

Study of Permeable Brick Pavement

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Abstract- Permeable brick pavement (PBP) is an innovative and sustainable pavement system designed to allow water infiltration through its surface into underlying layers. Rapid urbanization has increased impervious surfaces, leading to flooding, groundwater depletion, and environmental degradation. This research paper studies the structure, working mechanism, materials, design considerations, advantages, limitations, and applications of permeable brick pavements. The study highlights that PBP significantly reduces stormwater runoff, improves groundwater recharge, and enhances environmental sustainability. However, challenges such as clogging, maintenance, and structural limitations restrict its widespread application. The paper concludes that permeable brick pavements are an effective solution for modern sustainable urban infrastructure when properly designed and maintained.

Keywords: Permeable Brick Pavement (PBP), Porous Pavement, Low Impact Development (LID), Groundwater Recharge etc

I. INTRODUCTION

Urban development has led to an increase in impervious surfaces such as concrete roads and pavements, which disrupt the natural hydrological cycle. This results in excessive surface runoff, urban flooding, and reduced groundwater recharge.

Permeable brick pavement is a type of eco-friendly pavement system that allows rainwater to pass through its surface and infiltrate into the ground. It is widely used as a **Low Impact Development (LID)** technique for stormwater management.

Studies show that permeable pavements can reduce peak flow and runoff volume significantly, making them an essential component of sustainable urban drainage systems.

II. OBJECTIVES

- To understand the concept and working of permeable brick pavement
- To study materials and construction techniques

- To evaluate advantages and limitations
- To analyze environmental and hydrological benefits
- To suggest suitable applications

III. LITERATURE REVIEW

Previous research indicates that permeable pavements:

- Reduce stormwater runoff by 4–13% and overflow by up to 30%
 - Improve groundwater recharge and water quality
 - Are part of sustainable “Sponge City” concepts
- However, studies also highlight issues such as:
- Reduction in permeability due to clogging over time
 - Lower structural strength compared to conventional pavements

IV. COMPONENTS OF PERMEABLE BRICK PAVEMENT

A typical permeable brick pavement consists of the following layers:

4.1 Surface Layer

- Permeable bricks or pavers
- Designed with voids/joints for water infiltration

4.2 Bedding Layer

- Fine aggregates
- Provides leveling and initial filtration

4.3 Base Layer

- Coarse aggregates
- Acts as a reservoir for water storage

4.4 Sub-base Layer

- Larger aggregates
- Facilitates drainage and load distribution

4.5 Subgrade

- Natural soil
- Supports the entire structure

- Reduces urban heat island effect
- Provides better skid resistance
- Eco-friendly and sustainable

VI. WORKING MECHANISM

The functioning of permeable brick pavement involves:

1. Rainwater passes through joints or pores in bricks
2. Water is filtered through bedding and base layers
3. Stored temporarily in sub-base
4. Gradually infiltrates into soil or is drained

This process helps in:

- Reducing surface runoff
- Preventing waterlogging
- Recharging groundwater

VII. MATERIAL USED

- Permeable concrete or clay bricks
 - Crushed stone aggregates
 - Sand (for bedding)
 - Geotextiles (optional)
- Material design focuses on:
- Porosity
 - Strength
 - Durability

VIII. DESIGN CONSIDERATION

Key factors in designing permeable brick pavement include:

- Traffic Load: Suitable mainly for light to medium traffic
- Soil Type: Permeable soil enhances performance
- Rainfall Intensity: Determines drainage capacity
- Base Thickness: Varies depending on load and permeability
- Clogging Potential: Requires proper filtration design

Base thickness may vary widely depending on traffic and subgrade conditions.

IX. ADVANTAGES

- Reduces stormwater runoff
- Enhances groundwater recharge
- Improves water quality

Permeable pavements also help mitigate urban flooding and pollution

X. CONCLUSION

Permeable brick pavement is an effective solution for sustainable urban development. It addresses critical issues such as stormwater management, groundwater recharge, and environmental protection. Although challenges like clogging and structural limitations exist, proper design and maintenance can significantly enhance performance. Therefore, permeable brick pavements should be promoted as a key component of eco-friendly infrastructure.

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