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Vibration Control of Footbridges Using Tuned Mass Dampers

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Research article Page: 01-19

Vibration control of footbridges using tuned mass dampers (TMDs) targets pedestrian-induced lateral or vertical resonances at 1-5 Hz, reducing peak accelerations from 1-2.5 m/s² to below 0.5 m/s² per design guidelines. TMDs, with mass ratios of 1-6% of modal mass and tuned frequencies within 1-5% of bridge fundamentals, dissipate energy via viscous damping (ζ=5-20%), optimally placed at maximum mode shapes. Multiple TMDs (MTMDs) broaden bandwidth to handle varying pedestrian loads, achieving 70-82% amplitude reductions in curved or long-span bridges, as validated by field tests and parametric optimization. Frequency-adjustable TMDs adapt to evolving structural properties, enhancing robustness against detuning from mass changes or nonlinearities. …..… [For more click here]

Experimental Study on the Bond Strength of FRP Sheets to Concrete Surfaces

L. T. Watson, Islam Boulaares & Laib Ibtissam

Research article Page: 20-38

Experimental studies on the bond strength of FRP sheets to concrete surfaces utilize single-shear pull tests, such as near-end supported (NES) setups, to measure ultimate bond stress ($\tau_{max} \approx$ 2-10 MPa) and effective bond length ($l_e \approx$ 100-400 mm) influenced by concrete strength, FRP stiffness, and width ratio. Concrete debonding (DB-C) predominates in high-strength concrete (>30 MPa), with failure propagating 0.1-0.5 mm into the substrate, while interfacial debonding occurs in weaker mixes or poor surface preparation. Surface roughness via sandblasting and epoxy saturation boosts bond by 20-50%, with groove configurations optimizing τ_{max} for CFRP sheets ($E_f t_f >$ 40 GPa·mm). Models like Chen-Teng predict strengths matching tests within 10%, validated across CFRP/GFRP and varying b_f/b_c ratios…… [For more click here].

Sustainable Drainage Systems for Urban Stormwater Management

Sara Chetehouna, Ahlem Frahtia, Ouidad Atoussi & Samir Derouiche

Research article Page: 39-56

Sustainable drainage systems (SuDS) manage urban stormwater by mimicking natural hydrological processes through source control, infiltration, attenuation, and treatment, reducing flood risk and improving water quality. Key components include permeable pavements, swales, rain gardens, green roofs, and constructed wetlands that capture and filter runoff, achieving 70-90% volume reduction and pollutant removal. These systems slow peak flows, support biodiversity, and create amenity spaces, with permeable surfaces costing 9% more initially but offering long-term savings via lower maintenance. Integration via the management train approach—combining source, site, and regional controls—builds resilient cities amid climate change. …… [For more click here]

Buckling Analysis of Thin-Walled Steel Sections in Cold-Formed Structures

M. W. Trosset

Research article Page: 57-71

Buckling analysis of thin-walled steel sections in cold-formed structures distinguishes local buckling (plate-like compression/flange distortion), distortional buckling (lip/flange rotation), and global buckling (Euler flexural-torsional), using tools like CUFSM for elastic critical loads. Direct Strength Method (DSM) employs finite strip buckling factors (λ modes) to predict nominal strengths, with constrained FSM separating modes for accurate interaction assessment in lipped channels or Z-sections. Stress gradients increase buckling resistance in beams, while imperfections and residual stresses reduce capacity, addressed via effective width or DSM provisions in AISI S100. FEM (e.g., shell elements) validates modes for complex sections, essential for distortional-global interactions in back-to-back C-columns. …… [For more click here]

Impact Resistance of Laminated Glass Facades in Blast Scenarios

S. C. Kugele & Islam Boulaares

Research article Page: 72-87

Impact resistance of laminated glass facades in blast scenarios relies on PVB or ionomer interlayers that retain fragments post-glass fracture, minimizing hazardous debris and reducing injury risk by absorbing energy through large deformations. Multi-layer configurations with thick central plies and hybrid interlayers (SG, EVA) achieve superior performance, limiting deflections to 4-7 mm under 150-250 kPa impulses while preventing interlayer rupture. Field and arena tests validate ALE3D simulations, showing point-fixed facades with ionomer laminates withstand close-range blasts (15-30 kg TNT at 10-16 m), with rebounding failure risks from negative phase addressed via P-I diagrams. Anti-shatter films and bomb blast nets further enhance mitigation for existing structures…… [For more click here].

Passive and semi-active vibration control systems

Hira Krishnan & M. Życzkowski

Research article Page: 88-97

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]