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Research Article

Modified Pervious Concrete Pavement with Lime Mortar and Recycled Plastic Fibers for Urban Infrastructure in Bangladesh

Muhammad Akhtar Hossain, Abid Hussain*, Proton Sarker

Department of Civil Engineering, Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh

Abstract

This study evaluates the mechanical and permeability performance of a Modified Pervious Concrete Pavement (MPCP) developed for urban infrastructure in Bangladesh. The MPCP incorporates lime mortar, selected for its binding properties, and recycled plastic bottle fibers, introduced to enhance tensile strength, crack resistance, and durability. A series of mix designs were developed and tested to assess the effects of varying proportions of lime mortar and plastic fibers on the structural and hydraulic characteristics of the pavement. Among the tested configurations, the A5 mix (cement: lime mortar: aggregate = 1:0.25:3) demonstrated an effective balance between strength and porosity. It achieved a 28-day compressive strength of 18.445 MPa and a porosity of 17.01%, meeting functional criteria for pervious pavement applications. Additionally, the A5 mix exhibited a high infiltration rate of 483.362 mm/hour, supporting its suitability for stormwater management in flood-prone areas. The experimental findings indicate that the integration of lime mortar and recycled plastic fibers can improve both mechanical and permeability characteristics of pervious concrete without compromising its fundamental design properties. The use of locally sourced and waste-derived materials further supports resource-efficient construction practices. This study provides a framework for the development of structurally sound and hydraulically functional pervious pavement systems tailored to the environmental and infrastructural context of Bangladesh.

Keywords

Modified Pervious Concrete Pavement, Lime Mortar, Recycled Plastic Fiber, Mechanical Properties & Sustainability

1. Introduction

The increasing demand for sustainable and resilient infrastructure in developing countries has prompted engineers and researchers to seek innovative materials and construction techniques. In Bangladesh, where rapid urbanization is accompanied by issues such as waterlogging [1], plastic pollution [2], and inadequate stormwater management [3], the limitations of conventional concrete pavements have become more apparent. Traditional rigid pavements, while durable and cost-effective, are impervious by nature, thereby obstructing natural water infiltration, contributing to surface runoff, and placing added stress on urban drainage systems [4].

To overcome these challenges, pervious concrete pavement (PCP) has emerged as a viable alternative [5]. Characterized

*Corresponding author: abidhussain00035@gmail.com (Abid Hussain)

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by its interconnected void structure, pervious concrete allows rainwater to pass through its body and reach the subgrade, facilitating groundwater recharge and reducing stormwater runoff [6]. Additionally, its application supports sustainable urban development goals by promoting eco-friendly construction and enhancing the hydrological balance within urban environments [7].

However, the broader application of PCP is often limited by its relatively low compressive and tensile strength, which restricts its use in areas with high vehicular loads or where long-term durability is essential. Achieving an optimal balance between mechanical strength and permeability remains a major challenge in the advancement of pervious concrete technology. This necessitates the use of innovative additives and mix designs that can reinforce the concrete matrix without significantly compromising its porosity [8, 9].

In this context, lime mortar and recycled plastic fibers have gained attention as promising modifiers to improve the performance of pervious concrete. Lime mortar, known for its historical significance in masonry work, offers excellent binding properties, workability, and thermal compatibility with cementitious systems. Its inclusion in the mix can lead to improved matrix integrity, resistance to cracking, and better bonding between paste and aggregates [10-13]. Furthermore, it promotes environmental benefits by reducing the dependence on Portland cement, whose production is energy-intensive and carbon-emissive [14].

The integration of recycled plastic fibers, particularly those obtained from post-consumer PET bottles, offers a sustainable and practical solution to enhance the mechanical performance of pervious concrete pavements (PCP) while addressing the growing issue of plastic waste in urban environments. These fibers act as micro-reinforcements, mitigating crack propagation, enhancing toughness, and increasing long-term durability [15]. Additionally, their inclusion improves tensile strength, crack resistance, freeze-thaw durability, and water management properties of PCP. From an environmental perspective, this approach supports waste valorization and circular economy principles by transforming harmful plastic waste into functional construction materials. However, achieving an optimal balance between durability and permeability in PCP remains a significant challenge. Increasing porosity, typically targeted within the range of 15–25% [16], is essential for adequate water infiltration, but it inevitably reduces compressive strength, which is ideally maintained within 2.8 to 28 MPa as per ACI PRC-522 guidelines. This inherent trade-off complicates the development of pervious pavements that are both highly porous and sufficiently strong for commercial applications, where enhanced load-bearing capacity and long-term performance are critical.

Given these multifaceted advantages, the development of a Modified Pervious Concrete Pavement (MPCP) using lime mortar and recycled plastic fibers holds substantial promise for urban infrastructure in Bangladesh. It provides an opportunity to address local challenges—such as plastic pollution and inadequate drainage systems—while delivering structurally sound, environmentally conscious pavement alternatives.

