GRL-Cell for Bi-Directional Static Load Testing

The GRL-Cell is a high capacity device installed within a deep foundation element to perform a bi-directional static load test. As the GRL-Cell is pressurized, it loads the foundation element in two directions. The portion of the foundation element above the cell location is pushed upward, mobilizing its shaft resistance. Simultaneously, the foundation element below the cell location is pushed downward, mobilizing its shaft resistance, and its toe bearing or "base resistance." Shaft and toe movements, as well as embedded strain gage instrumentation, are monitored throughout the test. An equivalent top-loading curve is constructed from the measured shaft resistance load-movement and base resistance load-movement responses.

Standard GRL-Cell Sizes*			
GRL-Cell Capacity (tons)	Maximum Test Load (tons)	Outside Diameter (inches)	Maximum Stroke (inches)
350	700	12	9
500	1000	15	9
750	1500	18	9
1100	2200	21	9
1500	3000	24	9
2000	4000	28	9
2500	5000	31	9
3500	7000	36	9

*GRL-Cell capacities based on nominal 10,000 psi operating pressure. Higher capacities available at higher operating pressures. All cell sizes are subject to change.

Benefits of Bi-Directional Static Load Testing with the GRL-Cell

- High capacity static load test method for drilled shafts, bored piles, barrettes, and ACIP/CFA piles
- Separates soil/ rock resistance and movement data for shaft and toe
- Determines magnitude of mobilized shaft and toe resistances
- Embedded strain gages within the foundation determine the soil/rock resistance distribution along the foundation length for optimizing the foundation design
- Not restricted by structural or geotechnical limit of load frame (reaction beam(s), reaction piles, etc.)

GRL Engineers, Inc.

Corporate Office
Ohio

Office Locations

California
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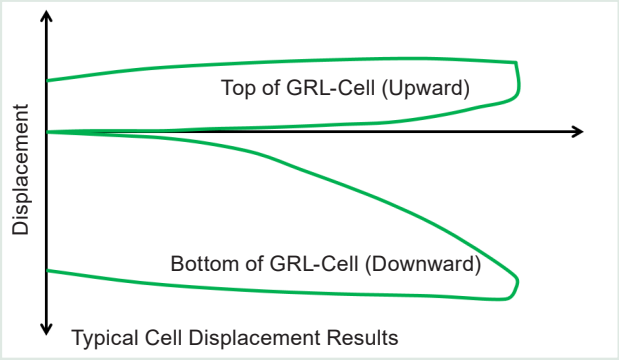
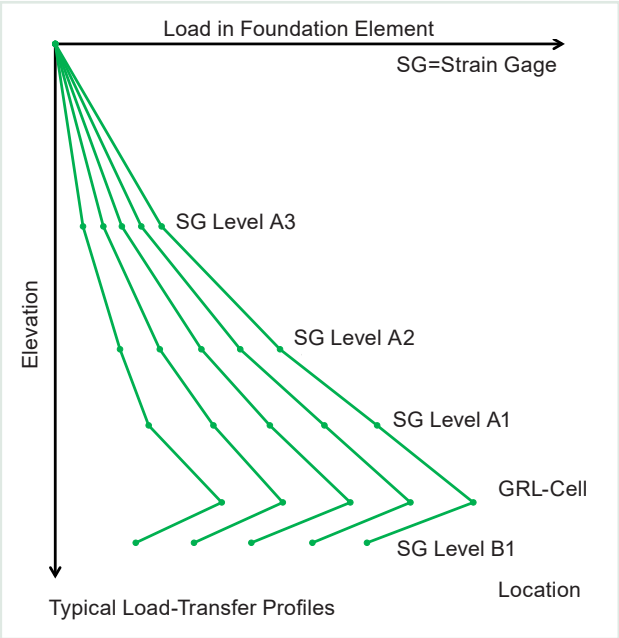
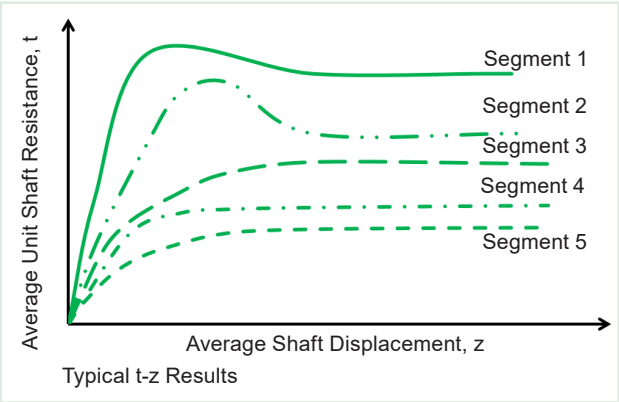
GRL Engineers, Inc.



