Identification:India is experiencing a typical problem of rapid ground water table decline due to decreased precipitation recharging into the subsoil and planned water removal for agriculture and industry through pumping. Rainwater recharge can be helped by pervious concrete, which is used to construct low-load pavements, platform walkways, and parking lots. It could be placed in the Indian government's top priorities for rainwater collection.

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(c) Material procurement for experiment:IS 12269 specifies OPC 53 grade cement with a specific gravity of 3.15. (1987). To ensure standard consistency, 31.5 percent water is required. The initial and final cement setting times were respectively 60 and 270 minutes.

1.cement-IS 12269 specifies OPC 53 grade cement with a specific gravity of 3.15. (1987). To ensure standard consistency, 31.5 percent water is required. The initial and final cement setting times were respectively 60 and 270 minutes.

2.aggregate-Single-sized particles of 10mm are widely utilised in pervious concrete. The particles in pervious concrete are rounded and crushed. The specific gravity of coarse aggregate is 1.75.

3.water-With the right chemical admixtures, water-to-cement ratios of 0.27 to 0.40 are common, and as high as 0.35 has been successfully used. The link between strength and water-to-cement ratio is uncertain because, unlike ordinary concrete, the total paste content is smaller than the spaces between the particles.

4.admixture-Mid Polyvinyl Chloride has a density of 1.1 kg/m in concrete.

5.fibre-Fibers of Polypropylene To improve the paste's post-cracking behaviour, 12 mm Polypropylene fibres were added. To ensure proper dispersion, these fibres were separated using an air compressor prior to mixing. The fibre was used in the concrete at a concentration of 2% by volume.

(d) Mix design of concrete: The various steps used are discussed below-

- Density of aggregate
- Adjust to SSD weight
- Determine paste volume
- Determine cement content
- Determine water content
- Determine solid volume
- Check percent voids

(d) Casting and curing: The moulds were first cleaned and then the internal surfaces were completely oiled to avoid adhesion with concrete after hardening. The specimens are demoulded after 24 hours and completely immersed in water.

(e) Testing: the testing is done in a completely equipped laboratory.

RESULTS AND DISCUSSION

The experimental results are discussed below.

1.Workability-when two percent there is a significant improvement in the workability of concrete in comparison to pervious concrete without fibre.

2.Compressive strength-An average increase in compressive strength by 12.95% is seen with the addition of fibres to pervious concrete,

3. Void content-this increases the permeability of water over pervious concrete and help in drainage of water.

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