

Geomechanics of Trenchless Pipe Installation, Repair and Replacement

Ian D. Moore, PhD, PEng

Abstract: *Traditional pipe installation and replacement involves extensive excavation of trenches along the full length of the pipeline that are both expensive and disruptive. To minimize those costs, many different ‘trenchless technologies’ have been developed by contractors and manufacturers, to permit pipe installation, pipe repair and pipe replacement using minimal earthworks. The inventive individuals and organizations that develop these techniques generally focus on development of the construction tools, materials and procedures, rather than the geotechnical (and structural) consequences of these methods, and so a variety of Geomechanics investigations are needed to establish how ground conditions influence the success or failure of such projects.*

The presenter has worked for the last twenty years exploring the Geomechanics and soil-pipe interactions associated with trenchless technologies, and this lecture presents an overview of some of the associated research problems and their solutions. After introducing three of the commonest trenchless technologies, examples are presented illustrating how computational and experimental projects are being used to explain and quantify the underlying Geomechanics phenomena. First, pipe installation using horizontal directional drilling is introduced, and the Geomechanics research illustrated considering studies of mud transportation from the borehole as a result of blowout or hydrofracture. Next, pipe repair using liners is introduced, with description of research investigations of soil-pipe-liner interaction under earth loads. Finally, pipe replacement using static pipe bursting is explained, where studies have explained how cavity expansion and soil dilation lead to uplift at the ground surface and damage to overlying infrastructure.