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Long-term aging effects on tensile characterization of steel fibre reinforced concrete

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Research article Page: 01-18

Long-term aging generally modifies the tensile response of steel fibre reinforced concrete (SFRC) by altering both the cementitious matrix and the fibre–matrix interface. Over years of service, microstructural densification of the matrix can increase the limit of proportionality and initial tensile strength, while creep and shrinkage still promote crack development. Aging often enhances fibre–matrix bond, which may increase post-cracking residual tensile capacity, but corrosion of exposed steel fibres in aggressive environments can gradually reduce their bridging efficiency. Overall, the long-term tensile performance of SFRC depends on exposure conditions and temperature, with moderate environmental actions showing good retention of residual tensile capacity, whereas severe corrosion or high-temperature histories can cause notable degradation.…… [For more click here]

Structural reliability analysis under extreme loads

S. H. Han, P. B. Thanedar, R. H. Plaut & P. Morelle

Research article Page: 19-31

Structural reliability analysis under extreme loads evaluates the probability that a structure survives events like earthquakes, blasts, winds, or floods without failure. It models resistance (capacity) and load effects as random variables, computing failure probability via the limit state function where resistance exceeds demand. Common methods include First-Order Second-Moment (FOSM), First-Order Reliability Method (FORM), Monte Carlo simulation, and time-dependent approaches accounting for deterioration and load growth …….. [For more click here]

Sustainable Pavement Materials Using Waste Plastic and Rubber Crumb

S. Nishiwaki

Research article Page: 32-46

Sustainable pavement materials incorporating waste plastic and rubber crumb modify bitumen binders to enhance rutting resistance, fatigue life, and elasticity while diverting landfill waste. Low-density polyethylene (LDPE) at 8-10% and crumb rubber at 5-15% by binder weight improve high-temperature performance, raising softening points by 6-10°C and increasing complex modulus (G*) values. These hybrid modifiers promote better aggregate adhesion and deformation recovery, extending pavement service life by 30-50% under heavy traffic compared to conventional asphalt. Waste plastics like HDPE blend effectively via the dry process, reducing voids and permeability, while rubber crumb enhances low-temperature cracking resistance through viscoelastic damping. This approach supports circular economy principles, cutting CO2 emissions from virgin binder production and enabling scalable recycling in road construction. …… [For more click here]

Nonlinear Analysis of RC Beams Strengthened with Near-Surface Mounted FRP Bars

Jonas Dahl & Tayseer Mansour Kanan

Research article Page: 47-62

Nonlinear analysis of RC beams strengthened with near-surface mounted (NSM) FRP bars uses finite element models like ABAQUS to simulate concrete cracking, steel yielding, and FRP debonding via cohesive surface interactions and damaged plasticity criteria. These models accurately predict load-deflection curves, with NSM CFRP or GFRP bars increasing ultimate flexural capacity by 50-100% through enhanced tensile reinforcement in pre-cut grooves. Key parameters include groove dimensions (typically 1.5-2x bar diameter), epoxy adhesive properties, and bar spacing, where closer spacing (e.g., 165-200 mm) boosts torsional/shear stiffness but risks premature concrete splitting. Debonding governs failure in over-reinforced beams, mitigated by anchorages or hybrid EB/NSM schemes, validating experimental gains in ductility and energy absorption…..… [For more click here].

Hydrodynamic Modeling of Tsunami Wave Impacts on Coastal Structures

Jakob S. Jensen
Research article Page: 63-79

Hydrodynamic modeling of tsunami wave impacts on coastal structures predominantly employs smoothed particle hydrodynamics (SPH) to simulate violent fluid-structure interactions, capturing bore slamming, run-up, and overturning moments on dikes or piers. SPH models like GPUSPH predict hydrodynamic forces from frontal impact and drag, with circular piers experiencing less violent run-up than square ones due to flow separation, validated against lab data for bridge piers. Non-hydrostatic models integrated with immersed boundary methods quantify surge wave pressures, showing sloped dikes and shelter structures reduce forces by 15-50% via wave dissipation and blockage attenuation. These simulations aid resilient design by resolving unsteady flow fields, bed shear stresses, and dynamic responses under varying wave heights and structural configurations…..… [For more click here].

Effect of Fiber Orientation on the Post-Cracking Behavior of SFRC Panels

Ole Sigmund & Ibrahim Abdelfattah Almajali
Research article Page: 80-98

Fiber orientation in steel fiber reinforced concrete (SFRC) panels strongly influences post-cracking behavior, with aligned fibers perpendicular to cracks enhancing pull-out resistance and residual flexural strength by up to 50% compared to random distributions. Flow-induced orientation during casting leads to higher fiber density near formwork surfaces and preferential alignment in the flow direction, increasing fracture energy in bending tests but causing anisotropy in tensile performance. Image analysis and X-ray CT quantify orientation factors ($\alpha \approx 0.4$-0.7), where higher α correlates with improved σ-w relationships and ductility in wedge-splitting or notched prism tests. Panels with optimized fiber alignment exhibit ductile failure modes, making SFRC suitable for slabs-on-ground and industrial floors. ..…… [For more click here]