DEVELOPING A MASONRY BLOCK BY USING GLASS WASTE AS AN ALTERNATIVE MATERIAL

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The global concern of solid waste management has led to an urgent need for innovative solutions. Among these challenges is the substantial presence of post-consumer glass waste in solid waste streams, causing environmental issues and posing recycling dilemmas. The accumulation of glass waste exacerbates environmental problems, necessitating effective strategies for waste reduction and resource conservation. An intriguing avenue to address waste management challenges while conserving natural resources is the incorporation of waste glass as a substitute for fine aggregate in masonry blocks. To investigate the viability of this solution, a comprehensive experimental study was undertaken. The study primarily focused on utilising industrial waste glass as a replacement for fine aggregate in masonry block production. The experimental setup encompassed an array of tests, including the evaluation of compressive strength, water absorption, moisture content, spray erosion resistance, and the determination of dry, wet, and bulk densities of the masonry blocks. Four distinct concrete mix designs were formulated, with varying proportions of M/sand being replaced by a combination of glass waste and quarry dust. The results revealed that the mix design substituting 25% of M/sand with glass waste exhibited remarkable performance across multiple parameters. This particular mix design demonstrated enhanced compressive strength, improved water absorption characteristics, optimal moisture content levels, and excellent spray erosion resistance. Notably, the performance of this mix surpassed that of the controlled mix, emphasising the potential of waste glass as a sustainable alternative in masonry block production. Additionally, panel testing was conducted to assess the structural integrity of the masonry blocks with the highest compressive strength mix design. This testing confirmed the exceptional performance of the mix designs, showcasing results that exceeded the requirements stipulated in relevant codes.

In conclusion, the incorporation of waste glass as a substitute for fine aggregate in masonry blocks presents a promising avenue for sustainable waste management and resource conservation. The findings from this comprehensive study underscore the viability of this approach, emphasising the potential to mitigate waste accumulation while enhancing the performance of masonry block structures.

Keywords: Waste glass, Masonry blocks, Sustainable construction, Compressive strength, Durability

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AIM & OBJECTIVES

AIM

The aim of this study is to develop the concept of Masonry unit technology with the required durability and strength standards by using glass waste as a potential replacement for aggregates used in common concrete masonry units to provide a highly sustainable building walling material for the future of construction

OBJECTIVES

- Propose suitable mix designs for Masonry blocks with glass waste as an alternative material
- Determine the Compressive Strength for the different mix designs
- Determine the Water absorption and the durability characteristics of the material
- Assess the compressive performance of wall panels

METHODOLOGY

- Collection of the literature and understanding the concepts that followed in similar experiments.
- Gather the resources which are needed for the experimental process such as cement, aggregates, mixing equipment and glass waste by contacting glass company.
- Understand how the experiment should be carried out
- Create masonry blocks by using available resources and conducting the required testing
- Compare the results and arrive at conclusions

TESTING	STANDARDS FOLLOWED
Crushing Strength of Masonry Block	SLS 855
Water Absorption and Moisture Content	SLS 855
Spray Erosion Test	SLS 1382-Part_02
Dimensions of the Block	SLS 855
Service, Dry and Wet Density	ASTM C140
Determination of Compressive Strength of wall panel	BS EN 1052-1: 1999-Part 1

Mix Designs

Materials	Base	M.D.01	M.D.02	M.D.03	M.D.04
Cement (Kg)	50.00	50.00	50.00	50.00	50.00
Glass (Kg)	0.00	47.50	95.00	157.50	220.00
M/Sand (Kg)	190.00	142.50	95.00	95.00	95.00
Quarry Dust (Kg)	250.00	250.00	250.00	187.50	125.00
(10-05)mm Metal (Kg)	125.00	125.00	125.00	125.00	125.00
Water (Kg)	25.00	25.00	25.00	25.00	25.00

Results