



Evaluation of properties of paver block using dismantaled concrete for medium traffic

Prashant Udeniyan

prashantudenian35@gmail.com

Lakshmi Narain College of
Technology, Bhopal,
Madhya Pradesh

Abhay Kumar Jha

abhaykumarjha0907@gmail.com

Lakshmi Narain College of
Technology, Bhopal,
Madhya Pradesh

Barun Kumar

yadavbarun28@gmail.com

Lakshmi Narain College of
Technology, Bhopal,
Madhya Pradesh

ABSTRACT

Concrete paver blocks are versatile, attractive, cost-effective and functional, blocks for the construction of pavement, if paver blocks are correctly manufactured and laid then paver blocks, required very less maintenance. In India as per Indian standard paver blocks can be used for roadways. Paver blocks are divided into different traffic categories by Indian standard i.e. very heavy traffic, non-traffic, Light-traffic, medium traffic, and heavy traffic. Wastes of the demolished building are generally used in landfills, these waste contain waste of bricks and concrete. These demolished building wastes which are also known as Demolish Concrete Aggregates are increasing gradually; many engineers are working on these wastes to make it effectively useable. One of the best uses of this waste is to use it as a coarse aggregate in concrete. In this project coarse aggregate is replaced by Demolish Concrete Aggregate which contains wastes of concrete from demolished that is wastes from a beam, column, and slab up to 100% at an interval of 10% in M 40 concrete of paver blocks for medium traffic. Demolish Concrete Aggregate which passes from 10mm IS sieve and retained on 4.75mm IS sieve was used. For this project test like compressive strength and the flexural test was performed on paver blocks and to evaluate the workability of fresh concrete slump cone test was performed. The study indicated that compressive strength, flexural strength, and workability of concrete is required but aggregate enough to be used as paver blocks for medium traffic.

Keywords— Compressive strength, Flexural, Strength, Paver blocks, Workability, Demolish concrete aggregate, Concrete

1. INTRODUCTION

The twenty-first century is known as concrete era. Concrete is the most widely used substance in the world and is second only to water as the most consumed substance on the planet. It is roughly estimated that in 2006 between 21 and 31 billion ton of concrete (containing 2.54 billion tonnes of cement) was consumed globally [1]. Ingredients of conventional concrete are coarse aggregate, fine aggregate, cement and water. Fly

ash, copper slag, washed bottom ash (WBA), quarry dust, quarry fines, foundry sand, construction and demolition waste, spent fire bricks and silica fume can be used as alternatives to the conventional concrete ingredient. Conventional concrete ingredients can be substituted by Demolish Concrete Aggregate as coarse aggregate and quarry fines as fine aggregate.

India is one of the fastest growing economies in the world. To cope up with infrastructural advancement in world India has also started investing in expressway, power projects, metro projects and industrial structures. To meet the requirements of globalization, in the construction sector, a large quantity of concrete is going to utilize. Conventional concrete ingredients have become highly expensive and scare. Scarcity of these resources will affect the construction industry, hence there is a need to find alternatives to conventional material of concrete.

2. PAVER DIMENSION

The first step of paver blocks manufacturing is to decide the dimension of paver blocks, the dimension of the paver blocks is given below:

Shape: I section

Length: 200 mm

Width: 120 mm

Thickness: 80 mm

Aspect ratio (L/T) = $200/100 = 2.0 < 4.0$ as per IS 15658: 2006

All Dimensions are in mm that is 120 mm.



Fig. 1: Paver block

2.1 Plan Area (A_{sp}) (Method 2)

The second method of the determination of the plan area is plan area method 2. In this method, the specimen is placed on cardboard by wearing face facing up and its perimeter is traced with the pencil. The shape of paver blocks is cut accurately with the scissors and weight is taken in N to the nearest 0.0001N and noted as M_{sp}. A rectangle measuring 200mm x 100mm cut out from same cardboard and weighted in N to nearest 0.0001 N and noted as m_{std}. Plan area for the block is calculated from the formula:

$$A_{sp} = \frac{20000 m_{sp}}{m_{std}} mm^2$$

$$M_{sp} = 0.019 \text{ Kg}$$

$$M_{std} = 0.013 \text{ Kg}$$

$$\text{Area (A}_{sp}\text{)} = 29230.769$$

$$= 29231 \text{ mm}^2$$

$$= 0.029m^2 < 0.03 \text{ m}^2 \text{ (as per IS 15658: 2006)}$$

3. EXPERIMENTS AND RESULTS

Table 1: Properties of Demolish Concrete Aggregate

S no.	Test	Recycled Aggregate
1	Water Absorption	4.52%
2	Specific gravity	2.8
3	Crushing value	22.54%
4	Impact value	18.40%
5	Fineness Modulus	2.67

