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Experimental Study on Strength Characteristics of Chicken Mesh Reinforced Paver Blocks

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Abstract- Paver blocks are widely used in pavement construction due to their durability, ease of installation, low maintenance, and aesthetic appearance. However, conventional concrete paver blocks suffer from certain limitations such as low tensile strength, brittle behavior, and susceptibility to cracking under heavy loads and impact forces. These limitations reduce their service life and increase maintenance requirements, especially in areas subjected to repeated traffic loading. In order to overcome these drawbacks, the present study focuses on improving the strength characteristics of paver blocks by incorporating chicken mesh as reinforcement. Chicken mesh is a lightweight, flexible, and economical material made of galvanized steel wires arranged in a hexagonal pattern. It is easily available in the market and can be effectively used as a reinforcing material to enhance the tensile behavior and crack resistance of concrete. In this experimental investigation, concrete paver blocks were prepared using conventional materials such as cement, fine aggregate, coarse aggregate, and water. Chicken mesh was introduced as reinforcement in different percentages, namely 0%, 1%, 2%, and 3%, to study its effect on the mechanical properties of paver blocks. The specimens were cast using standard moulds and cured for different durations of 7 days, 14 days, and 28 days under controlled conditions. The performance of the paver blocks was evaluated by conducting various laboratory tests, including compressive strength test, flexural strength test, and water absorption test. The results obtained from these tests were analyzed and compared to determine the effectiveness of chicken mesh reinforcement. The experimental results indicate that the incorporation of chicken mesh significantly improves the strength and durability of paver blocks. The compressive strength of reinforced paver blocks was found to increase with the addition of chicken mesh up to an optimum level of 2%, beyond which a slight decrease in strength was observed due to improper compaction and increased void formation. Similarly, flexural strength showed a considerable improvement, indicating enhanced resistance to bending and cracking. The water absorption of reinforced paver blocks was also reduced, demonstrating improved density and durability.

Keywords- Paver Blocks, Chicken Mesh Reinforcement, Compressive Strength, Flexural Strength, Water Absorption, Crack Resistance.

I. INTRODUCTION

Paver blocks are widely used in modern construction for developing pavements such as footpaths, parking areas, residential roads, industrial areas, and walkways. These blocks are precast concrete units manufactured in different shapes, sizes, and colors and are laid on the ground in an interlocking pattern. Due to their high strength, durability, ease of maintenance, and aesthetic appearance, paver blocks are increasingly replacing conventional cement concrete and bituminous pavements in many urban and rural infrastructure projects. One of the major advantages of paver blocks is their ease of installation and replacement. Damaged blocks can be removed and replaced without affecting the surrounding pavement, making maintenance economical and efficient. In addition, the interlocking arrangement of paver blocks provides better load distribution, enabling them to withstand vehicular loads effectively. They also offer improved skid resistance, surface finish, and drainage compared to conventional pavement systems.

With rapid urbanization and infrastructure development in India, the demand for durable and cost-effective pavement materials is increasing. Government initiatives such as smart cities, rural development schemes, and urban road networks have accelerated the use of paver blocks due to their practical advantages. However, conventional paver blocks made of plain concrete have certain limitations, such as low tensile strength, brittle behavior, and susceptibility to cracking under heavy loads and impact forces. Concrete is inherently strong in compression but weak in tension. When subjected to bending, impact, or repeated loading, cracks develop easily, leading to structural deterioration and reduced service life. Therefore, improving the tensile strength and crack resistance of paver blocks is essential for enhancing their performance and durability. To overcome these limitations, reinforcement techniques are used in concrete. Traditionally, steel bars, fibers, or synthetic materials are used to improve tensile properties. However, these methods may increase cost and complexity. An economical and effective alternative is the use of chicken mesh reinforcement. Chicken mesh is a thin galvanized steel wire mesh arranged in a hexagonal pattern. It is lightweight, flexible, inexpensive, and easily available in the market. When embedded within concrete, chicken mesh acts as a reinforcing material that helps in controlling cracks, distributing stresses uniformly, and improving the ductility of the paver blocks. It also enhances impact resistance and reduces sudden brittle failure. In this study, an experimental investigation is carried out to evaluate the strength characteristics of paver blocks reinforced with chicken mesh. The performance of reinforced paver blocks is compared with conventional paver blocks by conducting compressive strength, flexural strength, and impact resistance tests. The aim is to develop a stronger, more durable, and cost-effective paver block suitable for practical construction applications.

