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Corrosion Resistance Enhancement of Rebar in Chloride-Exposed Marine Environments

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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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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

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Research article Page: 34-45

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]