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Building Eco-Blocks through the Use of Solid Waste

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Abstract *India is buried under waste stacks as more than 1.50 lakhs of solid waste (MT) per day is produced. Worse, nearly 90% of the total volume is collected (135,000 tonnes daily). Almost 15,000 MT of waste remains exposed each day, which leads to a "severe" amount of contamination of some 55 lakh of MT of solid waste disposed of each year in open surface. Just 20% (27 000 tonnes per day) of the total waste collected and 80% (1 08 000 tonnes per day) was disposed of. The remaining 80% is disposed of on site. Progress in the management of solid waste has resulted in materials that replace conventional materials, including bricks, blocks,tiles, aggregates, ceramics, cement, lime, soil, timber and paint. In this research, Eco blocks are generated using waste materials like fly-ash and waste using aggregates of cement and yard. It optimizes materials with various combinations and defines the compression strength of the eco-blocks. Days of 7.71, 5.8 and 9.10 N/mm2 are compressive strengths of 14 and 28. The strength of ecological blocks is equal to or above that of the local company's regular concrete blocks. The study showed that solid waste can be used for solid block processing. We also analyzed how debris can be recycled to find an alternative to reduce natural resource costs and use.*

Keywords: *Eco Blocks · Solid Waste · Alternative Construction Materials*

I. INTRODUCION

The major construction components of the construction sector are traditionally materials such as clay, sand, steel, gravel, cement, concrete, block, tiles, distemper, paint, timber, and steel. All of these products were made from established natural resources and are characterised by their continuous use to damage the ecosystem. However, various building materials, in particular, are produced during the manufacturing process from calcium carbonate, lime and cement production, high carbon monoxide concentration, sulfure oxides, nitrogen oxides and suspended particulate matter.Exposure to such harmful gases that are released into the atmosphere leads to significant pollution of the air, water, soil, fauna and flora, as well as the marine life. In the construction industry, it is necessary to find practical alternatives for traditional construction materials due to high transport costs of the raw materials, demand and environmental limitations.

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In the last few decades, MSW (Municipal Solid Wastes) generation in India has increased significantly. The population growth of the world is largely a consequence of this. The country generates 1.50 lakh metric tonne (MT) of solid waste every day under garbage sites. India is buried. Worse - the overall quantity of waste collected is about 90% (1.35, 000 MT per day). Every day, almost 15,000 MT of garbage remains exposed and almost 55 lakhs of solid waste is disposed of each year in open spaces, resulting in an "extreme" degree of pollution.Just 20% (27,000 TM per day) of waste collected and the remaining 80% (1.08, 000 TM per day) discarded at sites of waste collection is treated. With energy saving and resource conservation as key, efficient recycling of all these solid waste now demands comprehensive research and development work to explore new applications and optimize the use of existing technologies in sustainable and environmentally sound management. As a result, 15–20 percent of solid waste in different building components is recycled in India by the informal and secondary industries. Advances in waste management have led to the replacement of traditional materials such as bricks, blocks, panels, aggregates, ceramics, cement, lime, soil, wood and paint.This paper uses waste material such as fly ash and debris using cement and course aggregates to create eco-blocks. Solid waste management aimed at reducing the amount of solid waste deposited by recuperating solid waste materials and resources. This in turn leads to less raw material and energy consumption as inputs for technical processes. [1]

II. MATERIALS

2.1 Fly ash: Fly ash is one of the residues produced when coal is combusted. The particle filtration equipment usually collects it. In India's thermal power plant about 140 tonnes of fly ash is generated every year. The actual use of fly ash amounts to only 50 per cent of the amount produced as a binder.

2.2 Cement: Cement is a binder used for building that binds and hardens, binds together with fine aggregates. For the development of Eco Blocks, the OPC available on the market is used.

2.3 Construction Debris: Symbiotic relationships between wrecking companies and materials producers with proper coordination and infras-tructure may occur in rapidly developing metropolitan areas where robust combinations of demolition and new construction projects are undertaken.

2.4 Coarse Aggregate: Current study was performed by coarse com- pounds locally available with a maximum size of 10 mm. Crude aggregates were tested according to IS: 383-1970. The 10mm aggregates were selected first by a sieve of 10mm and then a sieve of 4.75 mm.

2.5 Water: it is the principal component of a concrete weight that binds cement materials to aggregates and helps to hydrate cement, which is the most essential phenomena for strength gain. For mixing and even treating purposes, drinking water that is free of salts and impurities.

III. METHODOLOGY

Concrete Masonry Block architecture is in compliance with IS 2185 (Part 1): 2005 Indian Standard: (Part 1) Blocks of hollow and solid concrete (3rd Revision). The concept of concrete blocks is based in accordance to the specifications of the load bearing of steel, using the superior compression strength of a concrete to create macerated units with resistance. Mechanical vibration compaction of a lean concrete mix, including 1:3:6, 1:5:8, etc., is the basis of the blocks. Well classified concrete mix is used for block casting. Mechanical production of concrete blocks. The composition of materials and the methodology adopted for the production of Eco blocks is presented in table1 and Figure 1 respectively.

