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Advances in Bridge Design and Structural Performance

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Bridges are the core components of transportation infrastructure, supporting its safety, resilience, and long-term sustainability. However, bridges suffer from inevitable structural degradation due to rising traffic volumes and exposure to harsh environments. Combined deterioration from fatigue damage, creep, shrinkage and steel corrosion gradually aggravates structural reliability, creating long-undetected latent risks. Unaddressed degradation can fracture critical load-bearing components, triggering catastrophic progressive collapse that threatens public safety and causes devastating economic and social losses. Against this context, systematic research on fatigue assessment, life prediction and safety analysis of degraded bridges under extreme accidental loads (earthquakes, explosions, vehicle impacts, fires and typhoons) has become an urgent priority. Furthermore, performance-based design and targeted retrofitting, rigorous fatigue assessment and safety analysis, is among the most effective strategies to extend the service life of existing bridges and guarantee the long-term functionality. This reprint, *Advances in Bridge Design and Structural Performance*, collects cutting-edge original research and systematic reviews, covering recent theoretical breakthroughs, innovative methods and practical applications. It is designed for academic researchers and practicing engineers in bridge engineering, structural durability and infrastructure asset management. We hope this work will stimulate interdisciplinary collaboration and advance the development of safer, more sustainable bridge infrastructure globally.



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