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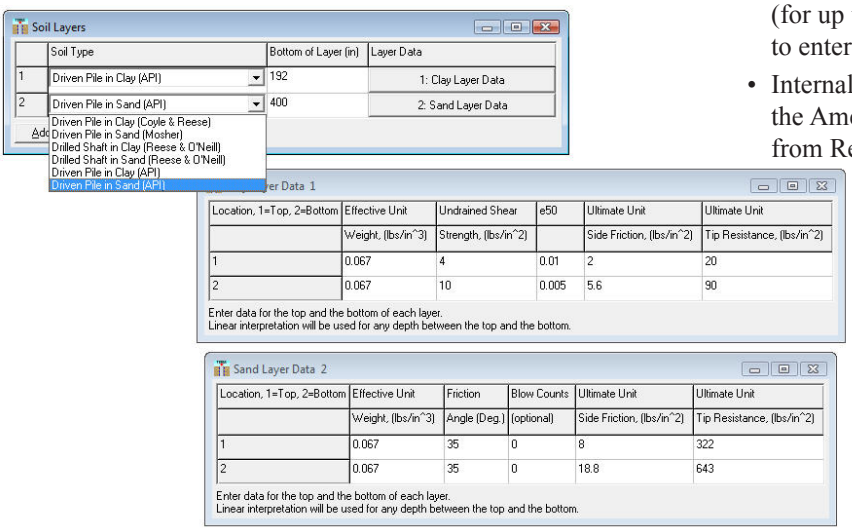
TZPILE v2014 (v3)

Load-vs-Settlement for Deep Foundations Under Axial Loads

GENERAL DESCRIPTION

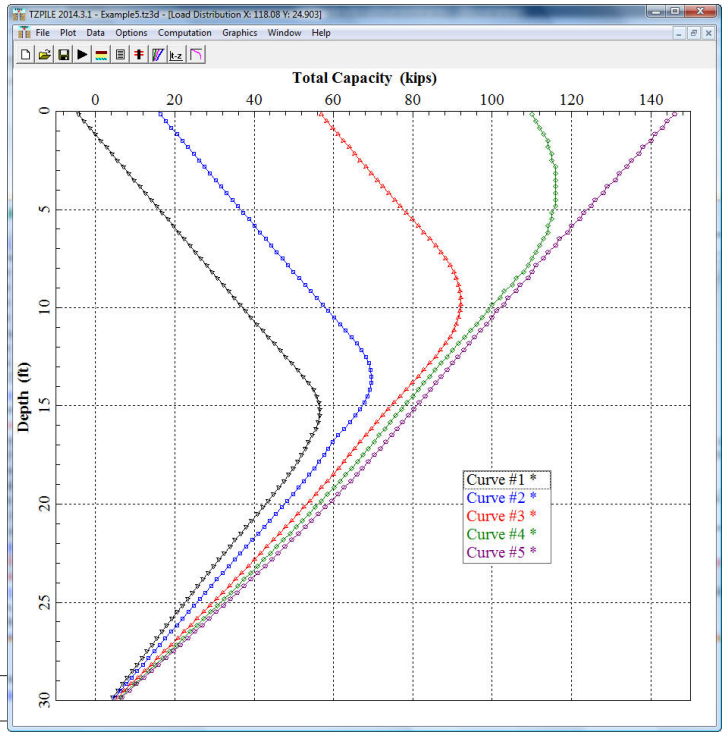
TZPILE implements the well-known method of soil-structure interaction, commonly called the *t-z method*, where *t-z* and *Q-w* curves are used respectively for load transfers in side resistance and end bearing. The *t-z* and *Q-w* curves can be internally-generated for both driven piles and drilled shafts with the input of information on the supporting soil and on the geometry of the pile.



Input of Soil Layers and Properties

Curves of short-term settlement as a function of applied loads are essential for some engineering computations; for example, when refined input is needed for the analysis of piles in a group. If a field-load test is performed, the computed curves can be "calibrated" by modifying input information to *TZPILE* to reach agreement with the experimental curves. The calibrated, site-specific curves can then be used with *TZPILE* to design the production piles, which may vary from the test piles in geometry and stiffness.

The main output provided by *TZPILE* is pile-head movement as a function of applied load. However, for any given load, the program can also present the load and movement along the length of the pile. In addition, the program allows the user to specify the settlement profile if the user would like to consider negative skin friction caused by downdrag. The program will use iterative solution to find the soil reaction based on the relative movement between the soil and the pile at the depth of interest. The neutral depth, which separates the negative and positive skin frictions, will be generated.



Sample Load-Distribution (w/Downdrag)

LIST OF FEATURES

TZPILE may be considered as the most versatile tool for study of the behavior of piles or drilled shafts under axial loading.

