



ANALYTICAL FRAGILITY RELATIONS FOR WAVE PROPAGATION DAMAGE TO BURIED SEGMENTED PIPELINES

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Seismic damage to buried segmented pipelines is typically characterized by empirical fragility relations. In order to have a reliable estimate of likely damage, one needs a large number of observations which for pipelines means a large inventory of pipe subject to the hazard. As a result, the available empirical evidence is primarily limited to the more common small diameter pipelines. Unfortunately, the pipelines of most interest are large diameter pipelines.

The presentation will describe an analytical procedure for estimating seismic damage to buried pipelines subject to tensile ground strains. Specifically the model envisions a weak joint surrounded by stronger stiffer joints. Equilibrium and compatibility are used to establish a relation for the ground strain resulting in leakage at a joint. The leakage ground strain is a function of the axial force and axial deformation for leakage at the weak joint and in particular the correlation between these key parameters.

The presentation will compare estimated damage from current empirical relations with those from the new analytical relations. In addition, the analytical procedure will be used to investigate the influence of pipe diameter on expected damage.

REFERENCES

- M.J. O'Rourke and X. Liu (1999) "Response of Buried Pipelines Subject to Earthquake Effects" *Monograph Series Multidisciplinary Center for Earthquake Engineering Research* A National Center of Excellence in Advanced Technology Applications.

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