Therefore, this study aims to evaluate the combined effect of lime mortar and recycled plastic fibers on the mechanical, permeability, and sustainability performance of pervious concrete pavement. By investigating multiple mix designs and analyzing their performance, the research seeks to develop an optimized solution tailored to the infrastructural and environmental conditions prevalent in Bangladesh's urban landscape.

While previous research [17] has investigated various aspects of pervious concrete and its applications in Bangladesh, the specific combination of lime mortar and recycled plastic fibers remains underexplored. For instance, studies have examined the use of porous pavements to mitigate waterlogging in Dhaka's newly developed areas, emphasizing the benefits of increased infiltration and groundwater recharge. Additionally, research has focused on incorporating recycled plastic fibers into concrete to enhance mechanical properties. However, these studies do not address the synergistic effects of combining lime mortar with recycled plastic fibers in PCP, particularly concerning the dual challenges of waterlogging and plastic waste management in Bangladesh.

Research Objective and Novelty

The primary objective of this research is to develop and evaluate a Modified Pervious Concrete Pavement (MPCP) using a combination of lime mortar and recycled plastic fibers, with the goal of enhancing mechanical strength and permeability while promoting sustainability in urban pavement systems. The novelty of this study lies in the combined use of lime mortar—a traditional, low-carbon binder known for its binding and thermal properties—and recycled plastic fibers derived from post-consumer PET bottles within a pervious concrete mix. While previous studies have examined the use of porous pavement or recycled fibers individually, limited research exists on the synergistic effects of integrating both materials in the context of Bangladesh's urban waterlogging and plastic pollution challenges. This study also provides an experimental validation of an optimized mix (A5), achieving a balance between strength (18.445 MPa) and porosity (17.01%), along with a high infiltration rate, which supports its suitability for urban drainage applications. This approach contributes to both structural performance and sustainable waste management, aligning with circular economy principles and responding to localized infrastructural demands in a developing country context.

2. Methodology

2.1. Experimental Materials

In this study, various pervious concrete mixtures were initially evaluated with differing aggregate compositions to identify the most suitable mix for performance assessment. The primary mix designs (Table 1) considered were A1 (1:3), A2 (1:3), A3 (1:3), and A4 (1:4), each containing 25% cement (Type B: clinker 95%, gypsum 5%) and incorporating varying aggregate size distributions. For the final mix designs (Table 2), A5 (1:0.25:3), A6 (1:0.5:3), A7 (1:0.75:3), and A8 (1:1:3) were examined, each containing 25% cement (clinker 95%, gypsum 5%) along with different proportions of lime mortar and plastic fiber, as well as varied aggregate size distributions. These modifications included the addition of lime mortar at varying percentages and fibers sourced from recycled plastic bottles. The selection of these mix designs was based on a comprehensive evaluation of their permeability and mechanical strength, ensuring an optimal balance suitable for pervious concrete pavement applications. These specific mix designs were selected to explore the effect of increasing lime mortar content and constant recycled fiber on mechanical strength and permeability, allowing for optimization based on balanced performance.

Table 1. *Initial % material used in different grade Pervious Concrete.*

Ratio	**% Materials Used**				
Pervious Concrete Mix (Cement: Aggregate)	**Cement**	**Aggregate 19mm-9.5mm**	**Aggregate 19mm-12.75mm**	**Aggregate 12.75mm-9.5mm**	**Aggregate 9.5mm-4.75mm**
A1 (1:3)	25	75	0	0	0
A2 (1:3)	25	0	0	0	75
A3 (1:3)	25	0	37.5	37.5	0
A4 (1:4)	25	0	0	37.5	37.5

Table 2. *Final % material used in different grade Pervious Concrete.*

Ratio	**% Materials Used**					
Pervious Concrete Mix (Cement: Lime Mortar: Aggregate)	**Cement**	**Lime Mortar**	**Aggregate 19mm-9.5mm**	**Aggregate 19mm-12.75mm**	**Aggregate 12.75mm-9.5mm**	**Aggregate 9.5mm-4.75mm**
A5 (1:0.25:3)	23.52	5.88	0	35.3	35.3	0
A6 (1:0.5:3)	22.22	11.12	0	33.33	33.33	0
A7 (1:0.75:3)	21.05	15.79	0	31.58	31.58	0
A8 (1:1:3)	20	20	0	30	30	0

The mix designs were selected to assess how variations in lime mortar content affect the mechanical and permeability properties of pervious concrete. The A1–A4 models focused on evaluating the effect of aggregate size and distribution on porosity and compressive strength. In the A5–A8 models, increasing the lime mortar proportion aimed to improve bonding and strength while maintaining acceptable porosity. By comparing these mixes, the study aims to identify an optimal design that balances structural strength with infiltration capability.

