

Geotechnical/  
Structural

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Project Title:  
Geotechnical Resistance Capacity  
and Stress Distribution of Soil/Grout  
Interface of Ground Anchors

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## Geotechnical Resistance Capacity and Stress Distribution of Soil/Grout Interface of Ground Anchors in Various Soil/Rock Conditions using Continuous Fiber Optics Strain Technology and Strain Compatibility Methodology

The research will use the recently developed instrumentation technology, fiber optics, which is the only technology available now to measure the strains along the entire length of grout column of the ground anchors.

### WHAT IS THE NEED?

Recent researches have indicated that loads on ground anchors are transferred to the anchor unbonded length under current single stage grouting practice. However, the magnitude, distribution, and proportion of load transfer into the unbonded length of ground anchors at different geotechnical conditions are still unknown. Consequently, whether the anchor bonded length of a given ground anchor is providing sufficient geotechnical resistance is unknown and cannot be verified using current performance and proof test regime.

With better understanding of the stress distribution along the grout column, we can develop ground anchor design and construction protocols that ensure pullout resistance in the anchor bond length provides the required design pullout resistance.

### WHAT ARE WE DOING?

For different soil and rock conditions, ground anchors will be installed and grouted differently. To account for various soil and rock conditions and installation and grouting methods, both vertical and sub-horizontal ground anchors are installed at selected test sites. The anchors are then loaded to monitor stress distribution along the grout column and ground anchor tendon.



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The research will use the recently developed instrumentation technology, fiber optics, which is the only technology available now to measure the strains along the entire length of grout column of the ground anchors. The measurements will produce the distribution of strain and converted stress along the grout column and at the grout/ground interface at typical ground anchor load schedule.

A finite element analysis of tendon-grout-ground behavior will also be performed. The parameters of the numerical model will be obtained from the field test results. A series of parametric study will be performed to develop design methodologies that account for verifiable and calibrated ground anchor geotechnical resistance capacity.

### WHAT IS OUR GOAL?

With the understanding of the stress distribution along the anchor grout column, we can develop ground anchor design and construction protocols that ensure pullout resistance in the anchor bond length provides the required design pullout resistance.

### WHAT IS THE BENEFIT?

The research will facilitate the development of verifiable and cost-effective design and construct protocols for ground anchor. The potential savings can be substantial and knowing that we are designing and building verifiable infrastructure is invaluable.

### WHAT IS THE PROGRESS TO DATE?

The project has not been started yet.

### IMAGE



Image 1