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Fire Resistance of Composite Steel-Concrete Beams Protected by Intumescent Coatings

Christopher Ha, Anita Bharti & Rohit Kumar

Research article Page: 01-18

Fire resistance of composite steel-concrete beams protected by intumescent coatings achieves up to 120 minutes by expanding 10-50 times upon heating to form a char barrier that delays steel critical temperature (500-620°C) while concrete slab provides additional insulation. These epoxy-based thin-film coatings (0.5-3 mm DFT) outperform cementitious spray-applied systems in aesthetics, corrosion resistance, and ease of application, with off-site coating enabling quality control for exposed steel. Full-scale furnace tests per ISO 834 or hydrocarbon curves validate performance, showing minimal deflection and shear stud integrity under combined axial/bending loads. Topcoats enhance weatherability and UV stability, critical for hydrocarbon fire scenarios in industrial settings…… [For more click here].

Optimization of Mix Design for Pervious Concrete in Urban Runoff Control

J. Sanchis, Shlash Alanazy, Mazen Abdullah & Al-Malki

Research article Page: 19-36

Optimization of mix design for pervious concrete in urban runoff control balances permeability (typically 2-20 mm/s) with compressive strength (5-25 MPa) through particle packing models that target 15-35% porosity using no-fines aggregates (4.75-19 mm). Key parameters include water-to-binder ratio (0.26-0.40), cement content (142-350 kg/m³), and aggregate-to-cement ratio (8-10), with superplasticizers ensuring flowability without fines. Incorporating pozzolans like fly ash or carbide residue (5-15%) and polypropylene fibers enhances durability and infiltration rates while meeting ACI 522R-10 guidelines for stormwater management. Experimental validation confirms optimal mixes reduce runoff volume by 70-90% and peak flows by 50%, ideal for parking lots and sidewalks…… [For more click here].

Dynamic Soil Amplification Effects on Mid-Rise Buildings

Ignacy Pardyka, Shingchern D. You, Gerassimos Barlas & Abdelfattah Almajali

Research article Page: 37-52

Dynamic soil amplification significantly influences mid-rise buildings (5-15 stories) by increasing spectral accelerations at site periods matching their fundamental frequencies (0.3-0.8 s), amplifying roof drifts and base shears by 1.5-2.5 times on soft soils. Nonlinear 3D site response analyses reveal topographic effects near slopes double peak accelerations at distances of 2-3 slope heights, exacerbating torsional responses in irregular plans. Soil-structure interaction (SSI) lengthens periods and reduces base shear but boosts displacements up to 211% under near-field motions, particularly for L-shaped buildings on layered clay-sand profiles. Mitigation via base isolation counters resonance, transforming deformation patterns to rigid-body motion even on soft soils. ……. [For more click here]

Corrosion Resistance Enhancement of Rebar in Chloride-Exposed Marine Environments

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Research article Page: 53-67

Corrosion resistance of rebar in chloride-exposed marine environments is primarily enhanced through protective strategies that mitigate chloride ingress and maintain the passive oxide film on steel. Epoxy or fusion-bonded coatings on rebar, combined with high-performance concrete using low water-cement ratios and supplementary cementitious materials like fly ash or slag, significantly delay chloride penetration to the steel-concrete interface. Cathodic protection systems, including impressed current or sacrificial anodes, actively halt ongoing corrosion by shifting the rebar potential, proven effective for salt-contaminated marine structures regardless of chloride levels. Stainless steel or glass fiber-reinforced polymer (GFRP) rebars provide inherent corrosion immunity, ideal for new construction in aggressive splash zones. These methods extend service life by 50-100 years, reducing maintenance costs in bridges, piers, and offshore platforms…… [For more click here].

Finite Element Simulation of Soil-Structure Interaction in Tunnel Excavation

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Research article Page: 68-83

Finite element simulation of soil-structure interaction in tunnel excavation employs advanced 3D models to capture complex behaviors like ground deformation, lining stresses, and surface settlements during staged construction. Software such as Plaxis 3D or DeepEX discretizes the soil and tunnel lining into finite elements, incorporating nonlinear soil constitutive models like Mohr-Coulomb or Hardening Soil to simulate excavation unloading and lining activation sequences. Key outputs include convergence of tunnel displacements, bending moments in segmental linings, and plastic strain zones in surrounding soil, with results showing up to 60% variation based on intersection angles in twin tunnels. Compared to simplified soil-spring methods, full FEM provides superior accuracy for heterogeneous soils and multi-hazard scenarios, aiding optimized support design and risk assessment…… [For more click here].

Life Cycle Assessment of Green Roofs for Urban Heat Island Mitigation

Jan Holnicki-Szulc, Mohammed Nijr Dughaylib Alotaibi, Mana Aziz Awadh Alharbi, Naif Hiji Alrasheedi & Abdulrahim Owaidh Saud Aloufi

Research article Page: 84-103

Life cycle assessment of green roofs reveals substantial environmental benefits over conventional roofs, with reductions in global warming potential by 1-5% and energy savings

up to 6% for cooling over a 50-year lifespan. These systems mitigate urban heat islands by lowering roof surface temperatures by 30-56°F through evapotranspiration and shading, while reducing peak ambient air temperatures by up to 20°F. LCA studies account for material production, installation, maintenance, and disposal, showing green roofs offset initial higher costs via extended durability and stormwater management gains. Additional advantages include GHG sequestration, pollutant filtration, and biodiversity enhancement, making them ideal for heat-vulnerable urban areas. …… [For more click here]