NOTIFICATION NO.: 592/2025

NOTIFICATION DATE: 31.12.2025

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Keywords: Municipal Solid Waste (MSW), Fly Ash, Compressive Strength Test, Water Absorption, Efflorescence, Hydraulic Diffusivity

TOPIC: OF RESEARCH: STUDY ON VIABILITY OF MUNICIPAL SOLID WASTE AS BUILDING MATERIAL

FINDINGS

India, a developing nation, accounts for 17.75% of the global population while occupying only 2.4% of the world's land area. The rapid pace of industrialization and urbanization has driven large-scale migration from rural to urban areas, significantly increasing the generation of municipal solid waste (MSW), which amounts to thousands of tons daily. Urban solid waste management systems, however, have not received adequate attention, leading to widespread accumulation of unmanaged waste across cities. Many longstanding landfill sites in India have surpassed their capacity, resulting in towering waste heaps resembling hills.

This study investigates the feasibility of utilizing municipal solid waste (MSW) as a partial substitute for natural sand in manufacturing waste-based bricks and as a primary material in brick production. The issue is particularly acute in metropolitan areas like New Delhi, where the Okhla landfill in South Delhi exemplifies the crisis. This site became oversaturated, leading to the cessation of operations in 2018.

For this research, approximately 500 kilograms of waste samples were collected from various locations within the Okhla landfill site at a depth of 15-16 meters. Following excavation, the samples were partially air-dried onsite for 7-8 days. The Quartering method was employed for sampling, and compositional analysis was conducted in the laboratory to determine the proportions of constituent materials. Proximate analysis provided insights. into key components of the decomposed waste, such as moisture content, organic matter, and residual ash. Additionally, the dried samples underwent detailed elemental composition analysis using various techniques to further understand their properties.

This study highlights the potential for recycling MSW into sustainable construction materials, addressing both waste management challenges and resource scarcity in India. The physio-chemical characterization of municipal solid waste (MSW) revealed in suitability as a partial replacement for natural sand in fly ash brick manufacturing. First aggregates were substituted with MSW at proportions of 10%, 20%, and 30%. Compressive strength test, water

absorption, efflorescence, and hydraulic diffusivity, were conducted on waste-based fly ash bricks, and the results were systematically analysed. The mechanical performance of these bricks, particularly in terms of compressive strength demonstrated promising outcomes. Notably, the compressive strength increased up to an optimal replacement level of 10% MSW, indicating its potential as a sustainable construction material.

The incorporation of municipal solid waste (MSW) into waste-based fly ash bricks other brick types aligns with the principles of a circular economy. This approach facilitates the recycling of MSW, minimizes the reliance on conventional raw materials, reengineers materials to be less resource-intensive, and repurposes waste as a valuable resource manufacturing innovative construction materials like waste-based fly ash bricks. Additionally, this practice contributes to reducing construction costs, mitigating environmental pollution, and significantly lowering health risks for both human and animal populations in affected areas.