2.2. Initial Specimen Preparation

The initial specimen preparation involved the systematic separation of aggregates through sieve analysis to develop various pervious concrete mix designs (A1, A2, A3, and A4). This process ensured proper categorization of aggregates based on size, with four distinct fractions: those passing through a 19 mm sieve but retained on a 9.5 mm sieve, those passing through a 19 mm sieve but retained on a 12.75 mm sieve, those passing through a 12.75 mm sieve but retained on a 9.5 mm sieve, and finally, those passing through a 9.5 mm sieve but retained on a 4.75 mm sieve. These graded aggregates were incorporated into the concrete mix in varying proportions to assess their impact on both permeability and mechanical strength. A water-to-cement (W/C) ratio ranging from 0.30 to 0.36 was maintained to ensure workability while preserving the essential porosity of pervious concrete. Each mix was used to prepare four cylindrical specimens, leading to a total of 16 specimens with a diameter of 4 inches (101.6 mm) and a height of 8 inches (203.2 mm). All specimens were cured in water for 28 days at ambient laboratory conditions (approximately 27 ± 2 °C), following standard curing practice for pervious concrete to ensure sufficient hydration and strength development. The primary goal of this study was to identify the most effective mix design for further enhancement by integrating additional additives, such as lime mortar and recycled plastic fibers, to improve the material's structural integrity and environmental sustainability. The final objective was to develop a pervious concrete pavement system capable of withstanding loading conditions while maintaining the necessary porosity and density levels, in accordance with the ACI 522R guidelines. By achieving a balance between permeability and mechanical performance, the modified pervious concrete aims to provide an eco-friendly and durable solution for sustainable pavement applications.

Figure 1. *Matest Servo-Plus Evolution compression testing machine.*

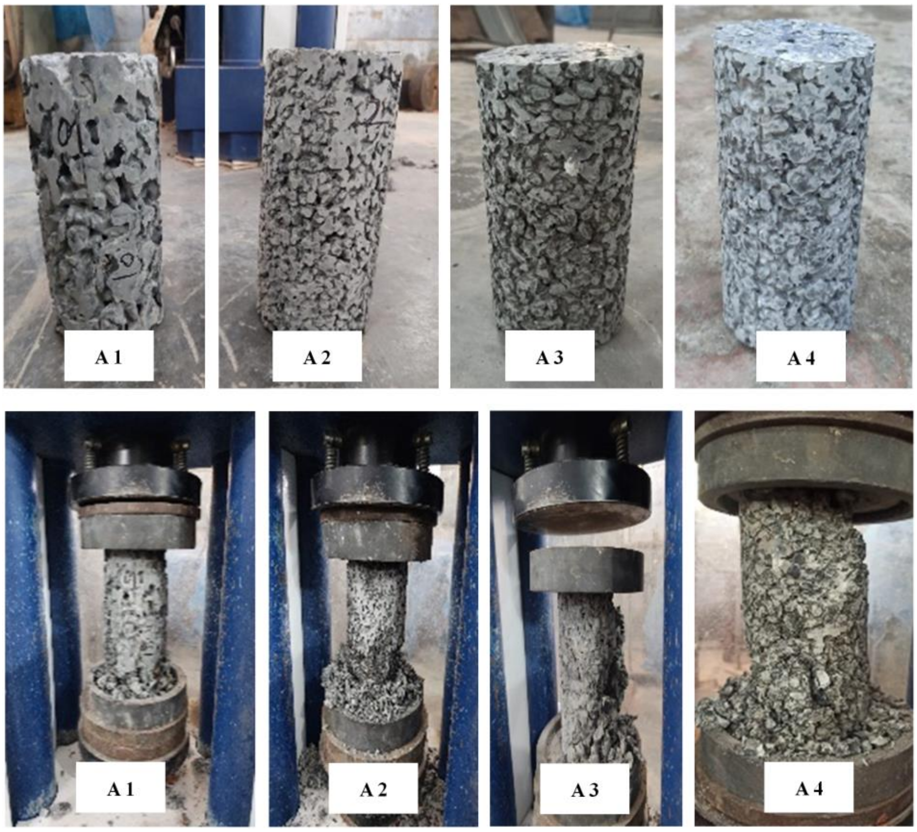

Figure 2. *Compression testing of different specimen.*

2.3. Final Modified Specimen Preparation

In this stage, Calcium Carbonate ($CaCO_3$) boulders were collected and wetted in water for 14 days to enhance their reactivity. Coarse sand, passing through a 4.75 mm sieve and retained in a 1.18 mm sieve, was then selected to maintain uniform particle size distribution. A lime mortar (LM) mix was prepared (Figure 3) in a 1:1 ratio (lime: sand) following established construction guidelines [18]. To further enhance the mix, 4 grams of plastic fiber, extracted from recycled plastic bottles, were incorporated to improve structural integrity. A total of 16 specimens were prepared with varying percentages of lime mortar, using the previously optimized A3 model as the base mix. In this phase, the mix designs for A5, A6, A7, and A8 were developed to identify the most suitable configuration for a modified pervious concrete pavement prototype. The curing process was structured, with eight specimens tested after 7 days and the remaining eight specimens tested after 28 days. To ensure compliance with the fundamental characteristics of pervious concrete, the density and porosity were carefully balanced to meet standard requirements [19, 20]. The controlled variation in lime mortar content played a significant role in achieving the desired properties, ultimately refining the material's performance for enhanced durability and permeability. These specific mix designs were selected to explore the effect of increasing lime mortar content and constant recycled fiber on mechanical strength and permeability, allowing for optimization based on balanced performance.

