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Experimental Investigation on Paver Block by Using Plastering Sand with Partial Replacement of Fine Aggregate

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Abstract
For the disposal of P-Sand, India has a glut of together reclamation sites and landfill area. It is essential for India to have aapproach for reducing, reusing, and recycling P-Sand. One way to accomplish this is to employ P-Sand in pavement blocks as a partial replacement for fine aggregate, so decreasing C&D waste as well as fine aggregate costs in concrete. For a 0 percent, 20%, 40%, and 80% replacement of C&D waste in fine aggregate, different mix proportions were developed. Paving block compressive strength was measured. The results showed that maximal strength may be attained by replacing fine aggregate with construction and demolition waste fine aggregate in the range of 40% to 60%, saving 3.28 percent in concrete costs. According to the findings, P-Sand can successfully substitute fine aggregate with only a minor increase in strength.
Key words: P-sand, paver blocks, compressive strength, fine aggregate.

1. INTRODUCTION

Concrete paver blockis a porous type of portion made from cement, sand and Aggregate. Block tiling is a popular decorative method for laying down a pavement or hard surface. A flat block of stone or concrete covering an area is known as block paving. The fundamental benefit of paver blocks over other materials is their capability to be removed and changed quickly. Paver blocks are often utilised in places such as pavements, driveways, patios, and road paving.Concrete is a fundamental requirement in the construction industry. The demand for building activities has increased in recent years as a result of strong economic growth, rapid urbanisation, and wealth. As a result, demand for construction raw materials such as cement, sand, and aggregate has soared.

Wastes and by-products from a variety of sectors are being used to create concrete as substitutes or alternative materials. They have gained traction for a variety of reasons, including the disposal of these wastes or land-filling since land is becoming a scarce

resource, making it increasingly expensive to use as a dumping yard. As a result, the current study is an attempt to test the feasibility of manufacturing concrete and solving environmental problems by partially replacing natural river sand with waste material.

It is also stated that only a small amount of construction waste is reused or repurposed, with the remainder being deposited or dumped.

2. OBJECTIVE

- To reduce the impact of waste material on environment.
- It is critical for India to implement a P-Sand reduction, reuse, and recycling policy.
- In recent years there has been an increasing tendency to P-Sand being the most important in terms of volume.
- Compressive and split tensile strength tests were performed on precast paver block elements.
- For the substitution of fine aggregate with P-Sand, several mix proportions were produced for 0%, 40%, 60%, and 80%.

3. MATERIALS USED

a) Cement

OPC 53 grade, depending on the strength of the cement at 28 days; if the strength is greater than 53 grade, the ordinary Portland cement contains no fly ash.

b) Aggregate

The coarse aggregate employed was nominally 20 mm in size, and the specific gravity and the fineness modulus of the coarse aggregate were found to be 2.6 and 2.98 respectively. The water absorption of coarse aggregate is 0.6 percent, and the passing percentage is within the IS: 383:1970 norms.

According to Indian norms, fine aggregate falls inside zone II. Sand has a specific gravity of 2.68. Fine aggregate has a bulk density of 1393.16kg/m^3 in the loose state and 1606.84kg/m^3 in the densest form.

c) Water

Concrete cubes are cured and mixed with potable water. Potable water was used to mix the concrete, as per IS 456-2000 standards.

d) Fine aggregate

Crushed sand is a cubical shape with ground edges that has been washed and graded for use in construction. Manufacturing sand is smaller than 4.75 mm in size.

The M Sand has the specific gravity of 2.66 and the fineness modulus of 2.56, respectively. The passing percentage is within the IS: 383:1970 guidelines.

e) P-Sand

P-Sand collected for the replacement of fine aggregate for the manufacturing of Paver Blocks since it is also low in cost than the normal fine aggregate chips so the cost can be reduced to half.

4. EXPERIMENTAL INVESTIGATION

Table 1:NUMBER OF SPECIMEN
(PAVER BLOCKS)

S.NO	Percentage of P sand	Number of Specimens Casted
1	0%	9
2	20%	9
3	40%	9
4	60%	9

Mixing

IS10262: 2009 is used to create a mix design for concrete of the M25 grade.

Test on paver block

The Compressive strength of Paver block is mentioned below

Table 2:Compressive Strength of Paver block

Percentage of P sand	Average load at 28 days (kN)	Compressive strength at 28 days N/mm^2
0%	633	21.68
20%	657	26.75
40%	593	28.57
60%	557	22.13

Abrasion resistance test

- The paver block was subjected to an abrasion resistance test in line with IS 15658:2006.
- A tile abrasion testing machine is used to determine the specimen's abrasion resistance.

- The abrasion specimen was cut from the entire concrete pavement block.

- This specimen is 7.06 x 7.06 in dimension, with a wear depth of no more than 3.5mm for ordinary use and no more than 2.0mm for heavy traffic, as per IS 15658-2006, with a volume loss of no more than 15cum.per50sq.cm.

- The abrasion test result for concrete pavement blocks was 2.3mm which is less than 3.5mm, indicating that the maximum wearing depth parameters were met.

Table 3: Abrasion resistance testAGE DAYS	Variation of % replacement of P-Sand			
	0	20	40	60
7	2.30	2.32	2.30	2.31
14	2.3	2.30	2.31	2.30
28	2.31	2.32	2.30	2.31

5. CONCLUSION

- P-Sand was used to replace 40 percent to 60 percent of fine aggregate, resulting in higher compressive strength.
- The abrasion was less than 10%, which was within the allowed range.
- P-Sand paver blocks may be used in public gardens and embankment slopes.

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