Table 1 Material composition used for Eco block manufacture

TYPES	FLYASH	JELLY(GRIT)	CEMENT	DEBRIS
A TYPE	10%	40%	25%	25%
B TYPE	10%	40%	20%	30%
C TYPE	10%	40%	15%	35%

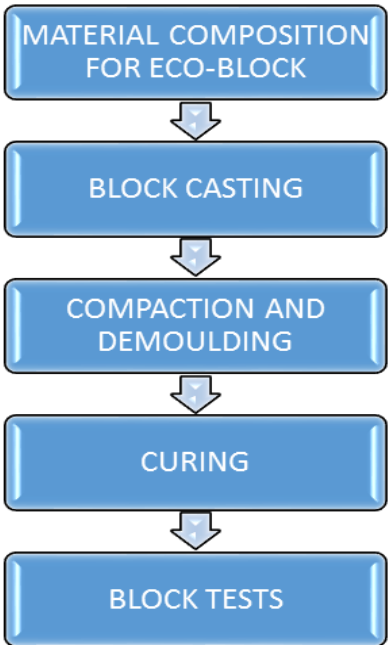

Fig. 1 Flowchart of Methodology adopted in the study

For testing the strength of the developed masonry units according to the specifications for the load bearings of the masonry, the following tests such as compression strength, waters absorption, and the eco blocks density test were done.

IV. RESULTS AND DISCUSSIONS

Different tests for the developed Eco Block were carried out based upon the experimental analysis, and the results are shown in the table and diagrams below.

Table 2 Eco block test results for 7, 14 and 28 days

Sample Type	Water Absorption %			Compressive strength(N/mm^2)			Density(≈1800kg/m^3)		
	7 Days	14 Days	28 Days	7 Days	14 Days	28 Days	7 Days	14 Days	28 Days
A Type	0.8%	1.6%	1.76%	4.7	5.7	6.24	2161	2153	2153
B Type	1.53%	3.53%	3.53%	4.6	4.99	5.72	2189	2236	2236
CType	1.75%	1.24%	1.24%	4.27	4.63	4.99	2249	2287	2287

Table 3 Compression Strength of Eco Blocks Compared to Standard Blocks

Sample Type	Compressive strength(N/mm^2)
APCO Block	4.1
A Type	6.24
BType	5.72
CType	4.99

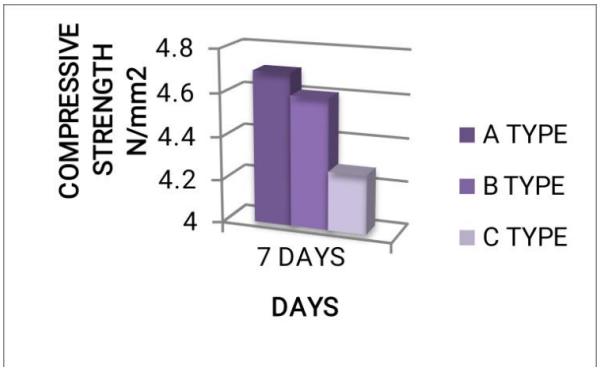

Fig. 2 Graph of Compr essive strength at 7 Days

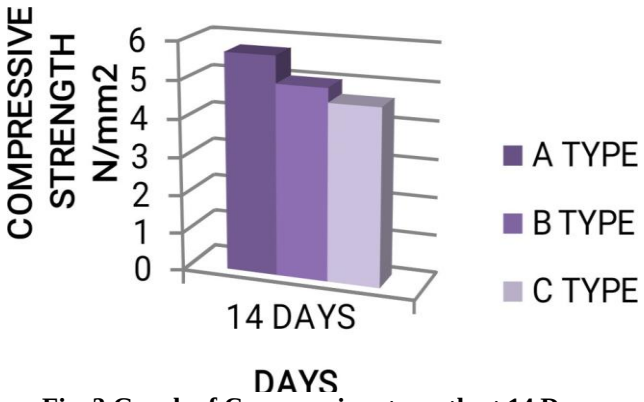

Fig. 3 Graph of Compressive strength at 14 Days

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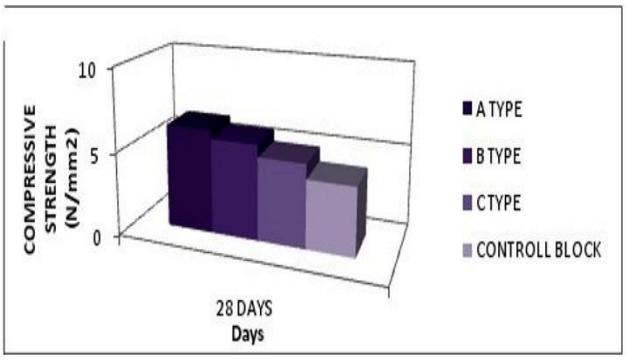

Fig. 4 Graph of Compressive strength at 28 Days

V. CONCLUSION

This study is based on the use of wastes like fly ash and debris and cement and course aggregates in the production of eco-blocks. Optimizing materials with various combinations and evaluating the compressive strength of environmen- tal blocks, the following conclusions have been drawn.

There are 6.24 N/mm2, 5.72 N/mm2 and 4.99 N/mm2 compressive strengths for a type, B type and C Eco blocks and a compressive strength for APCO block is 4.1 N/mm2. Due to hydraulic vibration and a downsize of 10mm aggregate, the high compressive strength could be due to a better interlocking field. Eco blocks have an average compressive strength of 5.65 N/mm2, and Eco block strength is greater than the solid concrete block strength developed by the local company.Building debris can be reused for block development effectively through mass manufacturing, initial produc- tion costs and tests can be minimized. The block costs are less than the strong blocks that the local factories produce. The Eco blocks are therefore considered to be ideal for building purposes.

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