International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 5 Issue 5, July-August 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Evaluation of Demolition Waste Aggregates in Paver Blocks for Medium Traffic

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ABSTRACT

In India, total building waste is projected to be between 12 and 14 million tonnes per year, with concrete and brick trash accounting for 7 to 8 million tonnes. Concrete trash is generated in vast quantities during construction, demolition, and renovation. This trash is either disposed of in a landfill or diverted to one. This concrete waste can be recycled in a high-quality manner. We offer the notion of sustainable use of concrete waste in concrete that can be utilised to make interlocking paver blocks in this study. After crushing, this concrete waste can be used as a total or half replacement for coarse and fine aggregates in paver blocks in two steps, according to IS.

KEYWORDS: *Paver Block, Sustainable, demolished aggregate, fine aggregates, replacement*

How to cite this paper: Deepak Brijpuria | Abhay Kumar Jha | Barun Kumar | Rajesh Kumar Misra "Evaluation of Demolition Waste Aggregates in Paver Blocks for Medium Traffic" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-5, August 2021, pp.2369-2371, URL: www.ijtsrd.com/papers/ijtsrd46338.pdf

IJTSRD46338

INTRODUCTION

Twenty first century is known as concrete era. Concrete is 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. 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 & demolition waste, spent fire bricks and silica fume can be used as alternatives to 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 economy 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 utilized. Conventional concrete ingredients has become highly expensive and scare. Scarcity of these resources will affect construction industry, hence there is need to find alternatives to conventional material of concrete.

Forecast for Construction Materials

New studies from the Freedonia Group, Inc., a Cleveland-based industry market research firm forecasts world demand for cement to grow at a rate of 5.3 percent per year to 3.6 billion metric tons in 2012 and for construction aggregates to grow at a rate of 4.7 percent annually through 2011 to 26.8 billion metric tons. By the end of 2017, worldwide sales of construction aggregates are forecast to expand more than five percent per year to 53 billion metric tons.

Fredonia Group report estimates that the Cement production by plants in India is set to increase at a rate of 8.2 percent per year to 237 million metric tons

in 2012. The forecast for Construction aggregates demand in India is expected to rise at a 7.7 percent annual pace to 1.6 billion metric tons in 2011.

Global demand for construction aggregates is expected to grow 4.7 percent annually through 2011 to 26.8 billion metric tons, valued at $201 billion. Some of the strongest sales increases will be registered in India, already one of the largest national markets, as well as in China. Smaller markets such as Indonesia, Thailand, Iran and developing countries in Asia also will record strong gains, spurred by industrialization and continued growth in infrastructure construction. Growing environmental and land-use concerns will spur above-average sales gains for aggregates composed of recycled materials such as crushed hydraulic and asphaltic concrete and waste materials such as fly ash and blast-furnace slag.

Aggregate Demand in India

Demand for construction aggregates in India amounted to 1.1 billion metric tons in 2006, making the country the third biggest aggregates market in the Asia/Pacific region and fourth largest market in the world (after China, the US and Japan). Sales in India have risen an average of 7.7 percent annually over the past ten years, exceeding both regional and global averages. A rapidly advancing economy and rising standards of living have helped increase overseas investment in India, stimulating large amounts of industrialization and infrastructure-related construction activity. However, Indian product demand (relative to construction spending and on a per capita basis) is substantially below regional and world averages.

The most commonly used product type is crushed stone, making up 40 percent of total 2006 aggregates demand. Gravel accounts for the next largest share of demand, followed by sand and other aggregate materials. Construction aggregates demand in India is expected to rise at a 7.7 percent annual pace to

LITERATURE REVIEW

Research Background

Amiya Das, Radhikesh P. Nanda, Moharana.N.C "Stone crusher dust as a first-rate aggregate in Concrete for paving blocks", replacement satisfactory combination by way of crusher dirt up to 50% by weight has a negligible impact on the discount of any bodily and mechanical residences like compressive energy, flexural energy, cut up tensile power and so on. Water absorption is properly under the restriction as in line with Indian codes. Sturdiness take a look at suggests no variant for one-of-a-type replacements of crusher dirt. There may be a saving of 50% - 56% of money if sand is replaced by crusher dust. The proportion of saving turned into much less however enormously useful for mass manufacturing of paving blocks.

Limbachiya and Leelawat (2000) discovered that Demolish Concrete Aggregate had 7-9% decrease relative density and 2 times the better water absorption than natural aggregate. Agreeing to their check results, it is examined that there has been no hassle with the opportunity of 30% coarse recycled concrete combination used at the ceiling energy of concrete. It also referred to that Demolish Concrete Aggregate may be carried out in high quality concrete mixes with the Demolish Concrete Aggregate content material within the concrete.

METHODOLOGY

General

This is all about methodology adopted for this project, this chapter give detail process of manufacturing of paver blocks which includes material used in project, mix design of concrete, casting and curing of paver blocks.

Paver Dimension

First step of paver blocks manufacturing is to decide the dimension of paver blocks, 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

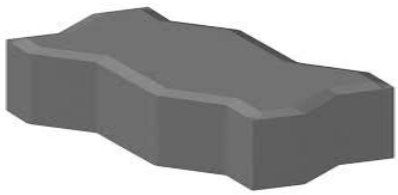

Figure 1: Dimension of Paver Blocks

All Dimensions are in mm

EXPERIMENTS AND RESULTS

Table 8: 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

Correction Factors for Thickness and Arris / Chamfer of Paver Block for Calculation of Compressive Strength

S. No.	Paver Block Thickness (mm)	Correction factor	
		Plain Block	Arrised / Chamfered Block
1.	50	0.96	1.03
2.	60	1.00	1.06
3.	80	1.12	1.18
4.	100	1.18	1.24
5.	120	1.28	1.34

CONCLUSION

1. Compressive strength of the concrete paver blocks is 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 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 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.
2. 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 roadsetc. 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 gives 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.

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