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DEVELOPMENT OF BUILDING BLOCKS BY WASTE RECYCLING MATERIALS

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Abstract - *The rapid development of industrialization and urbanization, the building industry generates a large amount of construction waste, Construction, and demolition waste are usually found whenever any construction or demolition activity takes place such as the construction of bridges, flyovers, roads, etc. Recycling such wastes by incorporating them into building materials is a practical solution to the pollution problem. The use of construction waste as a subgrade backfill material is an auspicious approach to solving the issues of the rapidly increasing amount of construction waste and the shortage of construction materials creates the demand for replacement in concrete materials. The present work has been done to explore the prospect of the full replacement of cement for building block manufacturing with construction waste. Construction waste such as bricks, concrete, and demolition waste exclude scrap wastes (steel, wood, glass, and plastic). Experiments are carried out to assess the compressive strength, water absorption, and durability of the constructed building blocks. The outcomes are compared to traditional building blocks to determine their viability for construction applications. The results show that including crushed brick waste in the sand mixture significantly improved the building block performance, especially under wetting-drying cycles and sulphate attacks. After producing recycled building blocks using construction & demolition waste, field implementation aids in investigating how innovation, sustainability, and prudent resource management can harmoniously converge, paving the way for a robust and environmentally conscious construction industry.*

Key Words: *Construction & Demolition waste, Recycling, building blocks, Replacement, Durability, Cost-efficient, Implementation*

1. INTRODUCTION

As the world is increasing development of buildings poses both opportunities and challenges. While it contributes to economic growth, urbanization, and improved living standards, it also brings various issues that need to be addressed. In this field implementation plan, we'll show you how to incorporate recycled concrete waste like concrete waste, mortar waste and brick waste into construction projects, promoting sustainability, conserving resources, and building responsibly. In today's world, where environmental issues are on the rise and there's a push for more sustainable construction, using recycled concrete to create new building materials is a game-changer that could revolutionize the construction industry. Construction and demolition waste, including mortar waste and concrete waste, is a significant environmental concern. Construction and demolition debris usually consists of bridges, overpasses, roads, etc. It is seen when there is construction or demolition activities. Sand, gravel, concrete, metal, plastic, glass, etc. It is made of inert and non-biodegradable materials. Demolition waste is heavy, dense and takes up a lot of space and space. Improper handling and disposal of these wastes can contribute to pollution, resource depletion, and negative impacts on human health. So, what if try recycling these wastes, recycling such wastes by incorporating them into building materials is a practical solution to the pollution problem. The present work has been done to explore the prospect of the fully replacement of cement for building block manufacturing with construction waste. Construction waste such as bricks, concrete, and demolition waste exclude scrap wastes (steel, wood, glass, and plastic). Experiments are carried out to assess the compressive strength, water absorption, thermal conductivity, and durability of the constructed building blocks. The outcomes are compared to traditional building blocks to determine their viability for construction applications. After producing recycled blocks, the process of field implementation is initiated with typical works like planning and preparation, material handling and incorporation, quality assurance and monitoring, environmental considerations, safety and community engagement, and project completion.

1.1 *Advantages of Innovative Bricks/Construction and Demolition Waste Building Blocks:*

1. By recycling construction and demolition waste into building blocks, we reduce the landfills, easing the pressure on waste management systems and supporting a more sustainable waste disposal

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approach.
2.Converting construction and demolition waste into building blocks reduces trash output in the construction industry. This waste reduction leads to a circular economy model, in which resources are reused and recycled indefinitely, resulting in more efficient resource utilization.

3. We lessen the demand for virgin resources as red soil by using recycled construction and demolition debris as raw materials for building blocks. This protects natural resources and ecosystems that may otherwise be harmed by resource extraction.
4.By recycling construction and demolition waste into building blocks, we reduce the landfills, easing the pressure on waste management systems and supporting a more sustainable waste disposal approach.
5. *Converting construction and demolition waste into building blocks reduces trash output in the construction industry. This waste reduction leads to a circular economy model, in which resources are reused and recycled indefinitely, resulting in more efficient resource utilization.*

1.2 *Applications of C&D Waste Building Blocks:*

Using construction and demolition waste to create building blocks has various advantages, including reduced waste, resource conservation, and promotion of sustainable building practices. Here are some specific uses for recycled building blocks:

