

Comparative Fragility Analysis of Shallow Tunnels Subjected to Seismic and Blast Loads

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Abstract : Underground structures are crucial components which required detailed analysis and design. Tunnels, for instance, are massively constructed as transportation infrastructures and utilities network especially in urban environments. Considering their prime importance to the economy and public safety that cannot be compromised, thus any instability to these tunnels will be highly detrimental to their performance. Recent experience suggests that tunnels become vulnerable during earthquakes and blast scenarios. However, a very limited amount of studies has been carried out to study and understanding the dynamic response and performance of underground tunnels under those unpredictable extreme hazards. In view of the importance of enhancing the resilience of these structures, the overall aims of the study are to evaluate probabilistic future performance of shallow tunnels subjected to seismic and blast loads by developing detailed fragility analysis. Critical non-linear time history numerical analyses using sophisticated finite element software Midas GTS NX have been presented about the current methods of analysis, taking into consideration of structural typology, ground motion and explosive characteristics, effect of soil conditions and other associated uncertainties on the tunnel integrity which may ultimately lead to the catastrophic failure of the structures. The proposed fragility curves for both extreme loadings are discussed and compared which provide significant information the performance of the tunnel under extreme hazards which may beneficial for future risk assessment and loss estimation.

Keywords : fragility analysis, seismic loads, shallow tunnels, blast loads

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