"Experimental Investigation of Green Concrete Paver Block by Partial Replacement of Cement by Fly Ash and Fine Aggregate by Marble Dust"

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Abstract *– Utilization of concrete paver block is considered highly advantageous due to its property and it is used on large scale in our surrounding. The research on recycled construction material helps environmental by reducing the carbon content, depletion of natural resources, these wastes need huge land for disposal leads to the land disposal. Though. Disposal of waste is a necessary issue in recent time. According to the survey, In India, fly ash production was about 226.13 million tons in the year 2019-20 and it is predicted to be around 300-400 million tons by the year 2025* In *this experimental investigation, the process of the development of the concrete for strength aspects in various proportions varying from 20%, 30%, 40% replacement of cement along with fly ash and marble dust with fine aggregate each. We are going to find its impact on compressive strength and identify the optimum percentage of replacement to gain the maximum strength and compare it with the strength of ordinary M30 grade of concrete. In this experimental investigation various test on aggregate cement and fresh concrete is carried out and analyzed. Compressive test is conducted on rectangular brick,the results are analyzed with respect to the IS-code*

Key Words: **Fly-ash, Marble Dust, Concrete paver block,**

1. INTRODUCTION

As per the report of central electricity authority thermal civil design division new Delhi. Report on fly ash generation at coal / lignite based thermal power stations and its utilization in the country for the year 2020 – 21. Stated the following data and graphs. During the Year 2020-21, the maximum utilization of fly ash to the extent of 25.81 % of total fly ash generated was in the Cement sector, followed by 15.59 % in Reclamation of Low-lying area, 15.04 % in Roads & Flyovers,
12.98 % in Bricks & Tiles, 7.94 % in Ash Dyke Raising, 6.20
% in Mine Filling, 0.83 % in Concrete, 0.03 % in Agriculture,
0.03 % in Hydro Power Sector, 7.97 % in Others and 7.59 %remained as unutilized fly ash.

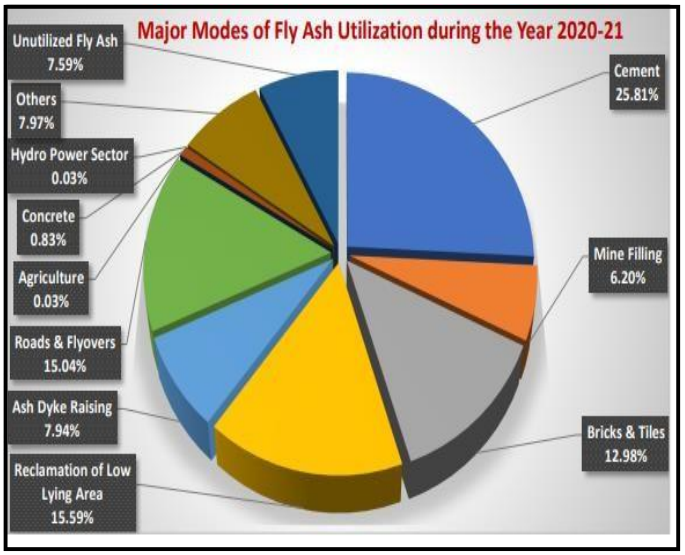
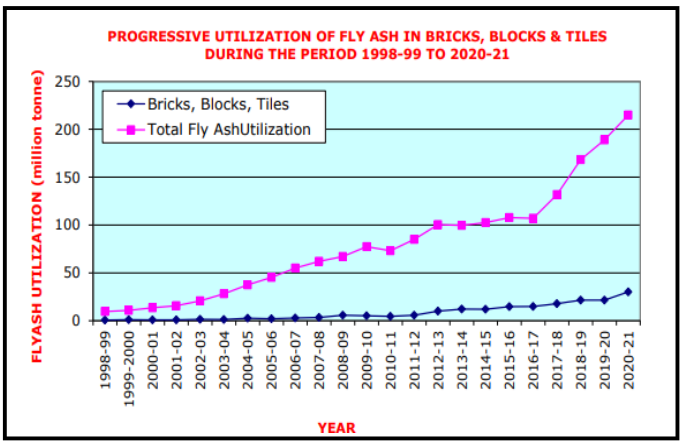


Image -1 Fly ash utilization

In the case of road construction use of paver blocks helps us where rapid construction is needed. By increasing the quality and thickness of block we can use the paver block on heavy traffic road as well. Use of paver block is also beneficial where regular underground repair and maintenance needed.

Fly ash-based Bricks / Blocks / Tiles are as good as clay-based conventional building products. It has great potential of fly ash utilization. A graph showing progressive utilization of fly ash in making of fly ash-based building products for the period from 1998-99 to 2020-21 is given in chart 1



1.1 Grade Designation of paver block

Type A: Blocks are interlock into each other and, by their plan geometry, interlock and resist the relative movement of joints parallel to both the longitudinal and transverse axes ofthe unit.

Type B: Blocks are interlock into each other and, by their plan geometry, interlock and resist the relative movement ofjoints parallel to one axis.

Type C: Blocks do not interlock. Several researchers indicate that the performance of these blocks depends also on the interlocking of the individual units and, to a lesser degree, onthe shape and the thickness of the blocks. Strength of the paver blocks depends on interlocking property , Nature of laying etc.