II. PROPOSED METHODOLOGY

Materials Used:

Table 3.1: Materials Used in Paver Blocks

Sr. No.	Material	Description
1	Cement	OPC 53 Grade
2	Fine Aggregate	River sand passing 4.75 mm sieve
3	Coarse Aggregate	Crushed stone (10 mm size)
4	Chicken Mesh	GI wire mesh reinforcement
5	Water	Clean potable water

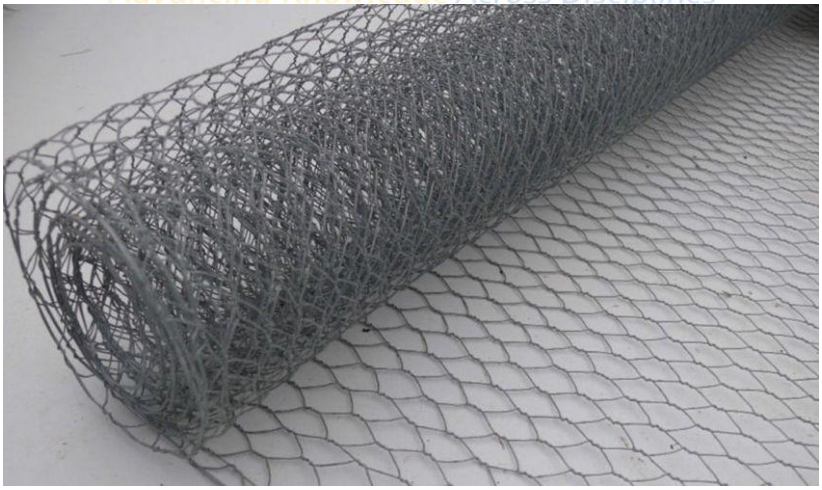

Figure 3.1: Collection of Chicken Mess

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MATERIAL TESTING:

Basic tests are conducted on materials before use.

Table 3.2: Material Testing

Material	Test Conducted
Cement	Consistency, Setting Time
Sand	Sieve Analysis
Aggregate	Crushing Strength
Chicken Mesh	Visual Inspection

Mix Design:

The mix design for paver blocks is prepared based on nominal mix proportions suitable for pavement blocks. In this study, a mix ratio of 1: 1.5: 3 (Cement: Sand: Aggregate) is adopted. Cement is partially replaced by Chicken mess in different percentages.

Table 3.3: Mix Design of Paver Blocks

Mix Type	Chicken Mess (%)	Cement (%)	Mix Ratio (M-20)
M1	0%	100%	1: 1.5: 3
M2	1%	95%	1: 1.5: 3
M3	2%	90%	1: 1.5: 3
M4	3%	85%	1: 1.5: 3
M5	4%	80%	1: 1.5: 3

Methodology:
Steps followed:
1. Collection of materials
2. Mix preparation
3. Placement of chicken mesh
4. Casting of paver blocks
5. Curing
6. Testing

