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EXPERIMENTAL STUDY ON STRENGTH OF THE CONCRETE BY PARTIAL REPLACEMENT OF FINE AGGREGATE BY USING WASTE GLASS POWDER

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ABSTRACT

Concrete is a fundamental construction material composed of cement, fine aggregate, coarse aggregate, and water. The high demand for concrete has led to the rapid depletion of natural resources, particularly fine aggregates like sand, resulting in significant environmental concerns and sustainability issues. The extraction of natural sand has adverse ecological impacts, including riverbed degradation, habitat destruction, and increased carbon footprint from transportation and processing. Consequently, there is a growing need to find alternative materials that can partially or fully replace natural fine aggregates and cement to mitigate these problems.

This study investigates the use of waste glass powder (WGP) as a partial replacement for cement in concrete. Various concrete mixes, including a control mix and five experimental mixes with different proportions of WGP, were evaluated for their mechanical properties and durability. Compressive strength, split tensile strength, flexural strength, water absorption, and pulse velocity tests were conducted at various curing days to determine the optimal proportion of WGP. The results indicate that incorporating WGP enhances the mechanical properties and durability of concrete up to an optimal replacement level. Mix 2, with the specific proportion of WGP, exhibited the highest strengths and improved durability, demonstrating the potential of WGP as a sustainable alternative in concrete production. The study concludes that while WGP can significantly enhance concrete properties, the replacement proportion must be carefully controlled to achieve optimal performance and sustainability.

KEYWORDS: *Concrete, Fine Aggregate, Depletion, Waste Glass Powder (WGP), Partial Replacement, Compressive Strength, Split Tensile Strength, Flexural Strength, Water Absorption, Pulse Velocity, Sustainable Construction, Environmental Impact, Cement Replacement, Mechanical Properties, Durability*

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