

ABSTRACT

This research investigates the influence of recycled electronic waste (e-waste), specifically printed circuit board (PCB) waste, and silica fume on the mechanical properties of concrete. The study aims to assess the feasibility of using PCB waste as a partial replacement for fine aggregate at varying levels of 4%, 6%, and 8% by weight, with silica fume incorporated as a supplementary cementitious material to enhance performance. Concrete specimens in the form of cubes and cylinders were cast and tested for compressive and split tensile strength, respectively. The results indicated that the inclusion of PCB waste up to 4% maintained satisfactory strength characteristics, with minor reductions observed at 6%, and significant strength loss at 8%. The addition of silica fume improved the concrete's microstructure, increased matrix density, and compensated for the performance reduction caused by the non-reactive nature of e-waste. This study demonstrates the potential of integrating recycled PCB waste and silica fume into concrete as a sustainable alternative, particularly for non-structural and low-load-bearing applications. It also highlights the environmental benefits of utilizing hazardous e-waste materials in construction, reducing landfill pressure, and conserving natural resources.

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