Table 2: Workability of concrete

Mix	Slump (mm)
DCA0	102
DCA1	93
DCA2	84
DCA3	81
DCA4	74
DCA5	71
DCA6	64
DCA7	61
DCA8	60
DCA9	54
DCA10	52

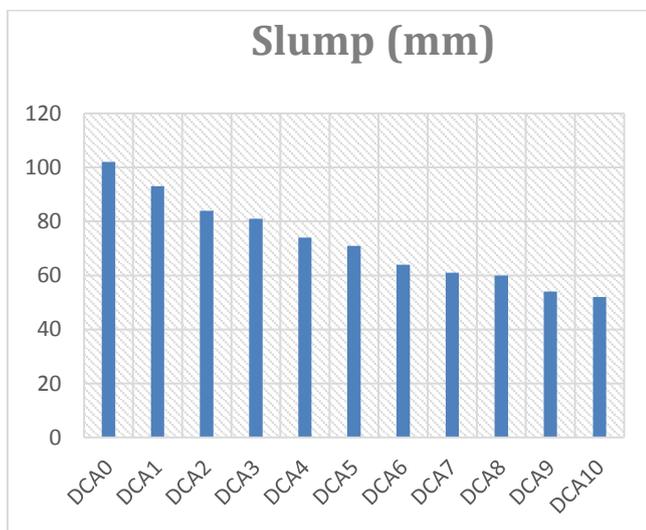


Fig. 2: Workability of Concrete

Table 3: Compressive strength of paver blocks

Mix	Compressive strength (MPa)	
	7 Days	28 Days
DCA0	35.61	49.2
DCA1	34.21	47.65
DCA2	33.66	44.97
DCA3	33.03	44.41
DCA4	32.22	43.43
DCA5	31.96	43.43
DCA6	24.42	42.57
DCA7	23.32	40.73
DCA8	21.73	37.91
DCA9	21.56	37.23
DCA10	19.21	34.42

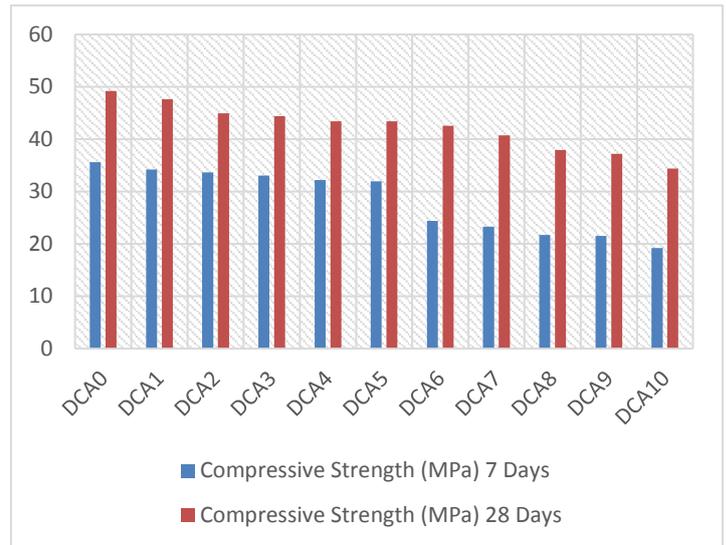


Fig. 3: Compressive strength of paver blocks

4. RESULTS

Compressive strength of paver blocks is evaluated and their result is given in table 2 and figure 1, 2, 3. Paver blocks made up of control mix possess 49.20MPa compressive strength after 28 days of curing and which gives a little decrement goes to 47.65MPa when 10% of the natural aggregate is replaced, decrement continues and goes down to 34.42 when natural aggregate is completely replaced. As per IS 15658: 2006 compressive strength of paver blocks are needed to be corrected and specification says that 100 mm paver blocks should be multiplied by 1.18. Corrected compressive strength of paver blocks is given in table 3 and figure 3.

Concrete when Demolish Concrete Aggregate is replaced natural aggregate. It has been observed that Demolish Concrete Aggregate decreases the workability of the concrete. Slump cone test is performed for workability and concrete which is prepared for workability does not contain admixture. Control concrete mix that is CC mix gives 102 mm slump which decreased to 93 mm when 10% of aggregate is replaced and it goes on decreasing to 52 mm when coarse aggregate is completely replaced by Demolish Concrete Aggregate.

5. CONCLUSION

The current study is all about the determination of properties of paver blocks manufactured with Demolish Concrete Aggregate. Following conclusion is carried out from this research project:

- Compressive strength of the concrete paver blocks goes down or decreased when Demolish Concrete Aggregate is

replacing natural aggregate but from this study, it has been concluded that 100% of the natural aggregate can be replaced by Demolish Concrete Aggregates. As per IS 15658 it is clearly specified that for medium traffic i.e. City streets, small and medium market roads, low volume roads, utility cuts on arterial roads, etc. give compressive strength 40 Mpa of more than 40 MPa and current research clearly shows that when natural aggregate is replaced by Demolish Concrete Aggregate in concrete of paver blocks, it clearly shows that the initial 7 mix gives compressive strength more than 40 MPa but after correction (multiplication of 1.24 in compressive strength as per IS 15658) all mix gives compressive strength of more than 40 MPa, so for paver blocks of medium traffic we can completely replace natural aggregate by coarse aggregates.

- Flexural strength of the paver blocks is also decreased when Demolish Concrete Aggregate is replacing natural aggregates in concrete for paver blocks, as per IS 15658, it is specified that for medium traffic i.e. City streets, small and medium market roads, low volume roads, utility cuts on arterial roads etc. minimum breaking load should be 6 kN after 28 days of curing and we calculate flexural strength with 6 kN load then calculated flexural strength is 2.25 MPa and current study shows that all mixes of Demolish Concrete Aggregate for paver blocks give flexural strength which is more than 2.25 MPa, hence we can say that 100% Demolish Concrete Aggregate is acceptable in concrete of paver blocks for medium traffic.

- Demolish Concrete Aggregate also decreases the workability of concrete which is going to be used for manufacturing of paver blocks but for the concrete mixes of paver blocks admixture can be used to make mix workable.

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