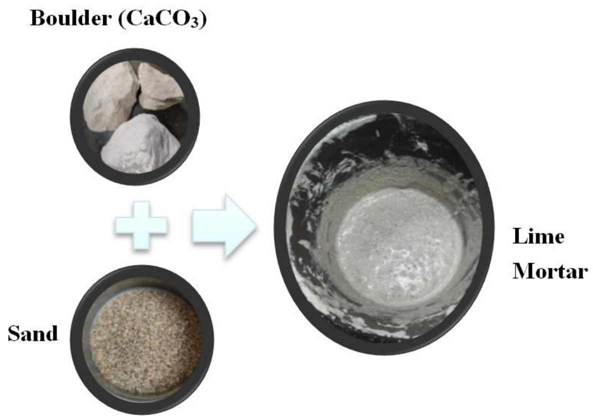

Figure 3. *Lime mortar preparation.*

Recycled plastic bottle fiber Mortar mix with fiber and lime mortar Final concrete mix

Figure 4. *Concrete mix design with using of lime mortar and plastic bottle recycled fiber.*

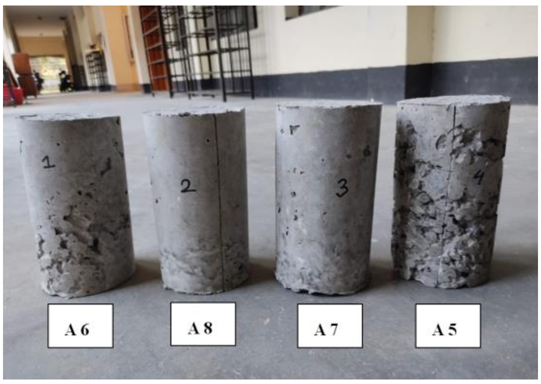

Figure 5. *Cylindrical Specimen for compression testing.*

The lime mortar was prepared by mixing hydrated lime and fine sand in a 1:1 ratio by weight, using a mechanical mixer for 5 minutes to ensure homogeneity. Water was added gradually to achieve workable consistency. After preparing the mortar, it was blended with cement and aggregates according to the proportions listed in Table 2. Recycled plastic fibers (4 grams per mix) were cut from PET bottles into lengths of 10–15 mm and manually pre-mixed with the dry aggregates before the addition of cement and mortar. All dry components were first mixed for 2 minutes, followed by gradual addition of water, and mixed for an additional 3 minutes to ensure uniform fiber distribution and workable consistency.

Calcium carbonate ($CaCO_3$) was incorporated in the mix as a filler with minor binding potential. Its use is rooted in traditional lime mortar applications in Bangladesh and contributes slightly to strength development. No carbonation testing was performed in this study, and no chemical carbonation reaction is claimed.

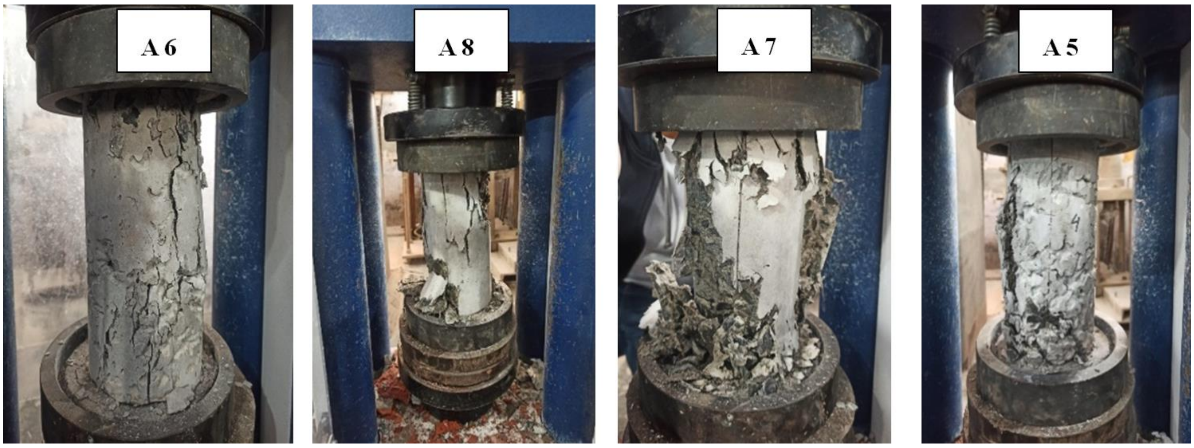

Figure 6. Compression testing of different specimen.

