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# Use of by-Products of Solid Waste in Casting of Paver Bricks and Bricks in Civil Engineering

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**ABSTRACT:** The project is focused on using solid waste byproducts in block casting in civil engineering aims to promote sustainability. It should investigate material properties, develop efficient mix designs, assess environmental impact and cost-effectiveness, ensure regulatory compliance, and perform performance testing. Learning from successful case studies is essential for guidance. This study will help determine the feasibility and advantages of incorporating waste by products in construction materials. The utilization of byproducts of solid waste in the casting of blocks and bricks is an innovative and sustainable approach that has gained significant attention in the field of civil engineering.

**KEYWORDS:** solid waste, by products, block casting, sustainability, efficient mix design, cost effectiveness, performance testing, feasibility, innovative, sustainable, significant attention.

## I. INTRODUCTION

The conventional materials which are predominantly used in construction process, such as concrete type bricks, hollow type blocks, solid blocks, pavement type blocks and floor tiles are generated from the already existing naturally available resources. This results in defragmentation of the environment due to vast exploration and which lead to depletion of naturally existing resources. Moreover, different kinds of noxious substances such as high level concentration of carbon monoxide, oxides of sulphur and nitrogen, and suspended particulates are released surplus into the open atmosphere during the operation phase and manufacturing of materials. These emissions creates toxic impact on environment and disturb the functioning phrases of environmental air, natural water resource, extensive soil, large flora species, fauna species and aquatic life, and it reflects on human health along with their living standard. Therefore, various concentrations in the environment may lead to degradation of prevailing atmosphere. To Improve sustainability and environmental conservation and has gained significance in our society in recent years. Due to more improvement in using sustainable, low cost, eco-friendly, lightweight and corpus construction materials in civil works has been emphasized to investigate as the growing needs, to improve the quality of environment and to maintain the materials requirements as per the standard. Our world is facing severe crisis of over population. In recent years different kinds of by-products, generated from various sources such as commercial, household, industries, hospitals, public places, etc. accumulated in very large quantities. Due to which pollution explosion is generated. To rectify this problem of environmental degradation and discharge of large quantities of solid waste in regular manner. The present work discuss about the new innovation preparing bricks/blocks from solid waste and tested against fire and other strength properties. This research paper has been shaped with an idea —utilization of waste to worthl in construction field for casting bricks using various kinds of waste materials.

## II. LITERATURE SURVEY

As a result of urbanization, a large quantity of waste is produced, and disposal of this waste became a big issue. Dumping and land-filling of solid waste causes environmental deterioration such as ground water contamination due to leaching, soil pollution, and human health concerns. In recent years, solid waste utilization has grown in potential to recycle valuable materials while reducing solid waste volume, other pollutants, and disposal costs. Brick/blocks is a widely utilized building material all over the world.

Blocks plays an essential part in the construction sector due to its exceptional qualities like as low cost, high strength, and long durability. Because of the high demand for building materials, particularly in the previous decade as a result of rising population, there is a gap in demand–supply management of these resources. As a result, experts are

working to create and develop sustainable alternative building material options to suit the ever-increasing demand. Lightweight construction materials low-cost and environmentally friendly are becoming increasingly popular in the construction sector has demanded research on ways to do so while still following the standards material criteria.

### III.PROPOSED METHODOLOGY AND DISCUSSION

The utilization of byproducts of solid waste in the casting of blocks and bricks is an innovative and sustainable approach that has gained significant attention in the field of civil engineering. In an era where environmental concerns are paramount, this practice not only helps reduce the burden of waste disposal but also contribution to the creation of eco-friendly construction materials.

- Dimensions of the block: 150\*150\*150 mm
- Proportion for the casting of blocks: 1:1.5:3  
(cement:fine aggregate:coarse aggregate)

Where 20% of fine aggregate can be replaced with solid waste as per requirement)

- Cement Grade : OPC 53
- Concrete Grade: M30.

