# 論文の内容の要旨

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The pipe jacking method has been widely used for installing underground pipelines for various issues such as electricity, water, gas, railway, etc., because of its benefits for the economy, environmental, and construction safety when compared with the cut and cover method, particularly in congested areas. However, jacked pipes perform in a complex manner during installation process, particularly when the pipes are driven through a curved alignment. In such a case, the joints between the pipes significantly affect the behavior of the pipes and alignment deviation. Stress concentrations are generated in such a case, and may damage the pipes.

To investigate the influence of the joints on the pipes, and the behavior of the pipes during jacking process, and reduce the damage potentials, prototype test on pipe behavior including joints and numerical modeling were carried out. Full-scale experiments were conducted for both straight and curved alignments. The joints between pipes were incorporated with cushion made from the expanded polystyrene (EPS) set in a range of 90 degrees at top and bottom of the contact cross areas. The testing system includes two consecutive concrete pipes of 2.43 meter in length and 0.8 meter in inner diameter, concrete side walls covered around the pipe periphery, eight hydraulic side jacks to generate surrounding pressure, two hydraulic jacks to create thrust force, and the EPS inserted at the joint between the pipes. The maximum thrust forces were applied up to 1000kN and 2700kN for the curved and straight alignment cases, respectively.

In addition, due to the limitation of time and cost, it is difficult to figure out all the factors affected on the pipe behaviour by experiments, a numerical modelling of the experiment had been conducted. The surrounding pressure acting on the pipe periphery was modelled by ground springs, the friction between the concrete wall supports and the pipes was represented by the interface element, and the cushion at the joints was illustrated by joint springs in axial, radial, and tangential directions. The simulations by using finite element software DIANA package were carried out for both alignments.

Consequently, the behaviour of the pipes and the effects of the EPS were presented in terms of strain, stress, and moment in the pipes, moment at the joint, and deformation of

the EPS. As a result, it was found that stress concentration occurs along the pipe length at the range where the cushion materials are set for both alignments and at the concave side of the curve for the curved alignment. Furthermore, the numerical modeling gives a reasonable result to simulate the experiments.