NUMERICAL MODELING OF REVERSE FAULT RUPTUTE EFFECTS ON LIFELINE

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Buried Pipelines as provide essential services for human needs such as transmission of water, oil, gas and other fluids are vital lifeline systems in modern society. Evaluation of the response of buried steel pipelines at active fault crossings is among their top seismic design priorities because of recent studies have shown that buried pipelines have been damaged heavily by seismic hazards such as fault movement.

In this paper, reverse fault rupture effects on pipelines are evaluated by numerical modeling and were compared by physical modeling results in this regard. Pervious numerical studies of fault rupture propagation through earth materials suggest that the finite element method can be applied to this class of problems. The well-known Plaxis Software (2008) based on the non-linear time-stepping finite element approach was used to carry out the numerical analysis.

Figure 1 shows the details of the geometry model and boundary conditions. Blue arrows mean the moving part while the green squares mean the stationary part of model. Interface elements similar to those used by Langen and Vermeer (1991) for analyses of trapdoor problems were used in order to model the onset of the rupture (Figure 1). A rigid layer with brown color was introduced in order to modelling bedrock beneath the soil layer with different shear wave velocity for parametric study.

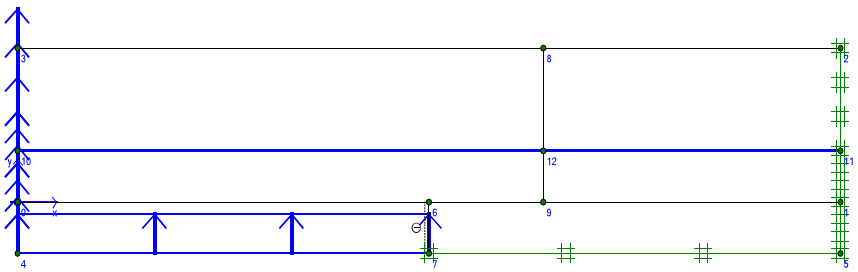

Figure 1. Geometry Model and Boundary Conditions

To evaluate the effectiveness of the proposed numerical analysis approach, the data from a small scale 1-g physical modeling tests using a sandbox in companion paper were compared with the predictions in this study. In the all of cases, the pipeline was modeled as elastic plate elements in Plaxis Software with flexural stiffness and axial stiffness as shown in Figure 2.

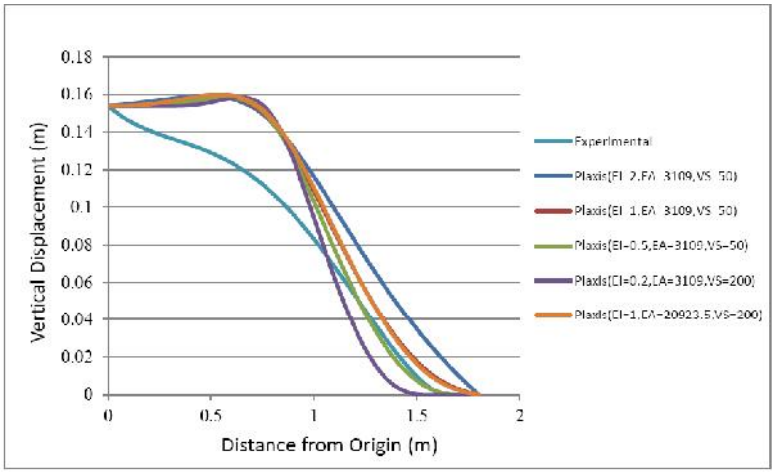

Figure 2. Reverse fault rupture effects on lifelines

Nevertheless it is obvious that proper complementary experimental investigations as well as extensive numerical parametric analysis is needed in near future in order to clarify much more and thereupon quantify the reverse fault rupture effects on lifelines.

REFERENCES

Langen HV and Vermeer PA (1991) Interface elements for singular plasticity points, *International Journal of Numerical and Analytical Meth Geomech*, 15: 301-315

PLAXIS (2008) Finite Element Code, PLAXIS BV