

## 0-6715: Interaction between Drilled Shaft and Mechanically Stabilized Earth (MSE) Wall

### Background

Drilled shafts are being constructed within the reinforced zone of mechanically stabilized earth (MSE) walls (Figure 1). The drilled shafts may be subjected to horizontal loads and push against the front of the wall. Distress of MSE wall panels has been noted in some cases, and there is a need to develop guidelines to include the drilled shaft load within the MSE wall design.

### What the Researchers Did

In order to develop design recommendations for this case, the following tasks were conducted:

1. A 7.5-ft-high instrumented MSE wall was constructed with a 2-ft-diameter drilled shaft 2 ft behind the front of the wall at the National Geotechnical Experimentation Site (NGES) at Texas A&M University. The MSE wall backfill was a uniform medium dense sand. The drilled shaft was horizontally loaded to failure, and all instruments were recorded.
2. Two Texas Department of Transportation (TxDOT) MSE wall/drilled shaft projects were instrumented in Bastrop and Salado, Texas. They were monitored under normal traffic loading for many months.
3. Numerical simulations were conducted using FLAC 3D. All components of the MSE wall drilled shaft system were simulated. The simulations were first calibrated against the NGES full-scale experiment. Then a parametric study was performed.

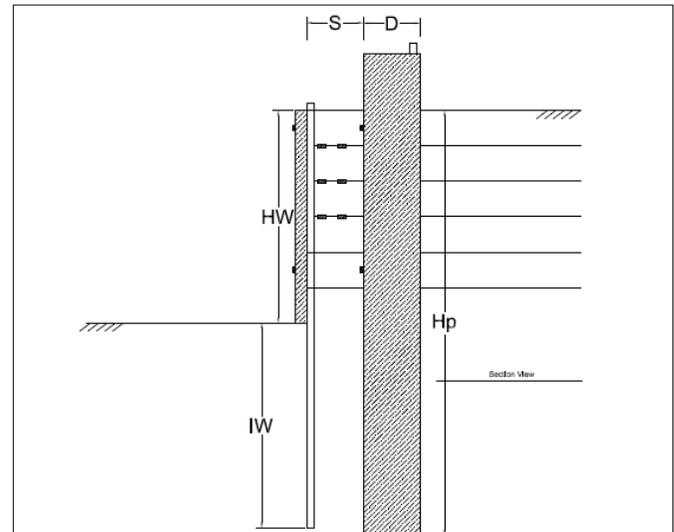


Figure 1. Drilled Shaft Embedded in an MSE Wall.

### Research Performed by:

Texas A&M Transportation Institute

### Research Supervisor:

Jean-Louis Briaud, TTI

### Researchers:

Marcelo Sanchez, TTI  
 Mohammad Aghahadi, TTI  
 Gang Bi, TTI  
 Jie Huang, TTI

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## What They Found

The NGES test showed that the drilled shaft could carry 40 kips at failure, the load brought the reinforcement to failure, and the load was limited by the ultimate bearing capacity of the sand wedge between the drilled shaft and the MSE wall panel. The monitored TxDOT sites showed no influence of the drilled shaft on the MSE wall. Based on the experiments and the simulations, design guidelines were proposed. They consist of including an additional pressure diagram (Figure 2) due to the horizontal design load on the drilled shaft to be resisted by the

MSE wall reinforcement. The maximum pressure  $\Delta\sigma(\max)$  at the top of the diagram depends on the horizontal load  $H_0$  on the drilled shaft, the diameter  $B$  and height  $h$  of the drilled shaft, and the relative clear distance  $D/B$  between the drilled shaft and the front of the MSE wall.

## What This Means

Now engineers can include the influence of a horizontal load on the drilled shaft embedded behind the front of an MSE wall on the MSE wall reinforcement by using the proposed pressure diagram.

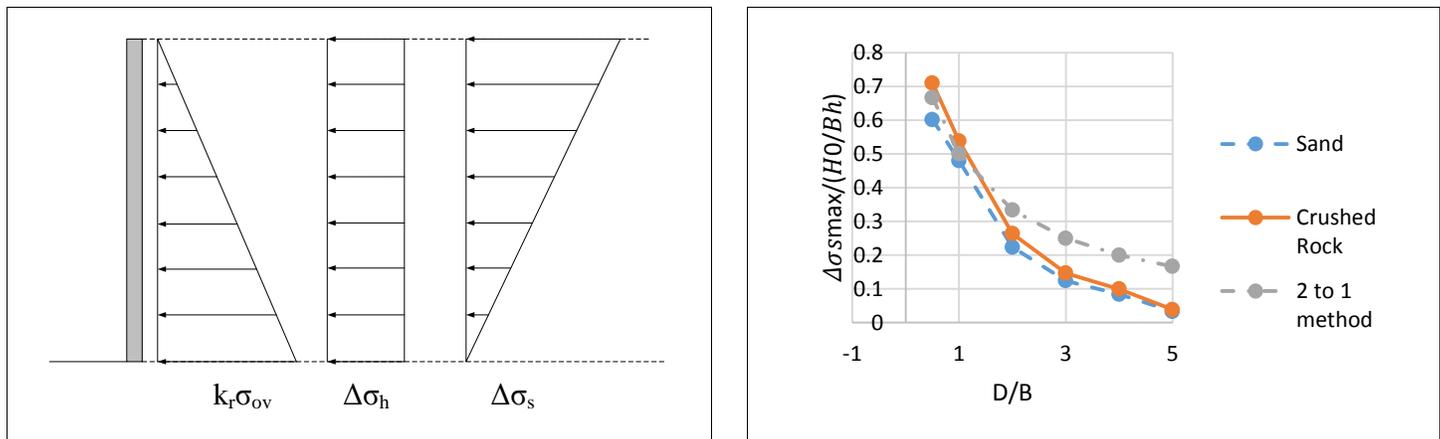


Figure 2. Proposed Design Pressure Diagram.

## For More Information

### Project Manager:

Kevin Pete, TxDOT, (512) 416-4738

### Research Supervisor:

Jean-Louis Briaud, TTI, (979) 845-3795

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Research and Technology Implementation Office  
Texas Department of Transportation  
125 E. 11th Street  
Austin, TX 78701-2483

[www.txdot.gov](http://www.txdot.gov)

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