1. Blocks of construction and demolition waste can be used to build partition walls as well as retaining walls
2. *Blocks of construction and demolition waste can be used to build partition walls as well as retaining walls.*
3. *Blocks of waste from construction and demolition projects can be used to construct affordable housing, particularly in resource-constrained developing nations. They are a viable option for giving housing to underprivileged communities because of their affordability.*
4. *These bricks will be more useful and effective for urban areas as well as rural community areas.*
5. *Utilizing recycled building materials can assist in achieving sustainability objectives in green building projects. Through energy efficiency, waste reduction, and the use of environmentally friendly materials, green buildings seek to reduce their negative effects on the environment.*

1.3 *SCOPE OF PROJECT*

1. *Collection of Construction Waste: Collecting the CD waste from sources like municipality office and other demolition and renovation process occurring places, Sorting and screening process helps to analyze the different type of waste like mortar waste, brick waste and concrete waste.*
2. *Development of CD Waste brick: Using Natural binders like limestone powder, fly ash which helps to bind with the construction waste to develop the brick*
3. *Testing: Several tests should be conducted for bricks in lab as well as field. Some of the major tests are compressive strength test, water absorption test, acid penetration test.*

2.OBJECTIVE & METHODOLOGY

2.1 OBJECTIVE:

1. *Converting C&D waste into useful building materials can decrease their disposal in dumping sites. Incorporating this measure will alleviate the pressure on waste management systems and facilitate the growth of a circular economy.*
2. *Recycled building blocks are frequently produced at a lower cost than new materials, they can be economical. For construction projects, this may lower overall costs.*
3. *Construction can be completed more quickly using recycled building blocks because of their uniform size and portability. This may result in faster construction times and cheaper labor.*
4. *Making various tests on field and ensure that recycled building blocks meet or exceed industry standards for strength, durability, and safety, providing reliable construction materials.*
5. *Implementation in the field yields insightful feedback. The original plan or strategy can be modified, improved, or altered using these insights, which will ultimately produce better results*.

2.2 Methodology

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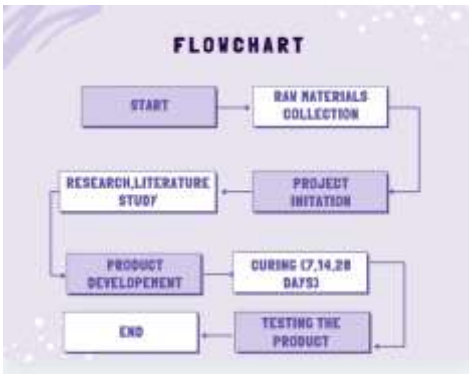


2.3 Literature Study

Recycling Concrete Materials: Review studies on crushing, screening, and quality assurance techniques used in the recycling of concrete materials.

Recycled Concrete Aggregates (RCA): Examine studies on the qualities and traits of recycled concrete aggregates, such as their strength, tensile stability, and suitability for a range of construction uses. Examine studies on developing standards and guidelines for using RCA and optimizing its use in concrete mixes.

Sustainability and Environmental Impact: Examine whether using recycled concrete in construction projects is environmentally and economically sustainable. Life cycle analysis (LCA) contrasting recycled concrete with conventional building materials.

3.RESULT

3.1 Compressive Strength Analysis:

The main purpose of a compressive strength test is to determine the maximum load a material can withstand per unit area before it fails in compression. It provides valuable information about the material's load capacity, durability and suitability for various structural applications.

Compressive strength test results are expressed in pressure units such as pounds per square inch (psi) or megapascals (MPa). The compressive strength is calculated by dividing the maximum load caused by failure by the cross-sectional area of the specimen.

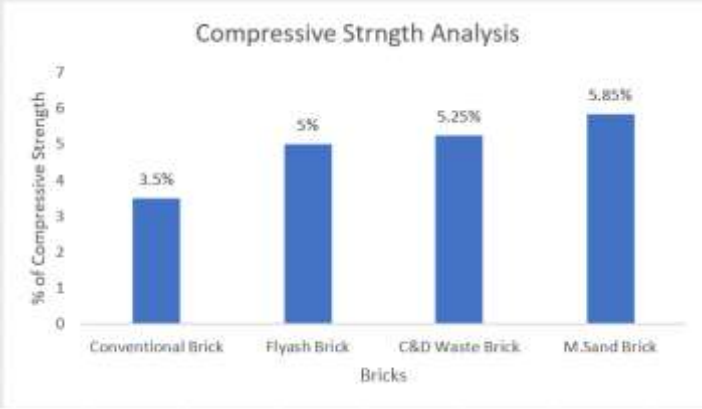
Table 1 Compressive Strength for Different Mix ratio of C&D Waste

