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Water Permeable Paver Block

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Abstract: Water permeable paver blocks are a sustainable pavement solution that allows rainwater to pass through the surface and enter the ground. Unlike conventional concrete pavements, they reduce water logging, surface runoff, and urban flooding while improving groundwater recharge.
In this project, permeable paver blocks are made using cement, coarse aggregate, minimal fine aggregate, water, and admixtures. Their performance is evaluated through tests like compressive strength, permeability, and durability. These blocks are suitable for low-traffic areas such as parking spaces, footpaths, and gardens, promoting eco-friendly construction practices.

I. INTRODUCTION

Rapid urbanization has increased roads, parking areas, and footpaths. Normal concrete does not allow rainwater to pass through it. Because of this, problems like water logging, flooding, and low groundwater level happen.Water permeable paver blocks are special blocks that allow rainwater to pass through them and go into the soil. They have small holes (voids) which help water to drain easily. This helps in groundwater recharge and reduces flooding. These blocks are made from cement, coarse aggregate, water, and admixtures with little or no sand. They are eco-friendly and mainly used in parking areas, footpaths, gardens, and low traffic areas. They are important for sustainable construction in modern civil engineering.

II. LITERATURE SURVEY

Rapid urbanization has increased the use of normal concrete and asphalt roads. These surfaces do not allow rainwater to enter the ground. This causes problems like water logging, flooding, and decrease in groundwater level. To solve this problem, researchers introduced water permeable paver blocks**.** These blocks allow water to pass through small gaps and voids inside them. They help in reducing surface runoff and improve groundwater recharge. Water permeable paver blocks are made using cement and coarse aggregates. Fine aggregates (sand) are used very less or not used at all to maintain porosity. Material selection is very important for good performance. Themix design should balance strength and water permeability. Usually, void content is about 15% to 25%. Higher voids increase water flow but reduce strength.

III. SCOPE OF THE PROJECT

The Water Permeable Paver Block project focuses on developing an eco-friendly pavement solution that allows rainwater to pass through the surface and enter the ground. This helps reduce water logging, urban flooding, and pressure on drainage systems. It also supports groundwater recharge and promotes sustainable construction practices.
The main objective of the project is to design and study permeable paver blocks that provide sufficient strength while managing stormwater effectively. Overall, the project aims to improve safety, conserve water, and create environmentally friendly infrastructure for urban and semi-urban areas.
Objectives:

1) To study the concept and importance of water permeable paver blocks in sustainable construction.
2) To design and develop permeable paver blocks that allow rainwater infiltration.
3) To reduce surface runoff and water logging in roads, footpaths, and parking areas.
4) To promote groundwater recharge by allowing rainwater to seep into the soil.
5) To reduce the load on drainage systems in urban areas.

IV. METHODOLOGY

Rapid urbanization has increased the use of conventional concrete roads that do not allow rainwater to enter the ground, causing water logging, flooding, and reduced groundwater recharge. To solve this problem, water permeable paver blocks are developed as a sustainable solution.

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In this project, OPC 53 grade cement, 10 mm coarse aggregate, clean water, and UltraTech WP+200 admixture are used to manufacture permeable paver blocks. The blocks are cast in
12 × 12 × 3 inch size, demolded after 24 hours, and cured for 7 and 14 days.
Various tests are conducted such as standard consistency test, impact test, abrasion test, slump cone test, compaction factor test, compressive strength test (CTM), and flexural test (UTM) to evaluate strength, durability, and permeability.The project aims to provide an eco-friendly, durable, and effective pavement solution suitable for low to medium traffic areas while promoting groundwater recharge and sustainable construction.

A. Mix design of M20 grade concrete:

1) Stipulation for proportioning:

- Grade designation: M20
- Type of cement: OPC 53 grade cement
- Maximum nominal size of aggregate: 10 mm
- Minimum cement content: 300 kg/m3
- Workability: 80 mm slump
- Exposer condition: severe
- Method of concrete placing: Hand placing and compaction.
- Degree of supervision: Good.
- Type of aggregate: Crushed, flaky elongated aggregate.
- Maximum cement content: 450 kg/m3

2) Test data for material:

Cement used: OPC 53 grade
Specific gravity of cement: 3.15
Specific gravity of
Corse aggregate: 2.74
Water absorption
Coarse aggregate: 0.5%

3) Target strength for mix proportion:

fck‟ = fck + t x sd
Where,
fck‟ –target average compressive strength 28
fck – characteristic compressive strength
n- Standard deviation
fck‟=20+1.65 x 4
fck‟=26.60 N/mm^2

B. Calculation CA proportion

For well compacted pervious concrete
Volume of concrete = 1m3
Void content = 16.25%
Paste volume = 17.25%
Volume of aggregate = 0.665m
Mass of coarse aggregate= 1788.85Kg/m3

Standard Consistency Test
The standard consistency test of cement is carried out to determine the minimum amount of water required to prepare a cement paste of normal or standard consistency.