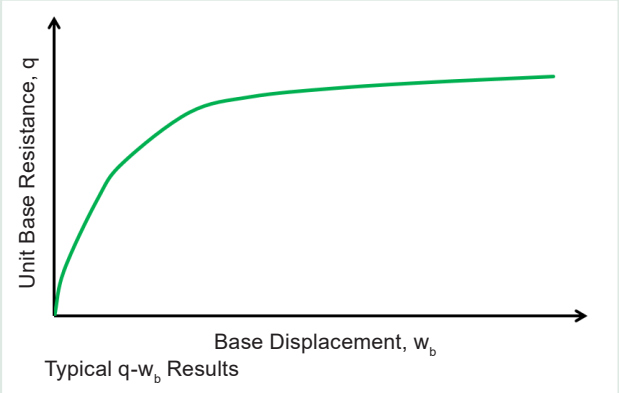
Typical Cell Displacement Results



Typical Load-Transfer Profiles



Typical t-z Results



Typical q-w_b Results

Test Data Collection, Analysis and Reporting

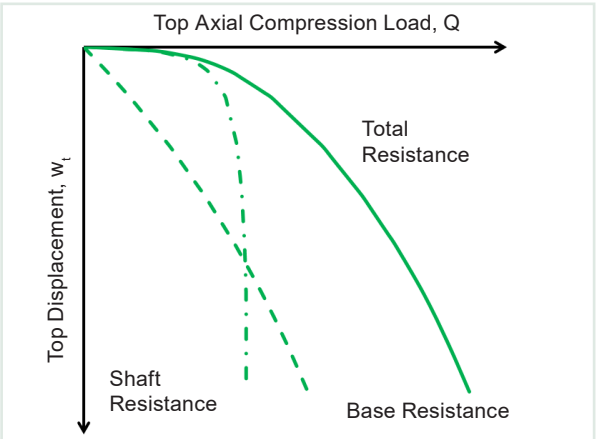
During a bi-directional static load test, the deep foundation element is instrumented to provide information about soil and foundation response to load. All instrumentation is read using a datalogger that stores the readings for subsequent analysis and presentation. The datalogger also displays select data for real-time monitoring and interpretation during the test.

Hydraulic fluid pressure supplied to the GRL-Cell is measured using an electronic pressure transducer. From these pressure readings, loads provided by the cell are determined. Cell expansion is measured using multiple electronic displacement transducers spanning the cell. Combined with telltale and top-of-foundation movement readings, the displacement transducer readings indicate the upward movement of the top of the cell, and the downward movement of the bottom of the cell. These results are then presented as upward and downward cell displacement versus load.

Embedded sister-bar strain gages are cast into the foundation concrete at various levels. To account for bending and to provide redundancy, each instrumentation level consists of multiple strain gages. After determining the foundation's cross-sectional area and elastic modulus at each instrumentation level, strain readings are converted to load in the foundation to obtain load-transfer profiles.

Strain, movement, and load data are analyzed to determine unit shaft resistance load-movement (t-z) and unit base resistance load-movement (q-wb) behavior. From these relationships, an estimated equivalent toploading movement curve can be constructed, including determination of separate contributions from shaft and base resistance.

For additional information on Bi-Directional Static Load Testing or any other GRL Engineers service please contact info@GRLengineers.com or visit us at www.GRLengineers.com.



Typical Estimated Equivalent Top-Loading Movement Curve with Shaft and Base Resistances

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