The following features are included in the program:

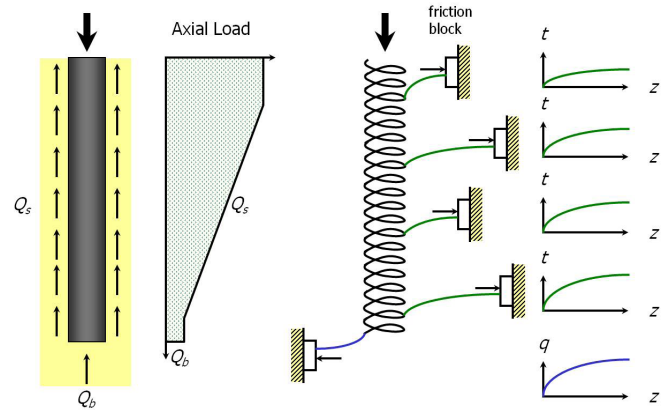
- Load-transfer curves in skin friction (*t-z* curves) and end bearing (*Q-w* curves) can be internally generated for drilled shafts or driven piles in cohesive and/or cohesionless soils (for up to 30 soil layers). In these cases the user only needs to enter the maximum skin friction at each soil layer.
- Internal t-z and Q-w curves are generated using criteria from the American Petroleum Institute (API) for driven piles and from Reese-O'Neill (1987) for drilled shafts.
- The new TZPILE allows users to select alternative criteria for driven piles, based on Coyle-Reese (Clay) or Mosher (Sand).
- Alternatively, the user can enter up to 100 nonlinear *t-z* curves at different depths of the pile (curves are interpolated linearly with depth). The user can also enter the *Q-w* curve at the pile tip as user-specified data.
- *TZPILE* accepts piles or drilled shafts having different section properties –cross-sectional area and modulus of elasticity– with depth.

TZPILE v2014 (v3)

Deep Foundations Under Axial Loads

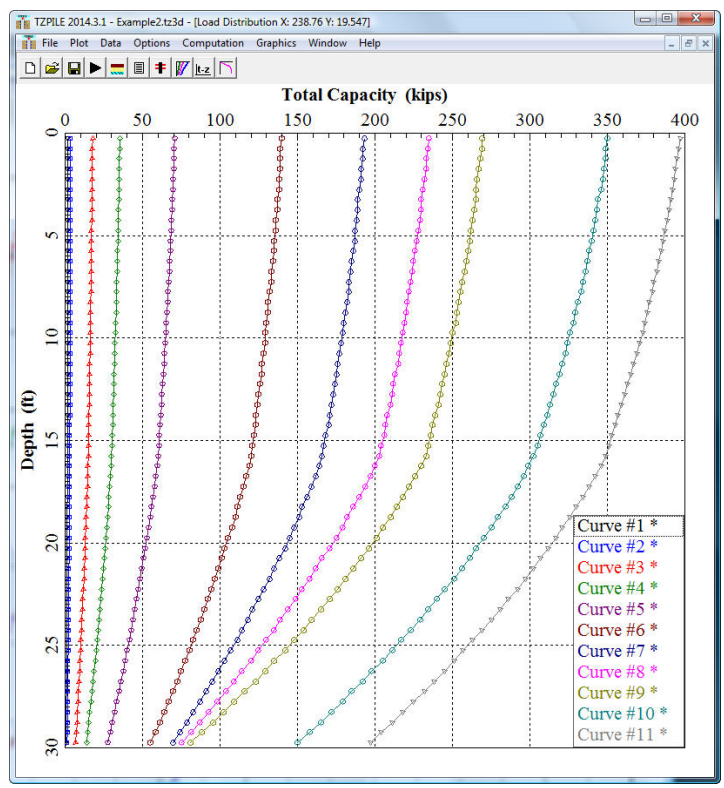
LIST OF FEATURES (Cont.)

- Models can be entered with any combination of English or S.I. units, since the program automatically converts all relevant units from one system to the other.



Mechanical model of axially-loaded pile used in TZPILE

- TZPILE 2014 allows for input of a soil-settlement profile that may be produced from downdrag. A pile will be subjected to downdrag when the soils in contact with the upper portion of the foundation move downward relative to the movement of the pile under its external loading. The resulting downward force from the near-surface soils will add to the force applied to the pile by the superstructure and can lead to excessive settlement of the foundation.
- A short-term, load-settlement curve is generated for the modeled pile using nonlinear soil models and elastic pile material deformation. *TZPILE* generates the load-vs-settlement curve based on the *t-z* and *Q-w* curves that are either generated internally by the program or specified by the user.
- *TZPILE* automatically outputs the internally-generated nonlinear soil-transfer curves in skin friction (*t-z* curves) at quarter depths on each soil layer.
- Graphics of load-distribution curves, load-settlement curves, and load-transfer curves are outputted by the program.
- TZPILE 2014 allows the use of modification factors for *t-z* and *Q-w* curves. This new feature may be used for special analytical cases, such as hypothetical computations of load-vs-settlement for evaluations of strength losses during pile driving or to match measured load-test data.
- The user may also enter variations of cross-sectional area as a function of depth, for controlled computations of elastic deformations.
- Improved file-management features are included to help the user during program execution. A standard single-program module is used for data input, program execution, and for the graphical observation of output-data curves.
- Output reports in TZPILE 2014 have been extended to include program and data file information, running date and clean echo printing of all inputted parameters.
- Input for the *TZPILE* models may be entered in English units (lbs, in and ft) or SI units (kN, mm and m). The program converts automatically all entered values when switching units.
- The files of input data and output reports are plain text and may be edited from within *TZPILE* employing the user's preferred text editor.
- New electronic manuals are installed with the program, both manuals with completely new format and revised contents. The copyrighted Technical Manual features all the relevant design theories and equations. The User's Manual includes a full description of all commands contained in the program and example problems are supplied for reference and instruction.
- TZPILE 2014 is fully compatible to all current releases of the Windows OS, including 8.1, 8 and 7 in 32 and 64-bit releases (as well as Windows Server 2012 and 2008).



Load Distribution vs Depth (Total Pile Capacity) for various tip movements