

Can We Tunnel Through Soil With Zero Ground And Building Deformation?

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Lunch Provided –



Dozens upon dozens of tunnel boring machines (TBMs) are today tunneling underneath major metropolitan areas worldwide primarily in soils and soft rock. TBMs ranging from 2m to 18m in diameter are excavating road, rail and water tunnels beneath sensitive buildings and utilities in Los Angeles, Seattle, San Francisco, New York, Hong Kong, Singapore, Shanghai, London, Riyadh and Doha, to name a few. The most significant risk in urban tunneling is damage caused by tunnel-induced ground deformation. Though this risk persists in the minds of owners and planners, the reality is that tunneling-induced ground deformation has decreased significantly over the past decade or two. This is largely the result of pressurized TBM tunneling and associated real time monitoring of ground and building deformation. This presentation begins by chronicling the reduction in ground and building deformation observed worldwide over the past 20 years on urban pressurized face TBM tunnel projects. The fundamental soil mechanics principles required for zero deformation tunneling are described. Magnitudes and patterns of deformation from three high profile US tunnel projects in New York City and Seattle are summarized as is the evolution of key TBM operating parameters that has led to minimal deformation. Following on Peter Drucker's quote 'if you measure it, it will improve', a framework for deformation control is presented using monitoring data and so-called data driven modeling (or data driven model updating). This framework is used to illustrate accurate deformation prediction based on current TBM parameters coupled with the prediction of deformation reduction via TBM parameter control.



Dr. Mike Mooney is a Professor of Civil Engineering and the Grewcock University Chair of Underground Construction & Tunneling (UC&T) at Colorado School of Mines. He leads the university-wide Center for UC&T. Mike teaches courses in tunnel design and construction, support of excavations, and instrumentation/monitoring. His research interests include soft ground TBM and conventional tunneling, geoconstruction monitoring and intelligent construction processes. Mike is a registered Professional Engineer and is actively involved in research and consulting on tunneling projects in Seattle, Los Angeles, Baltimore and New York. Mike is the chair of the Scientific Committee for the 2016 World Tunnels Congress to be held in San Francisco in April.

Questions? Dig in with us at uct.mines.edu or contact us uct@mines.edu