#### Preparation of Blocks:

We have replaced the traditional paver blocks casting method by adding different percentage of dry waste such as 05%, 10%, 15%, 20%. The standard proportion to make the paver block is 1:3:5, which means 5 parts of aggregate, 3 parts of sand, and 1 part of cement. The ratio varies as we add by products at different percentages of aggregates. This proportion of all raw materials is mixed well with the water for few minutes in the pan mixer. In the compacting stage, raw material is filled into the mold with the help of a feeder and converted into a block by receiving pressure from the machine. In this process, high vibration is also given to the mold to fill the material well. Then afterward its kept for drying for 24 hours. Its kept for curing for 7 days, then compression test is done at various days 7 days, 14 days, and 28 days.

The process involves mainly 6 stages-

- Proportioning/Batching
- Mixing
- Compacting
- Drying
- Curing



Types of paver blocks.



**Comparison between normal blocks and solid waste block**

Properties	Normal block	Solid waste block(dry waste)
Composition	Normal or conventional blocks are typically made from materials like concrete, clay, or cement. These materials are sourced and processed for the purpose of block production.	Solid waste blocks, on the other hand, are manufactured using recycled or waste materials. Common constituents include industrial waste, construction debris, plastic, and other discarded materials.
Production process	The production of normal blocks involves extracting raw materials, processing them, and shaping them into blocks through techniques like moulding and curing. This process often consumes energy and resources.	Solid waste blocks promote sustainability by repurposing waste materials. They are created through processes like compaction, compression, or extrusion, which require less energy and raw material extraction.
Environmental impact	Manufacturing normal blocks typically has a higher environmental footprint due to the energy-intensive production process and the use of finite raw materials. It may contribute to resource depletion and increased carbon emissions.	Solid waste blocks are more eco-friendly as they help reduce landfill waste and cut down on the consumption of new resources. They can contribute to waste reduction and a lower carbon footprint.
Strength and durability	These blocks are designed to meet specific structural requirements and are often known for their strength and durability.	While solid waste blocks can be engineered to meet certain strength standards, their properties may vary depending on the types and proportions of waste materials used.
Cost	The cost of normal blocks can vary based on the materials and manufacturing process. They may be more expensive in some cases due to the use of quality raw materials.	Solid waste blocks can be cost-effective, especially if waste materials are readily available, making them an attractive option for environmentally conscious construction projects.

Specimen Testing:

- Compression Strength test
- Water absorption test:

**IV. RESULT**

COMPRESSION TEST FOR PAVER BLOCKS (N/mm <sup>2</sup> )					
SIZE OF TEST BLOCKS 150X150X150mm					
Sr.no	Batch	% Of Waste Used	07 Days	14 Days	28 Days
1	A1	0	20.09	27.56	30.09
			20.89	26.89	30.57
			19.89	26.99	29.98
			18.99	27.01	29.8
		<b>Overall Average</b>	<b>19.96</b>	<b>27.11</b>	<b>30.11</b>
2	A2	5	19.68	26.95	30.02
			18.25	26.09	29.08
			19.47	27	29.99
			20.01	26.78	29.08
		<b>Overall Average</b>	<b>19.35</b>	<b>26.7</b>	<b>29.54</b>
3	A3	10	19.09	27.01	29.56



			19.05	26.55	29.01
			19.95	26.03	29.09
			20.03	25.56	29.76
	<b>Overall Average</b>		<b>19.53</b>	<b>26.28</b>	<b>29.35</b>
4	A4	15	18.84	24.98	29.02
			19.99	25.03	28.36
			19.05	24.56	28.21
			19.56	25.09	27.3
	<b>Overall Average</b>		<b>19.36</b>	<b>24.91</b>	<b>28.22</b>
5	A5	20	18.57	24.08	28.97
			17.56	23.56	27.55
			17.73	23.99	26.05
			16.99	25.88	25.03
	<b>Overall Average</b>		<b>17.15</b>	<b>24.37</b>	<b>26.9</b>

### V.CONCLUSION

We in this project have replaced the traditional paver blocks casting method by adding different percentage of dry waste such as 05%, 10%, 15%, 20%. After casting compression test was carried out on the casted blocks. Taking results into consideration we can use upto 10 to 15 % of dry waste in casting of the paver blocks. As using 10 to 15 % dry waste we can get the adequate amount of the compression strength.

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