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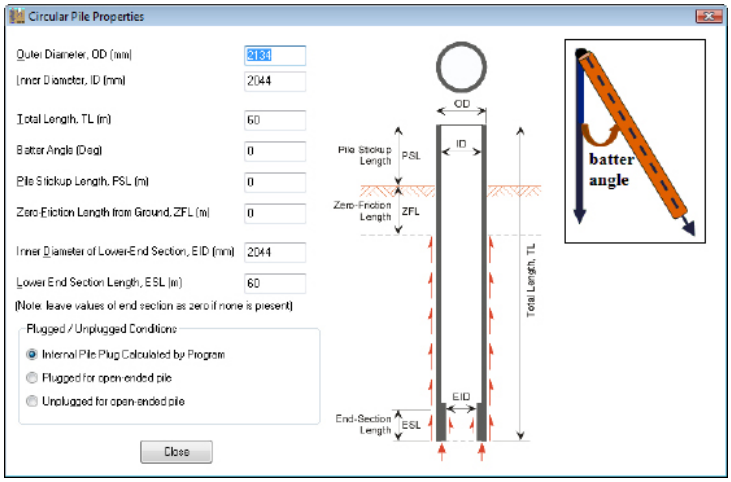
APILE

A Program for the Analysis and Design of Axially Loaded Piles

GENERAL DESCRIPTION

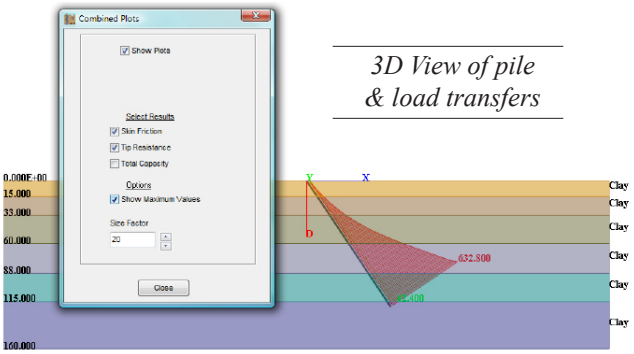
APILE is used to compute the axial capacity, as a function of depth, of a driven pile in clay, sand, or mixed-soil profiles. Several methods are used by APILE for computations of pile capacity: i) American Petroleum Institute (API RP-2A), ii) U.S. Army Corps of Engineers (USACE), iii) U.S. Federal Highway Administration (FHWA), and the iv) revised Lambda method.

The special *APILE Offshore* version includes four other CPT based methods: v) Norwegian Geotechnical Institute (NGI), vi) Imperial College Pile method (ICP but also referred as the Marine Technology Directorate or MTD method), vii) University of Western Australia (UWA) and viii) the Fugro method (all mentioned in the latest API RP-2A manuals).



Input of Circular Pile Properties

The APILE program also provides a flexibility allowing users to specify any set of values for load transfer in side resistance and end bearing as a function of depth. This feature is useful for cases when site data is available from instrumented axial load tests.

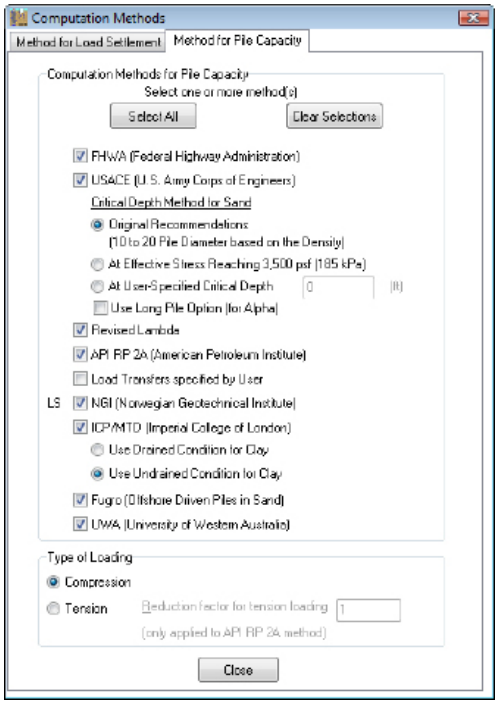


3D View of pile & load transfers

A short-term, load-settlement curve is generated for the modeled pile using nonlinear soil models and elastic pile material deformation. The *APILE* program uses two sets of internally generated *t-z* curves (load-transfer in axial side resistance as function of movement) and *Q-w* curves (load-transfer in end bearing as function of movement) for developing the load-settlement predictions.

LIST OF FEATURES

- Load transfer capacities in side resistance (skin friction) and end bearing are computed, along with the total capacity of a pile to sustained axial loading.
- Modeled pile can be vertical or with a batter angle. APILE calculates load transfers based on pile lengths in each soil layer and also based on overburden (when appropriate).
- Graphs and tables of total capacity, skin resistance and end bearing from four different analytical methods are provided in the basic version. Results from four CPT-based analytical methods are available in the Offshore version of APILE.
- The development of a plug in an open-ended pipe pile as it is driven is calculated internally in APILE. Users may select fully plugged, unplugged or internally calculated for comparison of pile capacities.

