Proceedings of the 11th World Congress on Civil, Structural, and Environmental Engineering (CSEE 2026)
Paris, France - April, 2026
DOI: 10.11159/icgre26.008

Advancing the Numerical Modelling of Soil–Metal Bridges: Performance-Based Simulation Frameworks

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Abstract:

Soil–metal bridges (SMBs) represent a highly efficient class of buried infrastructure systems in which structural performance emerges from complex soil–structure interaction (SSI). Despite their widespread use, current design practices remain largely rooted in simplified analytical methods and empirical correlations that do not fully capture the nonlinear, path-dependent, and highly coupled response of these systems, particularly under extreme loading conditions and during construction staging. This keynote lecture presents a comprehensive overview of modern and advanced numerical strategies for modelling SMBs, with a focus on next-generation finite element (FE) frameworks that enable performance-based assessment.