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# A STUDY ON CONCRETRE BLOCK AND PAVER BLOCK USING WASTE CONSTRUCTION MATERIAL

**[1]Gaurav Parmar, [2]Bhargav Gokani,**
[1] [2] Assistant Professor at
Department of Civil Engineering,
V.V.P. Engineering College, Rajkot, Gujarat, India.

***Abstract:*** This study has been undertaken to investigate compressive strength of precast interlocking paver block made from waste construction material. Construction and demolition (C&D) waste generation and handling issues have been in focus to achieve sustainable goals and this study is one of the attempts how can minimize C&D waste. We have represented sustainable use of waste aggregate and waste brick powder reused in paver block.

***Index Terms*** **– Construction and demolition waste, waste aggregate, waste brick powder, methodology for experimentation.**

## I. INTRODUCTION

In India, there is widely proportion of C&D waste is dumped. Nearly about 12 to 14 million tons per year waste is generated from construction industry. From this total waste brick and concrete waste is about 7 to 8 million tonnes. This waste can be reused in manufacturing of various concrete blocks. Concrete precast paving block is versatile, aesthetically attractive, functional and cost effective and requires little or no maintenance if correctly manufactured and laid. Paver block is solid, unreinforced precast cement concrete paving units. It is used in the surface course of pavements. Interlocking concrete paving block technology has been introduced for specific requirement like footpaths, parking areas, gardens, etc.

In this project, it is presented sustainable use of waste aggregate in concrete and waste brick powder of about 4-6 mm in paver block. In our project, we had decided thickness of paver block as 80 mm having surface area of 312cm². After crushing of the concrete waste, aggregates obtained is used as a replacement of coarse aggregates as partial replacement in concrete. Anh brick which is collected from nearby brick manufacturing site and crushed manually. This powder is used with partially replacing fine aggregate. Paver block of zigzag shape is manufactured in project. Concrete waste is to be collected from the nearby demolished site and crushed manually.

## II. LITERATURE REVIEW

There are some literatures that we have reviewed for reference of our projects. These literatures are about study of concrete blocks and interlocking pavers from waste C&D waste.

1. **Arya S, Ayana J, Sajina S Nazar, Swathy S G, Lekshmy D** presented, the concept of sustainable use of concrete waste in concrete which can be reused in manufacturing of interlocking paver block with copper wire. And concluded 1) Compressive strength increases with the addition of copper wire. Copper wire of 3cm length gave optimum compressive strength of 37.8 N/mm². 2)Paver interlocks with demolished waste along with 3cm copper wire have 26.61% greater compressive strength than conventional paver interlocks.

2. **S. Ashwin, V. Mohanalakshmi, A. Alex Rajesh** presented, casting of concrete cubes and paver blocks by replacing the Ordinary Portland Cement (OPC) with crushed ceramic tile powder of various percentage such as 10%, 20%, 30%, 40%, 50%. And concluded that compressive strength of cubes and paver is improved by replacement of cement with ceramic tile powder while comparing to the conventional specimen. In concrete cubes has been found that 30% replacement of cement by ceramic tile powder is optimum. In paver blocks, it has been found that 40% replacement of cement by ceramic tile powder is optimum.

3. **Mr. Shivkumar Hallale, Mr. Rohit M. Shinde, Ms. Vaishnavi Battul, Ms. Tejashree Gulve** presented casting of interlocking paver blocks by considering suitable materials, size, shape, mix design and by accepting specific casting methodology and by performing tests and concluded 1) partially replaced demolished aggregate paving block has higher compressive strength as comparing to fully replace demolished paving block at both 14& 28 days. 2) Demolished aggregate do not carry much loads after once used in Construction.

4. **Shirgire Anil V, Dr.Ambadkar Swati D** presented use of concrete waste for manufacturing of interlocking paver blocks with coir fibre. In this study, analysis is carried out on property such as compressive strength, splitting tensile strength and water absorption test to develop paver block along with coir fire in different percentage. They concluded 1) Partially replaced (40%) demolished aggregate paving block has higher compressive strength as comparing to fully replace demolished paving block at both 14 & 28 days. 2) The water absorption, tensile strength of paving block increases with percentage of coir fibre. 3) In fully replaced aggregate paving blocks absorb the water about 28.25% more than partially replaced aggregate. 4) A demolished replaced aggregate paving block absorbs more water. Because of coir fibre consumes more water. 5) In compression strength test of paving block of 0.3% coir fibre give optimum result. 6) Water absorption after using demolished aggregates, is below 7% as per IS recommendations.

## III. METHODOLOGY FOR EXPERIMENTATION

### A. Materials

Materials used are cement, fine aggregates, coarse aggregates, demolished concrete waste.

### B. Casting of Concrete block

6 blocks sizes 150mm x 150mm x 150mm were casted. Mix design for M30 grade concrete obtained as 1:1.87:2.28 as per IS 10262:2009.

### C. Casting of Concrete block with demolished concrete waste

6 blocks sizes 150mm x 150mm x 150mm were casted. Mix design for M30 grade concrete obtained as 1:1.87:2.28 as per IS 10262:2009. 40% of coarse aggregate replaced by waste coarse aggregate.

### D. Casting of paver interlocks with waste brick powder

3 paver interlocks were casted with M30 mix. 30% of fine aggregate replaced by waste brick powder.
Size: 80mm thick and surface area of 312cm².

### D. Experimental study

The specimens are tested in the compression testing machine. After the curing period of 3 days for concrete block and 7 days for paver block.
Compressive Strength = P/A
Where, P = Load
A = Surface Area

Fig. 1 Compressive strength test on paver block

TABLE : 1 COMPRESSIVE STRENGTH TEST RESULTS PAVER BLOCK

| Specimen | Load(kN) | Compressive Strenght (N/mm²) | Average Compressive Strenght (N/mm²) |
|---|---|---|---|
| A | 625.6 | 20.05 | 21.04 |
| B | 737.4 | 23.63 | |
| C | 607.2 | 19.46 | |

Obtained compressive strength is taken after 7 days of curing. After 7 days about 65% of strenght is needed of M30 grade minimum strenght (30.41N/mm²).

Strenght that obtained is more then 65%.

Fig.2 Compressive strength test on concrete block

TABLE : 2 COMPRESSIVE STRENGTH TEST RESULTS OF CONVENTIONAL CONCRETE BLOCK

| Specimen | Load(kN) | Compressive Strenght (N/mm²) | Average Compressive Strenght (N/mm²) |
|---|---|---|---|
| A | 230 | 10.22 | 10.86 |
| B | 240 | 10.66 | |
| C | 263 | 11.69 | |

TABLE : 3 COMPRESSIVE STRENGTH TEST RESULTS OF CONCRETE BLOCK WITH 40% OF WASTE COARSE AGGREGATE

| Specimen | Load(kN) | Compressive Strenght (N/mm²) | Average Compressive Strenght (N/mm²) |
|---|---|---|---|
| A | 322 | 14.31 | 13.74 |
| B | 310 | 13.78 | |
| C | 302 | 13.42 | |

## IV. CONCLUSION

1. Obtained compressive strenght of paver block (casted with 30% of fine aggregates are replaced by waste brick powder) is more then 65% after curing of 7 days. So, waste brick powder can be reused in paver block.

2. Obtained compressive strenght of concrete block (casted with 40% of coarse aggregate replaced by aggregates obtained from construction waste) is more than conventional concrete block.

## V. ACKNOWLEGEMENT

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