# Seismic Resilience Assessment of Steel Fiber Reinforced Concrete Frames under Cyclic Loading

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Research article Page: 01-12

Seismic resilience assessment of steel fiber reinforced concrete (SFRC) frames under cyclic loading highlights enhanced ductility and energy dissipation compared to plain concrete frames. Steel fibers bridge cracks, delay shear failure, and improve post-peak behavior, with optimal volume fractions of 1-3% boosting hysteretic energy absorption by up to ninefold in dynamic tests. Experimental studies on SFRC beam-column joints show reduced stiffness degradation and fuller load-displacement loops without pinching, enabling better performance in high-strength concrete applications. Increasing fiber content or stirrup ratios further elevates ultimate capacity and seismic toughness, making SFRC suitable for earthquake-prone high-rise structures. …… [For more click here]

# Numerical Modeling of Blast-Resistant Reinforced Concrete Slabs Using Finite Element Analysis

Renukaprasad .G, V. S. Kirthika Devi & Alfred Strauss

Research article Page: 13-31

Seismic resilience assessment of steel fiber reinforced concrete (SFRC) frames under cyclic loading employs finite element models and pseudo-static tests to quantify ductility, energy dissipation, and stiffness degradation. SFRC enhances crack bridging and shear resistance, yielding fuller hysteretic loops without pinching and up to 2% higher initial stiffness at 1-2% fiber volume fractions. Increasing column axial loads up to 50% of capacity delays damage accumulation and boosts early-stage energy dissipation, though exceeding this threshold risks concrete crushing and minor stiffness loss. Parametric studies confirm that SFRC outperforms plain concrete in beam-column joints, supporting resilient designs for seismic zones with optimized fiber ratios and stirrups. …… [For more click here]

# Influence of Nano-Silica Additives on the Durability and Compressive Strength of High-Performance Concrete

V. K. Le, Renukaprasad .G, V. S. Kirthika Devi & Alfred Strauss

Research article Page: 32-47

Nano-silica additives enhance the durability and compressive strength of high-performance concrete (HPC) by accelerating hydration, filling micropores, and promoting denser C-S-H gel formation. Optimal dosages of 1-3% by cement weight increase compressive strength by 15-32% at 28 days, with peak gains at 3% showing up to 21% improvement alongside reduced permeability. Durability benefits include 13-50% lower mass loss under sulfate attack after 300 days, elevated elastic modulus, and superior resistance to chloride penetration and freeze-thaw cycles at 1% nano-silica. Higher dosages beyond 3-4% risk agglomeration, diminishing workability and gains, emphasizing precise mix optimization for HPC applications. …… [For more click here]

## Numerical Modeling of Blast-Resistant Reinforced Concrete Slabs Using Finite Element Analysis

Victoria Zaborova, Tatiana Avdeeva, Tatiana Krasavina, Tatiana Zaytseva,Elena Saprykina, Dmitry Shestakov, Vitaly Rybakov, Alexander Anischenko, Hassan Shafaei

Research article Page: 48-65

Numerical modeling of blast-resistant reinforced concrete slabs using finite element analysis (FEA) employs three-dimensional Lagrangian models with fluid-structure interaction to simulate TNT explosions, air dynamics, and structural responses. Tools like ABAQUS or LS-DYNA incorporate concrete damage plasticity models, Johnson-Holmquist for brittle failure, and hexahedral elements for rebar-concrete separation, accurately predicting peak pressures matching Henry's formula and damage patterns validated against field tests. Parametric studies reveal that slab thickness above 80 mm, standoff distances over 500 mm, and TNT masses below 1 kg limit damage to low-moderate levels, with collapse radius and mid-span deflection scaling inversely with thickness and distance. Validated models show FEA captures crack propagation, spalling, and rupture effectively, aiding design optimization for military and civilian infrastructure under close-in blasts…… [For more click here]

## Time-Dependent Creep Behavior of Polymer-Modified Asphalt Mixtures for Pavement Applications

Binod Kumar Sah, Suresh Kumar Sahani & Huanjun Jiang

Research article Page: 66-87

Time-dependent creep behavior of polymer-modified asphalt mixtures for pavement applications exhibits viscoelastic-plastic deformation, with initial instantaneous elastic strain followed by decelerating primary and steady-state secondary creep, transitioning to tertiary acceleration under prolonged high stress. Polymers like styrene-butadiene-styrene (SBS) or high-elasticity modifiers create time-dependent microstructures, reducing permanent deformation by 20-50% compared to neat asphalt via enhanced elasticity and delayed flow at elevated temperatures. Modified time-hardening models incorporating logistic functions outperform Burgers models in capturing consolidation effects, accurately fitting creep compliance with $R^2 > 0.99$ and lower RMSE, especially under stresses of 0.55-1.00 MPa and 20-60°C. These mixtures show superior rutting resistance, with stress impacting creep rates more than temperature (99% vs. 65% strain increase), supporting durable pavements in high-traffic scenarios. …… [For more click here]

# Optimization of Bamboo-Reinforced Beams for Eco-Friendly Low-Cost Housing in Seismic Zones

Chattopadhyay & J. L. Walsh
Research article Page: 88-104

Optimization of bamboo-reinforced beams for eco-friendly low-cost housing in seismic zones involves selecting treated bamboo species like Dendrocalamus giganteus for tensile strengths up to 300 MPa, comparable to mild steel, while ensuring lightweight designs reduce inertial loads during earthquakes. Treatments such as boron, epoxy, or lime-water soaking minimize moisture absorption below 10% and enhance bamboo-concrete bond strength by 20-50%, preventing long-term degradation and improving ductility. Finite element analysis and experimental tests optimize reinforcement ratios at 1-2% cross-sectional area, with mesh configurations yielding flexural capacities 40% higher than plain concrete and 56% lighter weight versus brick beams, cutting costs by 40%. These beams excel in seismic performance through high strength-to-weight ratios and energy absorption, ideal for prefabricated panels in rural, disaster-prone regions like India. …… [For more click here]