2.4. Modified Pervious Concrete Pavement (MPCP) Prototype Preparation

The prototype (Figure 7) preparation began with the excavation of a trench measuring 2.2 feet by 2.2 feet with a depth of 7 inches. The subgrade, subbase, and base layers were systematically placed and compacted using a 33-pound hammer to ensure proper density and stability. Once the base preparation was completed, a well-mixed A5 model (Figure 12) concrete was prepared. The concrete mix was then poured into the designated area within a structured framework to maintain the desired shape and dimensions of the surface course, measuring 2 feet in length, 2 feet in width, and 4 inches in depth. This process ensures uniformity and accuracy in the prototype construction, adhering to standard pavement testing procedures like other research [21].

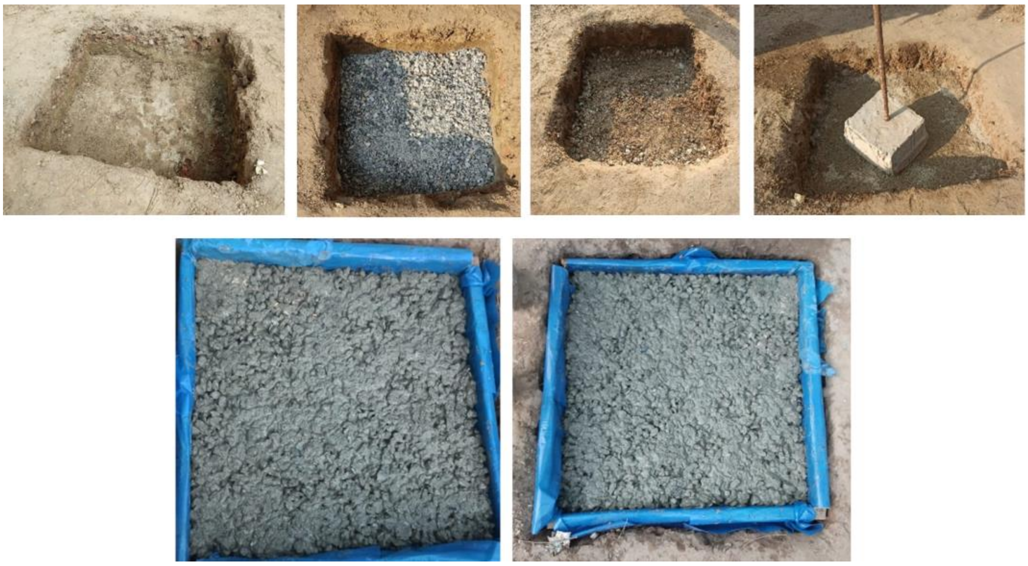

Figure 7. Modified Pervious Concrete Pavement (MPCP) Prototype layer preparation and Casting.

2.5. Infiltration Test of Modified Pervious Concrete Pavement

The infiltration rate of the modified pervious concrete pavement (Figure 8) was assessed in accordance with the ASTM C1701 standard test method. This guideline provides a systematic approach for measuring the field infiltration rate of in-place pervious concrete. The procedure involves placing a securely fitted infiltration ring on the pavement surface and introducing a known volume of water, ensuring minimal disturbance to the pavement structure. The time taken for the water to completely infiltrate through the pavement is carefully recorded, providing a direct measure of the pavement's permeability [22]. The infiltration rate is a crucial indicator of the pavement's ability to manage stormwater, reduce surface runoff, and minimize the risk of waterlogging. Higher infiltration rates suggest an efficient drainage system [23], which is a fundamental characteristic of well-designed pervious pavements.

Figure 8. Infiltration test of Modified Pervious Concrete Pavement prototype.

3. Result & Discussion

This study aimed to evaluate the mechanical performance and permeability characteristics of Modified Pervious Concrete Pavement (MPCP) incorporating lime mortar and recycled plastic fibers. Comprehensive laboratory tests were conducted to assess both the mechanical behavior and the hydraulic performance of the modified concrete mixes. Based on a detailed analysis of the experimental results, the following discussions are presented to elucidate the performance trends and the practical implications of the proposed material system.

