PHYSICAL MODELING OF REVERSE FAULT RUPTUTE EFFECTS ON LIFELINE

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Buried Pipelines due to 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 Observations of past earthquakes in Long Beach in 1993 America, Turkey and Taiwan in 1999 and 2008 China has been demonstrated the importance of the seismic hazards such as fault movement.

The 1-g physical modeling approach was adopted in the present study. The device used for performing the 1-g model tests was shown in Figure 1. The performed tests investigated reverse fault rupture propagation with a dip angle of 90 degree through the bedrock in a quasi- static mode using a jack beneath the moving floor. The pluviation technique with a pre-defined height and velocity of a sand rainer was also used to fill the box with a relative density of approximately 80%.

Figure 1. Overview of the reverse fault simulator

In these experiments, to ensure the accuracy of the results and applying them to the facts, it is necessary to satisfy the law of similarity. To accomplish this by simulating the relationship between model and reality is based on the reference used Iai (1989). Given that most of the steel pipes used in gas pipelines diameters 4, 6 and 8 inches are considering similar legislation, to provide them acting in the market. Table 1 shows the specifications of pipes selected for the physical model.

Table 1. Tubes selected for the physical model

Type of Pipe	Outer diameter (mm)	Internal diameter (mm)	Thickness(mm)
Aluminum	19	17	1
Aluminum	25	20	2.5
Copper	12.68	11.68	0.5

The sand used in the present study was the well known Babolsar sand available from the coast of Caspian see in north of Iran is shown in Table 2.

Table 2. The soil profile used in the experiment

Soil Type	c_c	C_u	D_{50}(mm)	$\gamma_{d_{min}}(\frac{gr}{cm^3})$	$\gamma_{d_{max}}(\frac{gr}{cm^3})$	$\gamma_d(\frac{gr}{cm^3})$	G_s
Sand	1.1	1.6	0.4	1.47	1.72	1.65	2.65

In total, 3 1-g model tests were performed to study burial depth of the pipe and elasticity modulus and pipe diameters as shown in Figures 2, 3

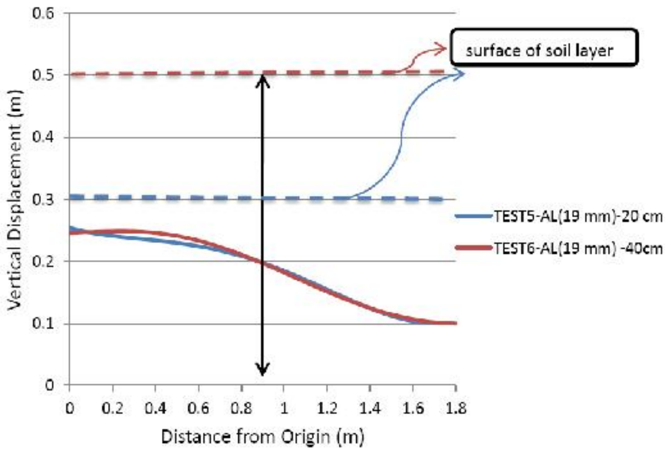

Figure 2. Deformed aluminum tube diameter 19 mm at different depths

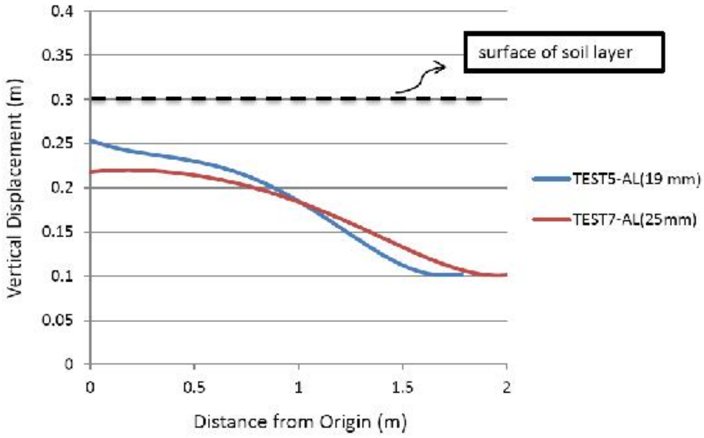

Figure 3. Deformation of aluminum tubes of different diameter and thickness

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