Seismic Fragility Analysis of a Buried Gas Pipeline Subjected to Mainshock-Aftershock Sequences

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ABSTRACT

In recent years, seismic activities occurring throughout the world has become more frequent, and conducting fragility analysis of important lifeline structures, such as buried gas pipelines has been accentuated. This study presents seismic fragility analysis of a buried gas pipeline, API 5L X70, considering the effect of mainshock-aftershock sequences. For numerical simulation of a buried pipeline, the Beam on Nonlinear Winkler Foundation (BNWF) was employed, and 20 different ground acceleration data were applied. To derive the seismic fragility curve, the nonlinear dynamic time history analysis was performed. Based on the results of numerical analysis, seismic fragility curves were evaluated according to the following damage states: moderate and major. The numerical results showed that failure probability curves including aftershock excitations represented higher failure probabilities than those influenced by the mainshock excitation only. Therefore, this study reinforces the importance of aftershock effects when conducting seismic fragility analysis of a buried gas pipeline.

REFERENCES

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