Research article, Type : Subscription **Volume: 84 Issue 05**

Geotechnical Stability Analysis of Embankments Using Geosynthetic Reinforcement under Extreme Rainfall

Ibrahim Abdelfattah Almajali, Ali Mujahidin, Indrianawati Usman, Yetty Dwi Lestari , Huanjun Jiang, Ankit Pawar, Roopadarshini S & Hasan Mahmood

Research article Page: 01-14

Geotechnical stability analysis of embankments reinforced with geosynthetics is vital for ensuring structural integrity under extreme rainfall conditions. Heavy precipitation significantly increases pore water pressure and reduces soil shear strength, leading to potential slope instability. The inclusion of geosynthetic layers enhances tensile reinforcement, improves drainage, and limits deformation of the embankment structure. Advanced numerical modeling and field instrumentation are often employed to evaluate the performance of such reinforced systems under transient hydraulic loading. Overall, geosynthetic reinforcement provides a sustainable and cost-effective solution for maintaining embankment stability in areas prone to intense rainfall events. ..... [For more click here]

Development of Self-Healing Concrete Incorporating Bacteria for Crack Repair in Infrastructure

Marcin Wikło, Shahab Ahmad Al Maaytah & Eman A. Shokr

Research article Page: 15-34

Development of self-healing concrete using bacteria focuses on embedding **spore-forming** microorganisms such as Bacillus species into the concrete matrix along with suitable nutrients. When cracks form and water penetrates, these dormant bacteria become active and induce microbial calcite precipitation, filling the cracks with calcium carbonate and restoring watertightness. To keep bacteria viable in the highly alkaline environment of concrete, researchers commonly use protective carriers like expanded clay, microcapsules, or hydrogels that act as internal nutrient and bacteria reservoirs. …… [For more click here]

Comparative Study of CFRP-Wrapped Columns for Retrofit of Aging Bridge Piers

C. A. Featherston, Daniel Carranza Montenegro, Fausto Fabricio Quichimbo Saquichagua, Jean Luis Arana Alencastre, Cecilia Laura & Mogrovejo López

Research article Page: 35-44

CFRP wrapping significantly enhances the seismic resilience and ductility of aging reinforced concrete bridge piers by providing lateral confinement that increases axial load capacity and shear strength. Comparative studies demonstrate that CFRP-retrofitted piers exhibit up to 100% greater load-carrying capacity compared to bare columns under lateral cyclic loading or impact scenarios. For multi-column piers, CFRP sheets reduce damage propagation and permanent deformations post-fire, collision, or blast events, outperforming traditional methods like steel jacketing in terms of installation speed and corrosion resistance…… [For more click here].

Impact of Climate Change on Coastal Erosion and Protection Using Hybrid Breakwater Systems

Alex Guillen-Bonilla, Jaime David Sevilla-Carrasco, Maricela Carpio-Arias, Diego Barzallo

Research article Page: 45-66

Climate change intensifies coastal erosion through accelerated sea-level rise, more frequent storms, and stronger wave action, leading to increased shoreline retreat rates worldwide. Hybrid breakwater systems, combining traditional rubble-mound structures with floating pontoons or geosynthetic materials, offer enhanced protection by dissipating wave energy while allowing sediment transport to maintain natural beach profiles. These systems reduce erosion impacts by up to 50% compared to conventional breakwaters, as they adapt better to rising sea levels and extreme events. Ongoing research emphasizes their role in sustainable coastal management, minimizing environmental disruption while safeguarding infrastructure in vulnerable regions. …… [For more click here]