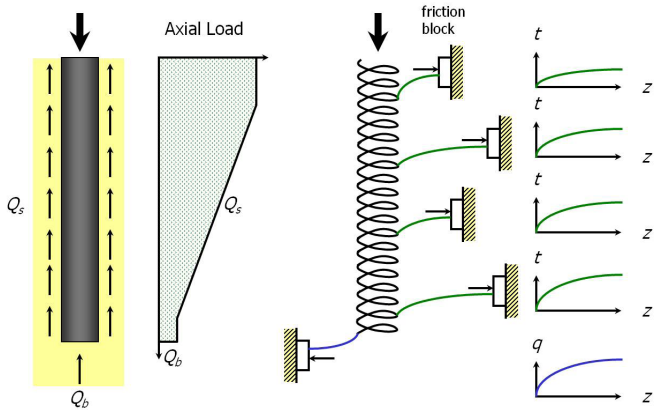


Computation Methods Used in APILE

APILE
Analysis and Design of Axially Loaded Piles

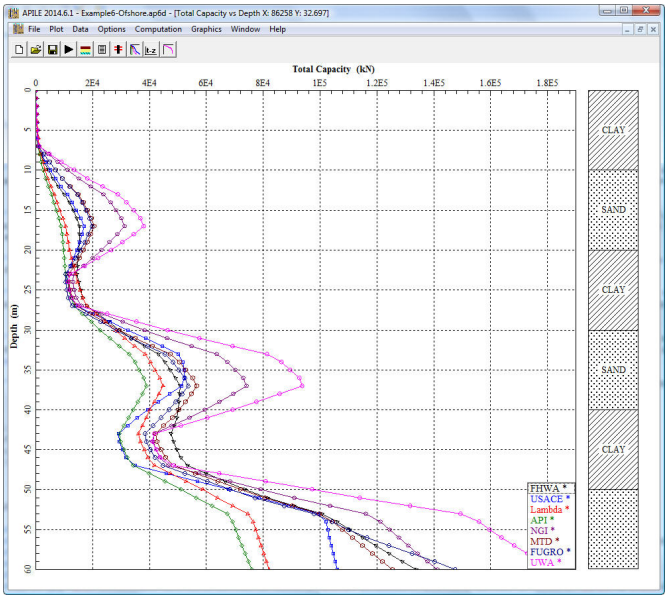
LIST OF FEATURES (Cont.)

- Graphics of load-distribution curves, load-settlement curves, and bearing capacity as a function of depth are outputted by the program. A 3D View feature is available to visualize the pile, soil stratum and computed load transfers.
- APILE allows the implementation of new LRFD analyses (AASHTO LRFD) so users may specify independent reduction factors (resistance factors) for skin friction and end bearing on each soil layer in the model. This feature may also be useful to account for strength reductions during pile driving or for overall pile-group reduction factor.



Mechanical model of axially-loaded pile used in APILE

- APILE has the ability to read cone penetration test (CPT) data files and convert to equivalent SPT-N values and equivalent shear strength versus depth.
- APILE can perform computations for tensile (uplift) loading with user-specified reduction factors.
- The user may also enter variations of cross-sectional area as a function of depth, for controlled computations of elastic deformations.
- Many pile types may be analyzed by APILE: circular pipe piles, steel shapes, precast concrete piles or also many FHWA piles of varying sections (tapered piles, timber piles, or Raymond-type step taper or uniform taper piles).
- The user may instruct the program to exclude a length at the top of the pile with zero side resistance in order to account for possible remolding of clays from excessive lateral deflections or due to other factors.
- Users may specify a pile stickup above ground (many offshore structures have stickup in water) to calculate properly the full elastic deformation of the pile.
- 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.
- The method of Neutral Plane Analysis for Downdrag is implemented into APILE based on FHWA recommendations.
- Input for the APILE 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.
- APILE produces the input data file for the GRLWEAP program for dynamic pile driving analyses.
- The program produces output tables of numerical values and graphs. Pile capacities in skin friction, tip resistance, and total pile capacity may be plotted as a function of depth.
- The program can produce graphs of the total axial load versus settlement and total axial capacity versus pile length.
- APILE can output the internally-generated nonlinear soil-transfer curves in skin friction (*t-z* curves) at any depth specified by the user.
- New AASHTO 2012 used to estimate friction angles from SPT values.
- Electronic manuals are installed with the program. The copyrighted Technical Manual features all the relevant design theories and equations. User's Manual includes a full description of all commands contained in the program and example problems are supplied for reference and instruction.
- APILE is fully compatible to all current releases of the Windows OS, including 10, 8.1, 8 and 7 in 32 and 64-bit releases (as well as Windows Server 2016, 2012 and 2008).



Total Pile Capacity vs Depth
for various computational methods