CONCRETE WASTE	Compressive strength(N/mm²)		
Mix Ratio	Sample 1	Sample 2	Sample 3
(1:2)-C&D waste +cement	3	3.7	3.35
(1:3)-C&D+cement	3.6	3.8	3.70

Table 2 Compressive Strength for Different Mix ratio of M. Sand

M.SAND	Compressive strength(N/mm²)		
Mix	Sample 1	Sample 2	Average
(1:2)- M. Sand +cement	2.8	2.92	2.86
(1:3)-M. Sand+cement	3.23	3.1	3.16

Figure 1: *Compressive Strength Analysis:*



3.2 Water Absorption Test

Water absorption tests determine the durability properties of blocks, such as degree of burning, block quality, and behavior in weather conditions. The degree of density of bricks is obtained by a water absorption test, because water is absorbed into the pores of the brick. Water absorption, mass percentage, after 24 hours of immersion in cold water according to the formula. As the pores increase, the water absorption of the blocks increases.

Table 3 Water Absorption for Different Mix ratio of C&D Waste

C&D WASTE	**Water absorption (%)**

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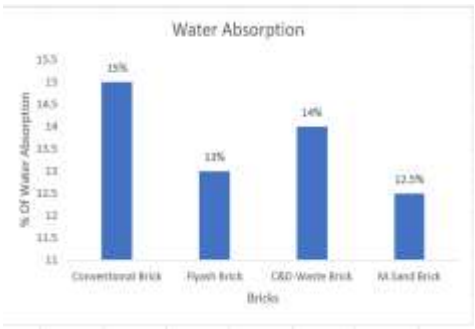
MIX	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVERAGE
(1:2)-C&D waste +cement	18.69	18.48	18.72	18.63
(1:3) C&D+cement	20.08	20.28	19.19	19.85

Table 4 Water Absorption for Different Mix ratio of Sand

M Sand			Water absorption (%)	
MIX	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVERAGE
(1:2)-M. Sand+ cement	14.10	14.48	14.38	14.32
(1:3)-M. Sand+cement	14.9	12.5	12.8	13.4

Figure 2: **Water Absorption**



The result clearly shows that the amount of water absorption is comparatively lesser than the fly ash brick and conventional brick which helps in durability of the brick. The water absorption of C&D waste (Brick waste) is 14%, due to the soil present in the brick waste is higher compared to other waste bricks (concrete waste) but, the water absorption level in concrete waste brick is 12.5% and combined waste brick is 13% which has low content of soil, so the porous present in concrete waste brick, sand brick is decreased. This is the reason; the water absorption level is lesser compared to other bricks.

3.Conclusions

This report concludes that the development and field implementation of recycled brick developed by Construction and demolition waste. This brick is developed keeping in mind all the necessary Indian standard codes, all the necessary test is conducted to analyze and improve the quality of recycled brick. The test results include the strength of the brick and water absorption of the brick. The comparison is made between the best three types of bricks (Brick waste brick, Concrete waste brick, and Combined brick & concrete waste brick) with conventional and fly ash brick to find out which brick is more efficient in all ways. Construction might have a large positive environmental impact if new construction works like retaining walls, partition walls, load load-carrying areas are made of C&D waste bricks. Based on the suggested ideas and literature studies, C&D waste bricks can be made with recycled concrete aggregates with a mixture of natural aggregates, lowering the demand for new resources and the accompanying environmental effects of waste disposal. By making it more durable and less cracking, recycled concrete aggregates can help enhance brick's sustainability. Making of C&D Waste brick, a practical substitute for conventional brick and fly ash bricks, with continuing research and development. We can help to speed the field application of newly developed bricks made from recycled concrete aggregates and realize the environmental benefits that they provide by following these recommendations. The utilization of recycled concrete aggregates has several environmental and economic advantages. It can aid in the conservation of natural resources by not extraction red soil, the reduction of landfill waste, and the reduction of greenhouse gas emissions ($C0_2$) which is produced in brick kilns. These C&D Waste bricks can also be less expensive than the other bricks.

Overall, the development of this type of C&D brick is a sustainable and cost-effective material with the ability to lessen construction's environmental impact.

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