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Sustainable Design and Performance Evaluation of Recycled Aggregate Concrete in High-Rise Structures

Katrin Wieneke, S. Shao & D. Carsten

Research article Page: 01-17

Sustainable design of recycled aggregate concrete (RAC) in high-rise structures promotes environmental benefits by reducing landfill waste and virgin resource extraction through the reuse of construction and demolition debris. Performance evaluations reveal that RAC maintains adequate compressive strength and durability for structural applications when replacement levels stay below 30-50%, though it often shows slightly lower modulus of elasticity compared to natural aggregate concrete. High-rise implementations, such as twin tower studies, demonstrate comparable carbon footprints and seismic performance with optimized mixes incorporating supplementary cementitious materials. ……..… [For more click here]

Experimental Investigation of Base-Isolated Structures under Near-Fault Earthquakes

Morium Akter & Emílio C. N. Silva

Research article Page: 18-31

Experimental investigations of base-isolated structures under near-fault earthquakes utilize shake table tests to assess performance against long-period velocity pulses that induce large isolator displacements. Sliding base isolators, such as friction pendulum bearings, reduce superstructure accelerations by 35-40% compared to fixed-base systems, though they exhibit increased base displacements up to 2-3 times under pulse-like motions. Hybrid simulations combining physical isolator testing with numerical superstructures validate reduced interstory drifts and floor accelerations, with electromagnetic systems further limiting displacements via inerter-enhanced stiffness. Results confirm base isolation's efficacy in mitigating near-fault effects, provided isolator design accounts for velocity-dependent friction and pulse periods exceeding structural frequencies. ……..… [For more click here]

Durability of GFRP-Reinforced Concrete Beams in Harsh Environments

Ruixin Luo, Xin Wang, Christopher Ha & Abdullah Abdulaziz

Research article Page: 32-48

Durability of GFRP-reinforced concrete beams in harsh environments, such as seawater-sea sand concrete (SWSSC) or alkaline chloride exposure, shows tensile strength retention of 70-85% after accelerated aging, with degradation accelerating under sustained loads. GFRP bars exhibit matrix cracking and fiber-matrix debonding from moisture diffusion and alkaline attack, reducing flexural capacity by 15-30% after 10 years equivalent exposure, though bond strength improves post-fatigue. In subtropical coastal conditions, GFRP beams maintain serviceability with minimal deflection increase, outperforming steel in corrosion-free performance but requiring design strength reductions per ACI 440.1R. Hybrid steel-GFRP configurations optimize longevity, with GFRP handling tensile zones effectively in de-icing salt or marine splash zones…… [For more click here].

Slope Stability Evaluation Using Limit Equilibrium and Finite Element Methods

Aeshah Mohammed Abdullah Nasib, Mohammed Abdulaziz alahmed, Abdulaziz Ali & Kuo-Wei Liao

Research article Page: 49-68

Slope stability evaluation using limit equilibrium methods (LEM) divides the slope into slices, assuming a failure surface and satisfying force/moment equilibrium to compute factor of safety (FOS), with methods like Bishop, Janbu, and Morgenstern-Price yielding results within 6% variance. Finite element methods (FEM) incorporate stress-strain relationships via Mohr-Coulomb elastoplastic models and shear strength reduction (SSR) techniques to predict FOS, deformation patterns, and non-circular slip surfaces without presupposing geometry. Comparisons on homogeneous and layered slopes show LEM and FEM FOS values closely matching (differences <5%), but FEM excels in heterogeneous soils, seismic cases, and visualizing plastic zones aligning with circular slip lines. FEM provides superior insights into failure mechanisms and reinforcement optimization, though LEM remains simpler for preliminary design……. [For more click here].

Fire Resistance of Composite Steel-Concrete Beams Protected by Intumescent Coatings

Christopher Ha

Research article Page: 69-81

Fire resistance of composite steel-concrete beams protected by intumescent coatings achieves up to 120 minutes by expanding 10-50 times upon heating to form a char barrier that delays steel critical temperature (500-620°C) while concrete slab provides additional insulation. These epoxy-based thin-film coatings (0.5-3 mm DFT) outperform cementitious spray-applied systems in aesthetics, corrosion resistance, and ease of application, with off-site coating enabling quality control for exposed steel. Full-scale furnace tests per ISO 834 or hydrocarbon curves validate performance, showing minimal deflection and shear stud integrity under combined axial/bending loads. Topcoats enhance weatherability and UV stability, critical for hydrocarbon fire scenarios in industrial settings…… [For more click here].

Wireless sensor networks for structural health monitoring

Ali Mohameed Alabdan, Fahad Saud Almotairi, Soliman Ibrahim Al-Abdan, Aishah Shafi Alanazi, Molawwah Nasser Alqahtani & Shoaa G.

Research article Page: 82-97

Wireless sensor networks (WSNs) enable continuous structural health monitoring (SHM) of civil infrastructure like bridges and buildings by deploying low-cost, battery-powered sensors that measure strain, vibration, and temperature without extensive wiring. These networks use protocols like ZigBee or Wi-Fi for real-time data transmission to a central base station, supporting damage detection through acoustic emission and Lamb wave techniques. Key advantages include scalability for hundreds of nodes, reduced installation costs compared to wired systems, and condition-based maintenance that predicts failures early. Challenges involve power management, data synchronization, and harsh environmental resilience, addressed via energy harvesting and embedded algorithms for anomaly detection. Applications in urban settings enhance safety for aging structures, aligning with your interests in vibration control and seismic resilience……. [For more click here].