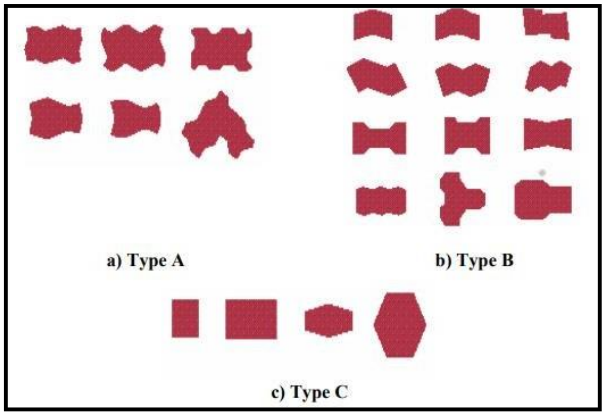


Image -2: Paver Block

1.2 Methodology

A concrete mix was designed to achieve the minimum grade as required by IS 456-2000. The investigation done by the different proportion of marble dust in the concrete mix design.

Sample 1: we take 20 % fly ash and 20 % marble dust.
Sample 2: we take 30% fly ash and 30 %marble dust.
Sample 3: we take 40 % fly ash and 40 % marble dust.
Standard: M 30 grade concrete

Material used: - Cement, Sand, coarse aggregate. fly ash, marble dust.

All the above-mentioned sample is compared with the standard M-30 Grade of concrete and the graph is plotted for the compressive strength of concrete. All the parameter from the IS-code is taken into consideration just to formulate conclusion of this research study.

1.2 Is -Code specifications

Grade: M-30
Traffic category: non-Traffic Recommended thickness: 50mm

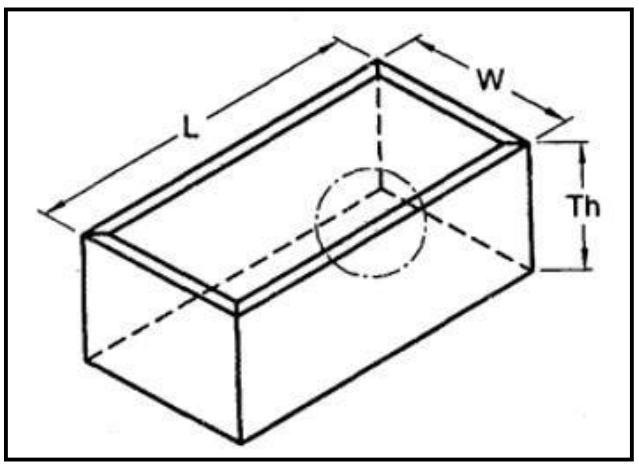
Examples of application: Building premises, monument premises, landscapes, public garden & parks, domestic drives, paths and patios, embankment slopes, sand stabilization area, etc.

The recommended dimensions and tolerances for paver blocks, measured as per the method in Annex B, are given inTable 2. Minimum block thickness shall be 50 mm and maximum 120mm. The thickness 60 mm, 80 mm, 100MMand 120mm will be considered as standard thicknesses under this specification.

The average 28 days compressive strength of paver blocks shall meet the specified requirement. Individual paver blockstrength shall not be less than 85 percent of the specified strength.

The length and width of the specimen (see Image. 2) shall be measured across two opposite faces by using the steel calipers or steel rule.

The thickness of the specimen (see Image. 2) shall be measured at four different positions. The mean value of the thickness of the block shall be noted to the nearest 1mm.



2. Result & Analysis

As per above mentioned methodology all the sample compared with standard M-30 grade of concrete paver, in this study 7days, 14 days, 28 days compressive strength is analyzed and accordingly conclusion is formulated. For this study simple rectangular mould is taken. In this paper 28 days strength comparison chart is mentioned followed with overall graphical

representation of this research analysis.

Table -1: 28 days compressive strength

Period	All the values in KN			
	Standard	Sample 1	Sample 2	Sample 3
28 Days	1031	823	709	515
	1063	930	785	588
	985	941	926	630
Avg (N / mm²)	32.84	28.73	25.81	18.48

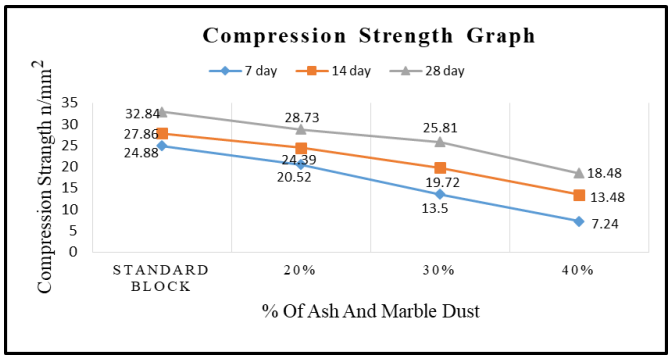


Chart -1: **Compressive Strength**

3. CONCLUSIONS

1. As we plot a graph compressive strength of concrete against % of fly ash and marble dust, we observed that compressive strength is considerably reduced by 50% as wecompare with standard concrete.
2. Addition of 20% fly ash replacing cement content and marble stone replacing Coarse aggregate reduce the strength up to 20%. So on account of this statistic we can use paver in non-traffic area as mentioned is IS code (15658:2006)
3. Addition of these constituent help to produce though constituents help to produce green material through we areconverting waste in recyclable material.
4. The Aggregate Impact Value is 26.67. Therefore, the nature of aggregate impact value is satisfied for surface coarse.

ACKNOWLEDGEMENT

We feel very much delighted in expressing sense of gratitude to our Project guide Prof. S.V Pathare, for his timely help during the study of the project and for their constant encouragement and valuable guidance.

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11] IS 15658:2006 Precast concrete block – specification