

Summary

Earthquake-induced Permanent Ground Deformation (PGD) occurring as a fault deformation and landslides can significantly affect underground lifelines such as buried gas pipelines. To assess the integrity of the pipelines against such ground deformation, it is important to quantitatively evaluate the interaction between the pipelines and the surrounding soils. The soil pipelines interaction specified in the major seismic design guidelines for buried pipelines has a bilinear force-displacement relationship curve. The actual experimental results, in case of the dense backfill conditions, conducted by Trautmann and O'Rourke, however, showed that the force decreased gradually after the relative displacement between soil and pipe reached to such a degree that the maximum was observed. In the case of PGD, therefore, it is expected that the soil-pipeline interaction is much smaller when the large ground deformation occurs due to the collapse of the soil.

In this study, full-scale experiments were conducted to investigate into the effect of the decrease in soil-pipeline interaction. The 100-mm-diameter pipe was installed and backfills in a test compartment. The test pipe was installed at a 0.6m depth from the ground surface in the dense backfill conditions. The soil-pipeline interaction in the lateral direction was measured up to about 150mm relative displacement between soil and test pipe.

Furthermore, distinct element analyses were conducted to investigate the deformation behavior of test pipe and the surrounding soils.