Figure 3.2: Casting of Cubes

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Figure 3.3: Curing of Cubes

Figure 3.4: Compressive Strength Test

Figure 3.5: Water Absorption Test on Paver Blocks

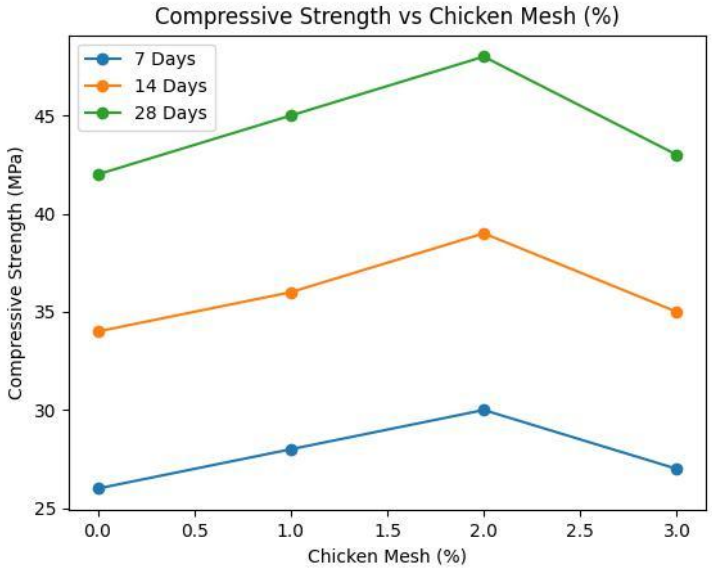
III. RESULTS & DISCUSSION

Compressive Strength Results:

The compressive strength test is one of the most important tests conducted on concrete paver blocks, as it determines their ability to resist compressive loads without failure. In pavement applications, paver blocks are subjected to heavy loads from vehicles and traffic, making compressive strength a critical parameter.

Table 4.1: Compressive Strength Results

Mix Type	Chicken Mesh (%)	7 Days (MPa)	14 Days (MPa)	28 Days (MPa)
M1	0%	26	34	42
M2	1%	28	36	45
M3	2%	30	39	48
M4	3%	27	35	43



Graph 4.1: Compressive Strength Results

Discussion:

- From the above results, it is clearly observed that the compressive strength of paver blocks increases with the addition of chicken mesh up to a certain limit and then decreases beyond that limit.
- At 0% reinforcement (control mix), the paver blocks show normal compressive strength values, which represent the performance of conventional concrete without any reinforcement.
- When 1% chicken mesh is added, there is a noticeable increase in compressive strength at all curing ages. This improvement is due to the ability of the mesh to restrict crack formation and provide additional resistance to internal stresses.
- At 2% chicken mesh, the compressive strength reaches its maximum value. This indicates that the reinforcement is most effective at this level. The mesh helps in distributing the load uniformly throughout the concrete and prevents the development of micro-cracks, thereby increasing strength.
- However, when the percentage is increased to 3%, the compressive strength shows a slight decrease. This reduction can be attributed to:
  1. Difficulty in compaction
  2. Increased voids
  3. Improper bonding between concrete and mesh
- Thus, it is evident that excessive reinforcement negatively affects the performance of concrete.

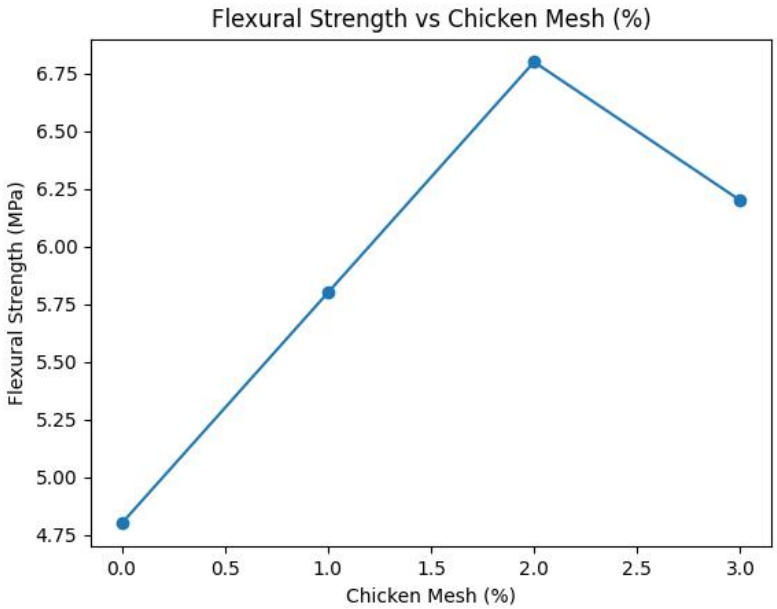
Additionally, it is observed that compressive strength increases with curing time for all mixes. This is due to continuous hydration of cement, which improves bonding and strength over time.

