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## **The Performance of Jacked Pipes**

### **Summary**

Pipejacking is a tunnel construction technique which is increasing in popularity, but fundamental research is necessary to fully understand the extent of its possible uses and limitations. This dissertation reports on laboratory research into the performance of reinforced concrete pipes, assessment of pipe joints and the use of joint packing materials.

The research has addressed specific problems which the tunnelling fraternity have raised. Model pipes have been constructed as scales of 1:6 and 1:10.5 using reinforced microconcrete and they have been tested in either a sand filled chamber or between supporting yokes. Current British Standard tests have been used as a control on the quality of pipe manufacture. Data have been recorded of changes in soil pressures, pipe geometry and strains induced in the pipes. The tests have investigated deformation of pipes, deflection angles between consecutive pipes, distribution of stress concentrations and the effects of the use of joint packing materials on allowable jacking loads and induced stress magnitudes in the pipes.

A review of current pipejacking practice is presented and recommendation for the control and supervision of pipejacking operations are made. The conclusions include recommendations for fieldwork monitoring and implications of this stage of the research to industry.

Recommendations are made for maximum installation jacking loads for any given deflection angle between pipes. The prediction of friction angles at the pipe soil interface have been assessed at different soil stress levels and new recommendations are made. The effects of cyclic loading on the pipejacking system and transfer from jacking load to ground loading once the pipes are installed are presented. The criteria used in the selection of a recommended joint packing material for use in jacking operations have been included. Failure modes of pipes are stated and recommendations are made for pipe design, installation and monitoring to predict and prevent such failures.

The dissertation is the report on the first stage of an overall programme of research which is now set to progress with monitoring of pipejacking operations on several construction sites.