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Model Solutions for Performance-Based Seismic Analysis of an Anchored Sheet Pile Quay Wall

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Abstract : Conventional seismic designs of quay walls in ports are mostly based on pseudo-static analysis. A more advanced alternative is the Performance-Based Design (PBD) method, which evaluates permanent deformations and amounts of (repairable) damage under seismic loading. The aim of this study is to investigate the suitability of this method for anchored sheet pile quay walls that were not purposely designed for seismic loads. A research methodology is developed in which pseudo-static, permanent-displacement and finite element analysis are employed, calibrated with an experimental reference case that considers a typical anchored sheet pile wall. A reduction factor that accounts for deformation behaviour is determined for pseudo-static analysis. A model to apply traditional permanent displacement analysis on anchored sheet pile walls is proposed. Dynamic analysis is successfully carried out. From the research it is concluded that PBD evaluation can effectively be used for seismic analysis and design of this type of structure.

Keywords : anchored sheet pile quay wall, simplified dynamic analysis, performance-based design, pseudo-static analysis
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