3.1. Initial Specimen Preparation

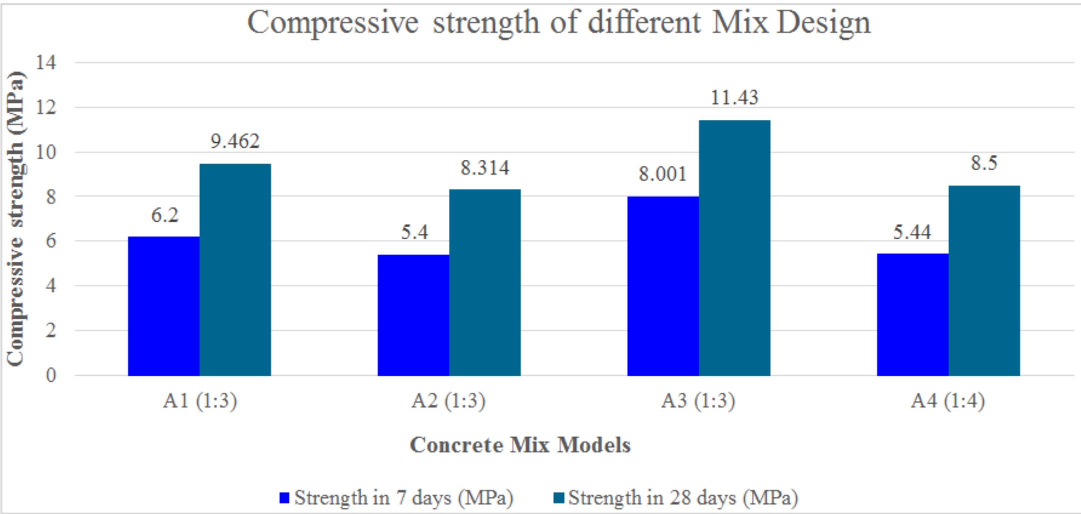

Figure 9. Compression test result of initial specimens.

Based on the comparative analysis of compressive strength [27] for different concrete mix designs (Figure 9), it was observed that Model A3 (1:3) exhibited the highest compressive strength among the tested mixes at both the 7-day and 28-day curing periods. At 7 days, A3 achieved a compressive strength of 8.001 MPa, demonstrating a significant early strength gain compared to the other mixes. This trend continued through the 28-day curing period, where A3 attained its highest recorded strength of 11.43 MPa, outperforming the other mix designs. In contrast, the other concrete mix models, such as A1 (1:3), A2 (1:3), and A4 (1:4), showed lower compressive strength values, with A1 reaching 6.2 MPa at 7 days and 9.462 MPa at 28 days, A2 recording 5.4 MPa at 7 days and 8.314 MPa at 28 days, and A4 achieving 5.44 MPa at 7 days and 8.5 MPa at 28 days. These results indicate that while all tested concrete mixes exhibited strength development over time, A3 consistently outperformed them in both early-stage and later-stage strength parameters. For its' superior mechanical performance, Model A3 (1:3) was selected for further optimization. Its' higher compressive strength suggests improved durability, making it a promising choice for structural applications where load-bearing capacity is a critical factor. The selection of A3 (Figure 10) for further development aims to refine its' mix composition, enhance its' workability, and explore potential modifications to achieve even better structural performance.

When different concrete mix models were designed to prepare cylindrical specimens (Figure 2) at initial stage (A1, A2, A3, A4), based on different aggregate size, then the compressive strength was found different, and the density was varied with water-cement (W/C) ratio. Where A3 showed maximum compressive strength of 11.43 MPa in 28 days where porosity was 24.04% (Table 3), which meets the criteria of being a pervious concrete pavement. Here porosity was determined using the water saturation method following ASTM C642 guidelines, which estimates the total void content in the concrete matrix.

Each reported compressive strength value represents the average of three test specimens. Both 7-day and 28-day strengths were considered to identify the most suitable mix design for practical application based on strength development trends.

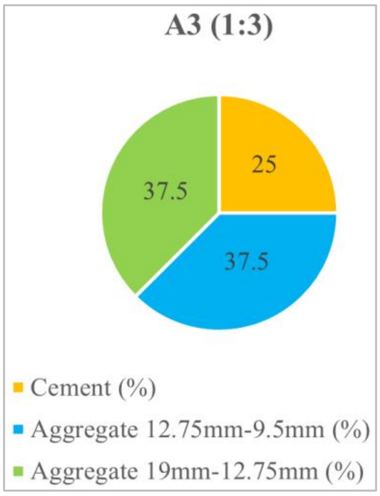

Figure 10. Selected mix design at initial stage.

3.2. Final Modified Specimen Preparation

These results confirm the influence of increasing lime mortar content on strength improvement, though excessive inclusion reduced porosity below acceptable pervious concrete thresholds.

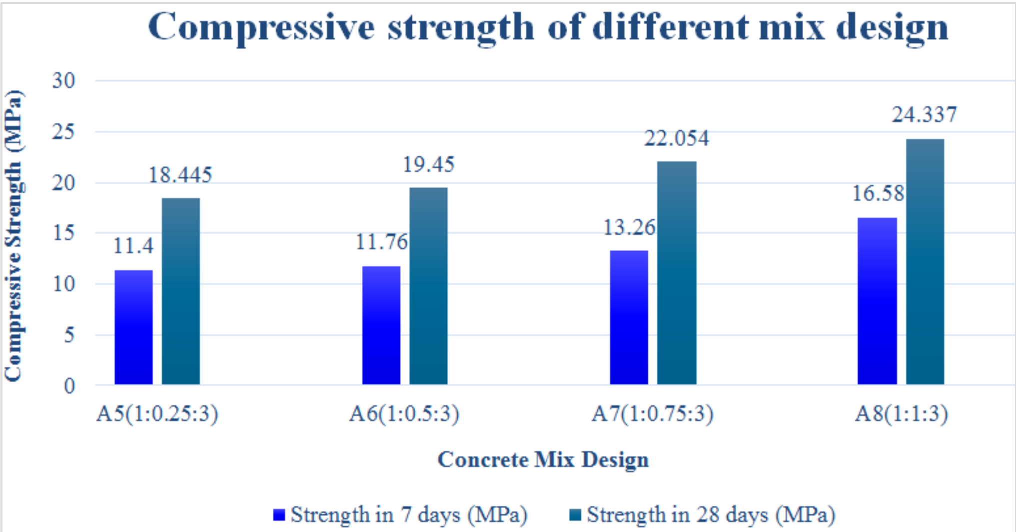

Figure 11. Compression Test results of final specimens.

