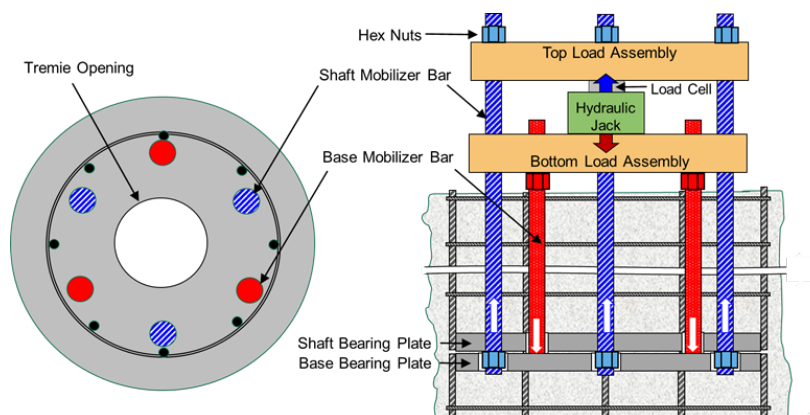




Top-Loaded Bi-Directional Testing (TLBT)

Top-Loaded Bi-Directional Testing offers an alternative method of loading drilled shafts without using an embedded sacrificial jack. Additional strain gage and displacement instrumentation determines the shaft and base resistances and load-movement response. In a TLBT, the test loads are also applied bi-directionally to the deep foundation. However, in a TLBT, only the bearing plates are cast into the foundation with the reusable hydraulic jack loading source located above grade. Reusable shaft mobilizer and base mobilizer bars transfer the hydraulic jack loads to the bearing plates cast within the drilled deep foundation. Strain gage and displacement instrumentation is again used to determine the shaft and base resistances and load-movement response.

The above grade, reusable jack reacts against a reusable load assembly connected to embedded bearing plates using threaded, shaft mobilizer and base mobilizer bars. Test instrumentation for determining bearing plate movements and load transfer behavior is similar to a conventional bi-directional test. A generalized schematic of the TLBT method is shown below. Additional details can be found below in US patent number 11,060,947.



Benefits of Top Loaded Bi-Directional Testing

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.)

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Florida	Louisiana	Texas	



Test Data Collection, Analysis and Reporting

During a top-loaded bi-directional 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 ($q-w_b$) 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 Top-Loaded Bi-Directional Load Testing or any other GRL Engineers service please contact info@GRLengineers.com or visit us at www.GRLengineers.com.

