Research article, Type : Subscription **Volume:01**

Passive and semi-active vibration control systems

Mansyu M.
Research article Page: 01-16

Abstract: 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]

Full-scale lateral impact testing of prestressed concrete girder

Ramesh Kumar & Ajeet Kumar
Research article Page: 17-34

Abstract: 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]

Passive and semi-active vibration control systems

Amit Mandal & M. Życzkowski
Research article Page: 35-49

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]

Bridge engineering and health monitoring

F. Spengemann, & Ajeet Kumar
Review Paper Page: 50-64

Bridge engineering incorporates health monitoring to continuously assess structural integrity, detect damage early, and enable proactive maintenance, extending service life beyond traditional visual inspections. Structural health monitoring (SHM) systems deploy sensors such as strain gauges, accelerometers, fiber-optic Bragg gratings, and GNSS for real-time data on

vibrations, displacements, corrosion, and environmental factors like temperature and humidity. Data transmission via wireless networks (e.g., Wi-Fi, LoRa) feeds into AI-driven analytics for anomaly detection, modal analysis, and predictive …… [For more click here]

Wind-induced vibrations and control in tall structures

Prakash Dev & C. Fleury
Research article Page: 55-78

Wind-induced vibrations in tall structures arise primarily from dynamic wind loads like across-wind gusts, vortex shedding, and buffeting, which can cause occupant discomfort through excessive accelerations and sway. Control strategies include aerodynamic shaping (tapered forms, chamfered corners, or openings to disrupt vortex formation), mass and stiffness modifications via outriggers or belt trusses, and supplemental damping devices. Passive systems dominate practical applications: tuned mass dampers (TMDs) reduce peak responses by 30-50% by counteracting motion at the fundamental frequency, …… [For more click here]

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

Katrin Wieneke, S. Shao & D. Carsten
Research article Page: 79-91

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]

Performance-based seismic design of reinforced concrete buildings

Marek Foglar, David B. Clarke, Mark West
Review Paper Page: 92-111

Abstract: Performance-based seismic design of reinforced concrete buildings focuses on achieving predefined performance objectives, such as operational continuity, immediate occupancy, life safety, or collapse prevention, under specific earthquake intensities rather than relying solely on force-based limits. This approach uses nonlinear static (pushover) analysis or time-history analysis to predict building response, including plastic hinge formation and inter-story drifts, ensuring predictable damage levels. Engineers select target displacements and verify them against capacity curves derived from structural modeling, often iterating designs to meet owner-specific risk tolerances. Unlike prescriptive codes, it provides transparency on expected performance, making it ideal for critical infrastructure in high-seismic zones…… [For more click here]

Wind-induced vibrations and control in tall structures

C. Fleury
Research article Page: 112-136

Abstract: Wind-induced vibrations in tall structures arise primarily from dynamic wind loads like across-wind gusts, vortex shedding, and buffeting, which can cause occupant discomfort through excessive accelerations and sway. Control strategies include aerodynamic shaping (tapered forms, chamfered corners, or openings to disrupt vortex formation), mass and stiffness modifications via outriggers or belt trusses, and supplemental damping devices. Passive systems dominate practical applications: tuned mass dampers (TMDs) reduce peak responses by 30-50% by counteracting motion at the fundamental frequency, …… [For more click here]

Non-destructive testing techniques for concrete structures

Hikaru Nakamura & Sahil Rajput
Research article Page: 137-149

Abstract: Non-destructive testing (NDT) techniques for concrete structures assess material properties like strength, density, uniformity, and defects without causing damage, making them essential for in-service inspections and quality control. Key methods include the rebound hammer test, which measures surface hardness to estimate compressive strength; ultrasonic pulse velocity (UPV) testing, where high-frequency sound waves detect internal voids, cracks, or delaminations by analyzing travel time through the concrete; and penetration resistance tests like the Windsor probe, embedding steel pins to gauge relative hardness. Ground-penetrating radar (GPR) and impact-echo methods further identify rebar location, cover depth, and subsurface anomalies, with results calibrated Non-destructive testing (NDT) techniques for concrete structures assess material properties like strength, density, uniformity, and defects without causing damage, making them essential for in-service inspections and quality control. Key methods include the rebound hammer test, which measures surface hardness to estimate compressive strength; , …… [For more click here]