This test ensures that the cement paste has proper workability and plasticity for further testing and practical use.

Impact value test

To determine the toughness of 10 mm aggregate by measuring its resistance to sudden impact or shock.

Abrasion value test

To determine the abrasion resistance (wearing resistance) of aggregates used in pavements and paving blocks.

Casting of Block

After Calculating mix design and taking material in proportion we are conducted mixing of material process and casting of block for size 12 x 12 x 3 inch.

V. COMPRESSIVE TEST ON CONRETE

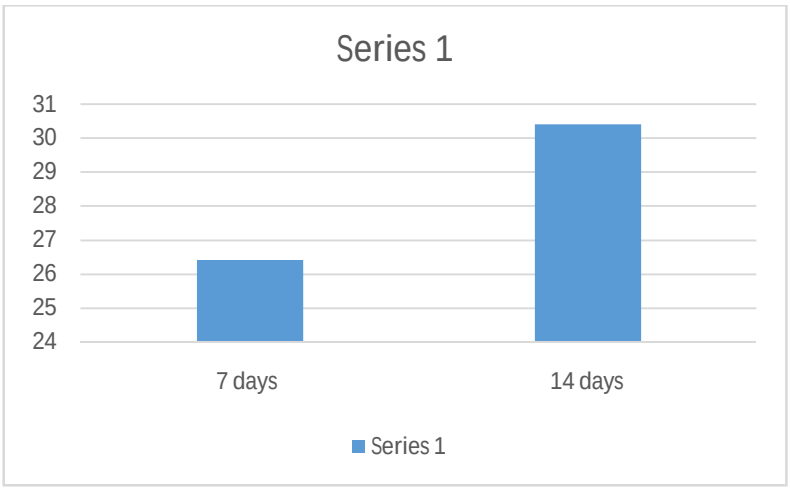
Compressive strength of normal and permeable concrete is tested using a Compression Testing Machine as per Bureau of Indian Standards guidelines.

Concrete cubes (12 inch × 12 inch × 12 inch) are cured for 7 and 14 days and then loaded until failure.

Normal concrete gives higher strength due to dense structure, while permeable concrete gives lower strength because of voids but is suitable for light traffic areas.

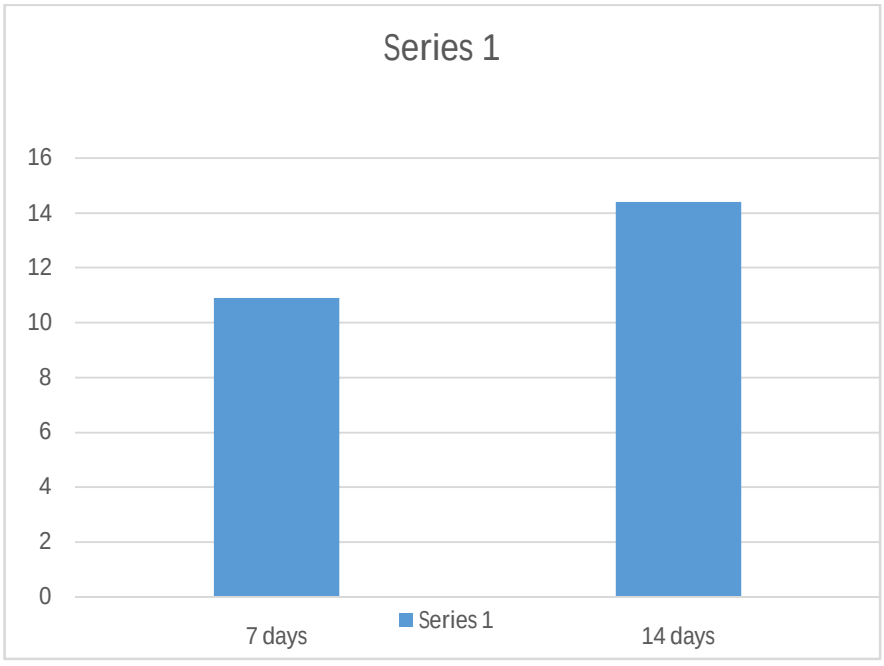
Compressivestrengthofnormalconcretecube

Curing	Compressive Strength (N/mm^2)
7days	26.05
14days	30.42



Compressive strength of permeable concrete cube

Curing	**Compressive Strength(N/mm^2)**
7days	10.9
14days	14.8



VI. FLEXURAL TEST

The flexural strength test is carried out to determine the bending strength of permeable concrete. Since permeable concrete is mainly used in pavements, paver blocks, and slabs, it is important to know how much load it can resist under bending.

In this test, a rectangular permeable concrete beam is cast and cured for a specified period, usually 7 days or 14 days. After curing, the beam is taken out of the curing tank and wiped clean to remove surface moisture. The specimen is then placed on the supporting rollers of theUDL machine.