Table 4. Compression test result of final specimen.

Ratio (C: LM: Ag)	Amount of Plastic Fiber (gm)	W/C Ratio	Strength in 7 days (MPa)	Strength in 28 days (MPa)	Density (Kg/m^3)	Porosity (%)
A5 (1:0.25:3)	4	0.35	11.4	18.445	2599.4	17.01
A6 (1:0.5:3)		0.35	11.76	19.450	2719.88	10.85
A7 (1:0.75:3)		0.35	13.26	22.054	2780.12	7.83
A8 (1:1:3)		0.35	16.58	24.337	2790	4.82

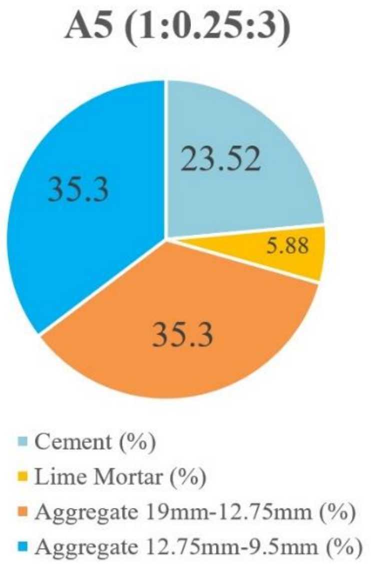

Figure 12. *Modified Pervious concrete final mix proportion.*

The comparative evaluation of compressive strength (Figure 11) across various concrete mix designs (Figure 5) highlights significant variations in their suitability for pervious concrete pavement applications. Among the tested models, A5 (1:0.25:3) has been selected as the optimal mix due to its balance between porosity and compressive strength, which aligns with the fundamental requirements of a modified pervious concrete pavement. While other mixes, such as A6 (1:0.5:3), A7 (1:0.75:3), and A8 (1:1:3), demonstrated higher compressive strengths, their porosity levels were insufficient to meet the criteria for pervious pavement, which relies on adequate permeability for effective water infiltration. The compressive strength of A5 reached 11.4 MPa at 7 days and 18.445 MPa at 28 days, providing a structurally viable yet permeable solution for sustainable pavement applications. The selection of A5 (Figure 12) underscores the necessity of maintaining a balance between mechanical strength and permeability in the design of pervious concrete, ensuring its practical functionality in stormwater management and environmentally responsive infrastructure. Furthermore, a prototype of the pervious concrete pavement model (Figure 7) was prepared for the next step for thermal analysis under sunlight exposure to evaluate its thermal performance in comparison with traditional pavements. This investigation aims to assess potential temperature differentials and heat mitigation benefits, contributing to the development of energy-efficient and sustainable pavement solutions.

As A3 showed the most efficient result in 28 days without using any additives, it was selected for the improvement section. Its' compressive strength was tried to improve by using lime mortar and recycling plastic bottle fiber by maintaining the criteria for being a pervious concrete. And in the second stage, the A5 mix design model showed the compressive strength 18.445 MPa (Table 4). Though the other design A6, A7, A8 showed better compressive strength but in case of porosity range, those were not acceptable. The porosity values obtained reflect total void space, which directly influenced both compressive strength and infiltration capacity. Higher porosity generally enhanced infiltration but reduced strength, while lower porosity increased density and compressive strength but limited water permeability. Here lime mortar (Figure 3) was used to get better thermal result as lime mortar was used in ancient heritage buildings in Bangladesh where it acts both binding material and heat insulation material. Besides, the use of lime mortar shows albedo effect which was shown practically during temperature measurement in pavement structures. Although Mixes A6 to A8 achieved higher compressive strength, their porosity values fell below the recommended range for effective pervious pavement. Therefore, Mix A5 was selected for its optimal balance of strength and permeability.

The inclusion of recycled PET fibers enhanced the tensile strength and crack resistance of the modified pervious concrete [24, 25]. These fibers acted as micro-reinforcements, controlling crack propagation and improving ductility without significantly compromising compressive strength [26].

Each reported compressive strength value represents the average of three test specimens. Both 7-day and 28-day strengths were considered to identify the most suitable mix design for practical application based on strength development trends.

