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Experimental study on Strength Characteristics of Concrete by Partial Replacement of Cement with Silica Fume and Fine Aggregate with Quarry Dust

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Abstract: *This research investigates the strength characteristics of M30 grade concrete incorporating silica fume and quarry dust as partial replacements for cement and fine aggregate respectively. The study examines various replacement levels to determine optimal combinations that enhance mechanical properties while promoting sustainable construction practices The experimental investigation revealed that a combination of 10% silica fume and 30% quarry dust yielded optimal strength characteristics, achieving compressive strengths exceeding the control mix by approximately 12-15%. The incorporation of silica fume significantly improved the microstructure through pozzolanic reactions, while quarry dust demonstrated effective performance as a fine aggregate substitute. Water absorption tests indicated enhanced durability properties with reduced permeability in optimized mixes. Economic analysis revealed potential cost savings of 8-12% compared to conventional concrete.*

Keywords: Quarry Dust, Silica Fume, Partial Replacement, Particle Packing and Strength of Concrete

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