

Passive and semi-active vibration control systems

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Research article Page: 01-18

Passive and semi-active vibration control systems mitigate dynamic responses in structures like buildings and bridges by dissipating energy without requiring external power sources. Passive systems, such as tuned mass dampers (TMDs), viscous dampers, and base isolators, rely on inherent material properties like friction, viscosity, or mass tuning to counteract wind or seismic excitations through proven, low-maintenance mechanisms. Semi-active systems enhance this adaptability by using sensors and minimal electronics to adjust damping or stiffness in real-time [\[For more click here\]](#)

Corrosion protection measures for reinforced steel

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Research article Page: 19-36

Full-scale lateral impact testing of prestressed concrete girders replicates over-height vehicle collisions on bridge undersides using specialized outdoor facilities, such as elevated tracks with impact carts to deliver controlled kinetic energy (e.g., 74 kip-ft from a 9000 lb cart dropping 10 ft). In a 2016 University of Tennessee study, an AASHTO Type I beam (56 ft long, 0.7-inch strands, $f'_c=14,100$ psi) was struck at midspan bottom flange, causing severe local spalling, flange rotation, strand rupture, and total flexural failure within 0.08 seconds, despite simple supports from Jersey barriers. Instrumentation including strain gauges, accelerometers (10 kHz sampling), [\[For more click here\]](#)

Durability of GFRP-Reinforced Concrete Beams in Harsh Environments

Ruixin Luo, Xin Wang, Christopher Ha & Abdullah Abdulaziz

Research article Page: 37-48

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

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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..... [\[For more click here\]](#).

Eco-friendly binders reducing CO2 emissions by 30-60%

E. Sharath Kumar, K. Kiran

Research article Page: 69-84

Eco-friendly binders like geopolymers, limestone-calcined clay cement (LC3), and alkali-activated materials replace Portland cement in roller-compacted concrete, slashing CO2 emissions by 30-60% through lower clinkering temperatures and industrial byproducts like fly ash or slag. These binders maintain comparable compressive strengths (25-40 MPa) while accelerating setting times, ideal for pavements in high-traffic urban areas. Biochar-amended variants achieve carbon negativity by sequestering CO2 in stable soil matrices, enhancing durability against freeze-thaw cycles. Implementation reduces lifecycle impacts without additives, supporting sustainable practices aligned with your materials research focus. Field trials confirm 50% emission cuts with no performance loss in eco-friendly roller-compacted concrete pavements..... [\[For more click here\]](#).

Retrofitting strategies for existing buildings

N. Olhoff & C. Fleury, W. Stadler & Marta Rey-López

Research article Page: 85-102

Retrofitting strategies for existing buildings enhance seismic, wind, and energy performance while minimizing disruption and costs, often combining structural upgrades with sustainability measures. Global shear walls, steel bracing, and concrete jacketing add stiffness and strength, effectively reducing drifts in RC frames and masonry infills by 50-70% under design earthquakes. Advanced techniques like base isolation (rubber bearings), supplemental dampers (viscous, friction), and fiber-reinforced polymers (FRP) provide ductility and energy dissipation without heavy interventions,..... [\[For more click here\]](#)