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Wind Tunnel Testing of Tall Chimneys with Damping Devices

Isabirye Edward Kezron & Nabirye Gretah Namukuve

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Wind tunnel testing of tall chimneys with damping devices employs aeroelastic models scaled to match Strouhal number, Reynolds number, and structural dynamics, simulating vortex-induced vibrations (VIV) and across-wind responses under turbulent boundary layer flows. Tuned mass dampers (TMDs) or viscous dampers reduce peak accelerations by 40-70% by targeting fundamental frequencies (0.2-0.5 Hz), as validated in real-time hybrid simulations for 183-300 m chimneys. Sectional rigid models quantify aerodynamic damping via forced oscillation tests, while full aeroelastic models capture nonlinear VIV lock-in, with TMDs outperforming stockbridge dampers in typhoon-prone regions. These tests inform Eurocode 1 design, optimizing damper mass ratios (1-5%) and locations for minimal base moments and top deflections…… [For more click here].

Durability of GFRP-Reinforced Concrete Beams in Harsh Environments

Ruixin Luo, Xin Wang, Christopher Ha & Abdullah Abdulaziz

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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: 29-44

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].

Impact of Climate Change on Coastal Erosion and Protection Using Hybrid Breakwater Systems

Alex Guillen-Bonilla, Jaime David Sevilla-Carrasco, Maricela Carpio-Arias, Diego Barzallo

Research article Page: 45-66

Climate change intensifies coastal erosion through accelerated sea-level rise, more frequent storms, and stronger wave action, leading to increased shoreline retreat rates worldwide. Hybrid breakwater systems, combining traditional rubble-mound structures with floating pontoons or geosynthetic materials, offer enhanced protection by dissipating wave energy while allowing sediment transport to maintain natural beach profiles. These systems reduce erosion impacts by up to 50% compared to conventional breakwaters, as they adapt better to rising sea levels and extreme events. Ongoing research emphasizes their role in sustainable coastal management, minimizing environmental disruption while safeguarding infrastructure in vulnerable regions. …… [For more click here]