The comparative analysis of Mixes A1–A4 and A5–A8 highlights the progression from conventional to modified pervious concrete compositions. While Mixes A1–A4 served as control specimens with basic cement-aggregate ratios, Mixes A5–A8 incorporated lime mortar and recycled plastic fibers, resulting in noticeable improvements in strength and overall matrix cohesion. Among them, Mix A5 demonstrated a favorable balance between compressive strength and porosity, making it the most practical choice for real-world pavement applications. This structured comparison confirms that the integration of supplementary materials can significantly enhance mechanical and hydraulic performance, aligning with the functional needs of pervious concrete pavements in urban infrastructure.

3.3. Infiltration Test Result of Modified Pervious Concrete Pavement

The measured infiltration rate (Figure 8) of 483.362 mm/hour for the pervious concrete pavement indicates a good permeability level. The measured infiltration rate of 483.362 mm/h notably surpasses the typical peak rainfall intensities observed in Dhaka, which range from 98 to 150 mm/h [3], indicating that the developed pervious concrete mix is well-suited for handling intense urban stormwater runoff. This rate suggests that the pavement can efficiently manage stormwater by rapidly allowing water to infiltrate, thereby reducing surface runoff, minimizing flooding risks, and promoting groundwater recharge. Achieving such a rate reflects the effectiveness of the pavement's material composition, construction quality, and subgrade preparation. However, maintaining this performance over time will depend on regular maintenance to prevent clogging from debris and sediment, as these factors can significantly reduce infiltration rates. While the current rate is suitable for handling moderate to heavy rainfall, continuous monitoring is essential to ensure sustained efficiency. Overall, this infiltration rate aligns well with sustainable urban drainage objectives, supporting eco-friendly stormwater management and contributing to the pavement's long-term functional performance.

4. Conclusion

This research demonstrates that Modified Pervious Concrete Pavement (MPCP), incorporating lime mortar and recycled plastic fibers, offers a promising and sustainable solution for urban pavement applications in Bangladesh. The optimized mix design (A5) achieved a favorable balance between compressive strength and porosity, meeting the essential performance criteria for pervious pavements. The high infiltration rate further confirms the system's ability to support efficient stormwater management and mitigate waterlogging—an urgent challenge in many Bangladeshi cities during the rainy season. Moreover, the integration of waste-derived materials contributes to environmental sustainability by reducing dependence on conventional cement and promoting the circular use of plastic waste. The findings suggest that MPCP can serve as an eco-friendly, structurally sound, and practically viable alternative to traditional rigid pavements, helping address local infrastructure and environmental needs. Further large-scale field applications and long-term durability assessments are encouraged to support its wider adoption in Bangladesh's urban landscape.

5. Limitations and Further Research Directions

Although this study demonstrates promising outcomes in terms of the mechanical and permeability performance of Modified Pervious Concrete Pavement (MPCP), several aspects require further investigation to fully establish its field applicability and long-term effectiveness. Future research should explore the optimization of admixture integration techniques during large-scale mixing to ensure consistent material quality. Additionally, comprehensive thermal analysis compared to conventional pavements is needed to evaluate MPCP's ability to contribute to surface temperature regulation under practical conditions. To validate long-term performance, durability tests such as freeze-thaw resistance and abrasion under actual traffic loading should be conducted. This study primarily examined compressive strength as a mechanical indicator; however, additional parameters such as Young's modulus, split-tensile strength, flexural behavior, and stress–strain response should be included in future work for a more comprehensive structural assessment. While the combined use of lime mortar and recycled plastic fibers showed positive effects in this study, the precise quantitative synergy between these components and their long-term durability impacts have not yet been fully established. These aspects should be the focus of future experimental and field-based investigations to support broader implementation of the MPCP system in urban infrastructure.

Abbreviations

MPCP	Modified Pervious Concrete Pavement
PCP	Pervious Concrete Pavement
PET	Polyethylene Terephthalate
LM	Lime Mortar
W/C	Water-to-Cement Ratio
ACI PRC-522	American Concrete Institute Pervious Concrete Provisional Report - 522

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Author Contributions

Muhammad Akhtar Hossain: Funding acquisition, Supervision, Validation, Visualization

Abid Hussain: Conceptualization, Formal Analys, Methodology, Visualization, Writing – original draft, Writing – review & editing

Proton Sarker: Data curation, Investigation, Resources, Software, Visualization

Data Availability Statement

The data available from the corresponding author can be provided for verification purposes. This publication has also included references to the data that support the findings of this investigation.

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and controlled research environment.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography

Muhammad Akhtar Hossain is currently working as a Professor at Rajshahi University of Engineering & Technology, Department of Civil Engineering. He acquired his B.Sc. in Civil Engineering from Rajshahi University of Engineering & Technology in 2001. He has published various research works and conference papers.

Abid Hussain has just completed undergraduate studies in the Civil Engineering Department at Rajshahi University of Engineering & Technology. He will acquire his B.Sc. in Civil Engineering degree from Rajshahi University of Engineering &Technology in 2025.

Proton Sarker has just completed undergraduate studies in the Civil Engineering Department at Rajshahi University of Engineering & Technology. He will acquire his B.Sc. in Civil Engineering degree from Rajshahi University of Engineering & Tech-Technology in 2025.