Flexural Strength Results:

Flexural strength is a critical parameter for paver blocks, as they are subjected to bending stresses due to traffic loads. This test evaluates the ability of the block to resist cracking under bending conditions.

Table 4.2: Flexural Strength Results

Mix Type	Chicken Mesh (%)	Flexural Strength (MPa)
M1	0%	4.8
M2	1%	5.8
M3	2%	6.8
M4	3%	6.2



Graph 4.2: Flexural Strength Results

Discussion:

- The flexural strength results clearly indicate that chicken mesh reinforcement significantly improves the bending performance of paver blocks.
- In the case of conventional blocks (0%), the flexural strength is relatively low due to the absence of reinforcement. Concrete being weak in tension tends to crack easily under bending loads.
- With the addition of 1% chicken mesh, the flexural strength increases considerably. This is because the mesh provides resistance against tensile stresses and prevents crack formation.
- At 2% chicken mesh, the flexural strength reaches its maximum value. The mesh effectively bridges cracks and holds the concrete matrix together, thereby improving load carrying capacity and ductility.
- At 3% mesh content, the strength slightly decreases due to congestion of mesh and poor bonding with concrete.
- Thus, the results clearly show that chicken mesh is highly effective in improving flexural strength.

Water Absorption Results:

Water absorption test is conducted to evaluate the durability and permeability of paver blocks. Lower water absorption indicates better resistance to moisture and longer service life.

Table 4.3: Water Absorption Results

Mix Type	Chicken Mesh (%)	Water Absorption (%)
M1	0%	7.0
M2	1%	6.2
M3	2%	5.4
M4	3%	6.5

Discussion:

- From the results, it is observed that water absorption decreases with the addition of chicken mesh up to 2%.
- At 0%, water absorption is highest due to presence of micro-cracks and pores in concrete.
- At 1% and 2%, water absorption decreases significantly because:
  1. Mesh controls cracking
  2. Reduces permeability
  3. Improves density of concrete
- At 3%, water absorption increases slightly due to poor compaction and formation of voids.

CONCLUSION

Based on the experimental investigation carried out on conventional and chicken mesh reinforced paver blocks, a detailed analysis of strength characteristics and durability performance has been conducted. The study focused on evaluating the effect of different percentages of chicken mesh reinforcement (0%, 1%, 2%, and 3%) on compressive strength, flexural strength, and water absorption of paver blocks. From the results obtained and discussions presented in the previous chapter, the following conclusions are drawn: The experimental results clearly indicate that the incorporation of chicken mesh as reinforcement significantly improves the overall performance of concrete paver blocks. The addition of chicken mesh enhances the tensile properties of concrete, which is inherently weak in tension. As a result, the reinforced paver blocks exhibit better resistance to cracking and improved load carrying capacity. It is observed that the compressive strength of paver blocks increases with the addition of chicken mesh up to an optimum level. The maximum compressive strength is achieved at 2% chicken mesh reinforcement, where the strength is higher compared to conventional paver blocks. This improvement is mainly due to the ability of the mesh to restrict micro-cracks and distribute stresses uniformly throughout the concrete matrix. However, beyond this optimum level (at 3%), the compressive strength shows a slight decrease due to improper compaction and increased void formation. Similarly, the flexural strength of paver blocks shows a significant increase with the addition of chicken mesh. The reinforced paver blocks demonstrate better performance under bending loads due to the presence of mesh, which resists tensile stresses and prevents crack propagation. The highest flexural strength is also observed at 2% reinforcement, indicating that this percentage is most effective for improving bending resistance. The water absorption test results reveal that the incorporation of chicken mesh reduces the permeability of paver blocks up to a certain level. The minimum water absorption is observed at 2% chicken mesh, indicating improved density and durability of concrete. Lower water absorption signifies better resistance to moisture penetration, which enhances the life span of paver blocks in practical applications. However, at higher percentages, water absorption slightly increases due to poor compaction and formation of voids.

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