Flexural strength values forpermeable concrete block

Sr. no.	Load at Failure in (KN)	Flexural strength
1	5.8	3.1
2	6.2	3.3
3	5.5	3.0

VII. COST ESTIMATING

Sr.No.	Name	Quantity	Cost (Rs)
1	Cement (OPC)	50kg	350/-
2	Aggregate	6 bags	650/-
3	WP+200 Admixtures	500ml	200/-
4	Mould	3	450/-
		Total =	1650/-

VIII. CONCLUSION

Permeable concrete blocks are an eco-friendly pavement solution that allows rainwater to pass through their porous structure, reducing surface runoff and water logging. They help in groundwater recharge and support sustainable water management in urban areas. Although their strength is lower than conventional concrete, they are suitable for low-traffic applications like footpaths and parking areas. Proper mix design, curing, and regular maintenance ensure durability and long service life. Overall, permeable concrete blocks promote sustainable and cost-effective infrastructure development.

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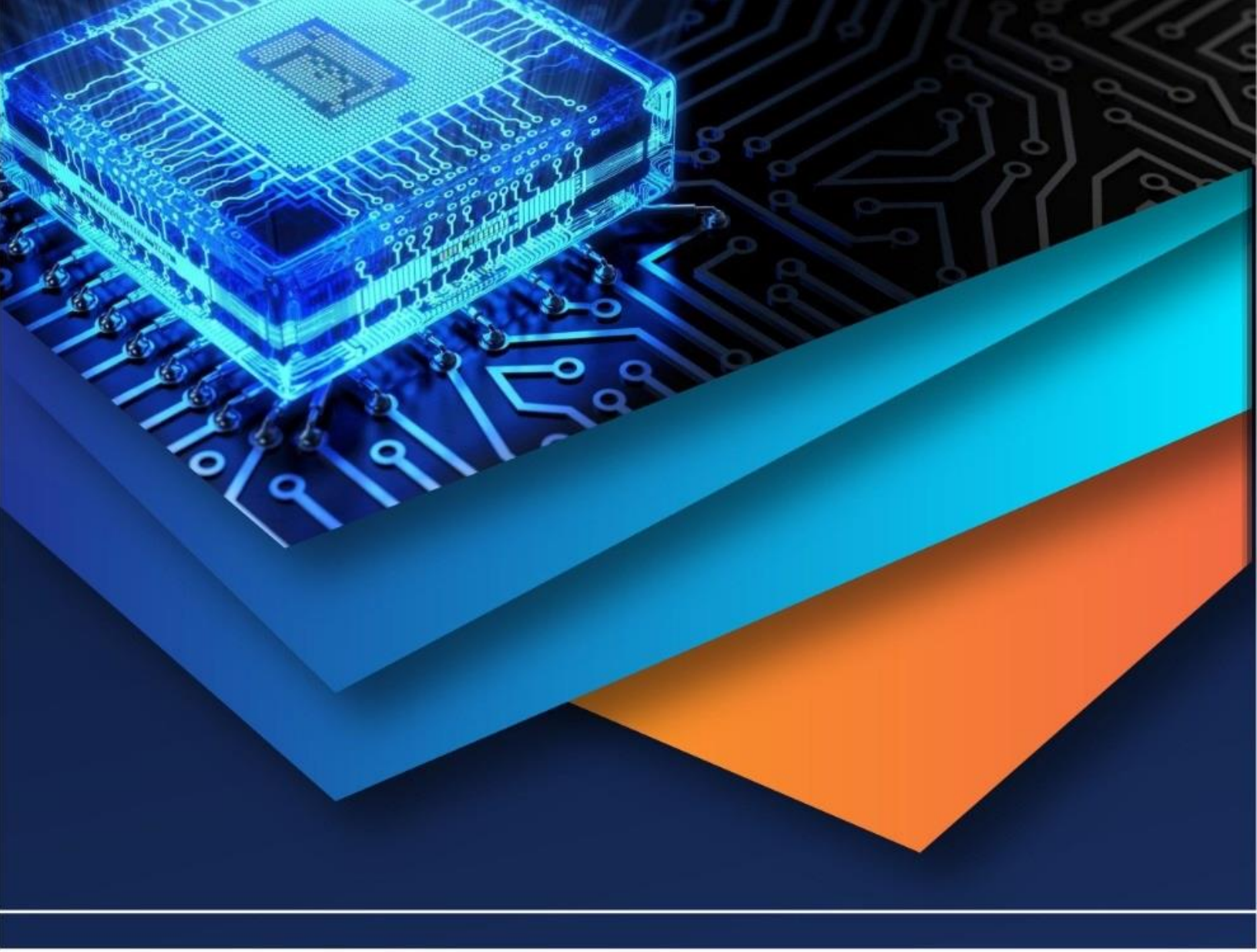

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