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DEEP FND

HELIX PILE

Design of Deep Foundations - Methods and Software Application

Presentation: Dimitrios Mamoglou, Senior Engineer, Deep Excavation LLC
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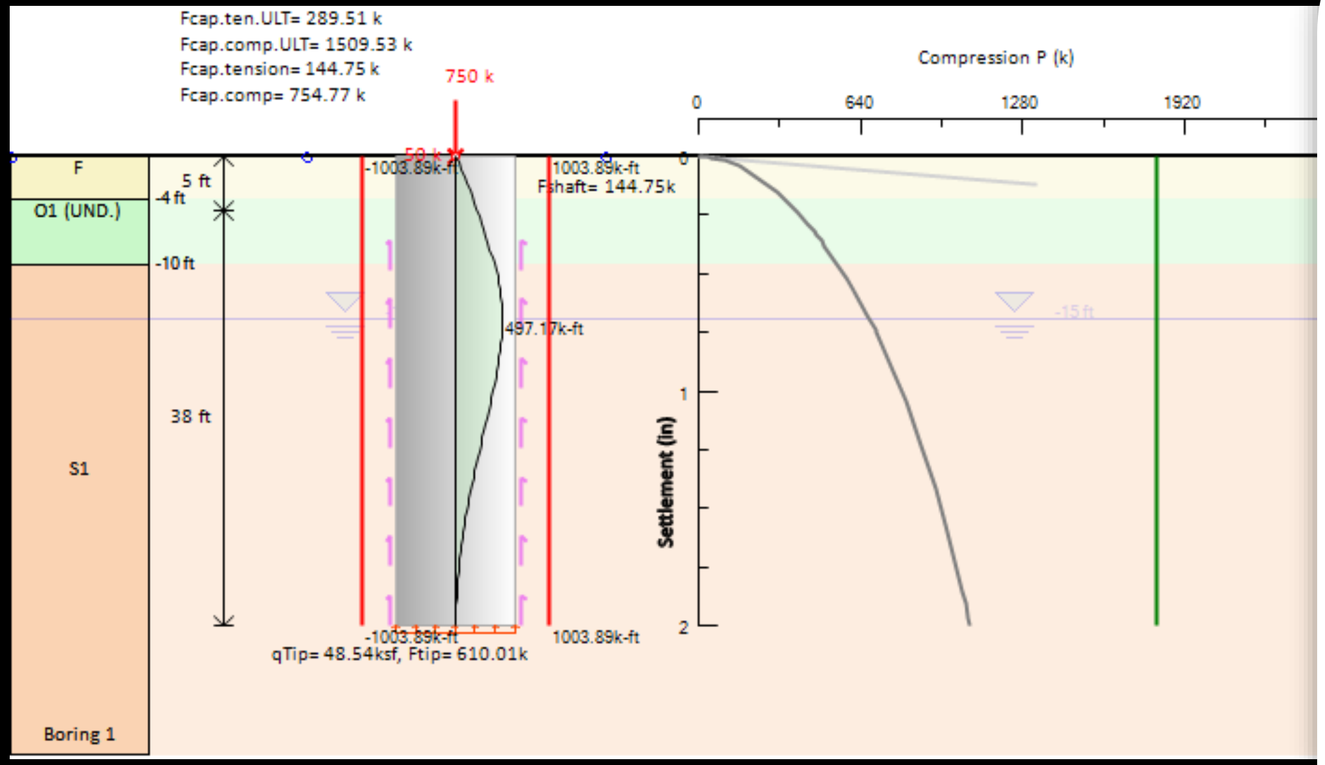

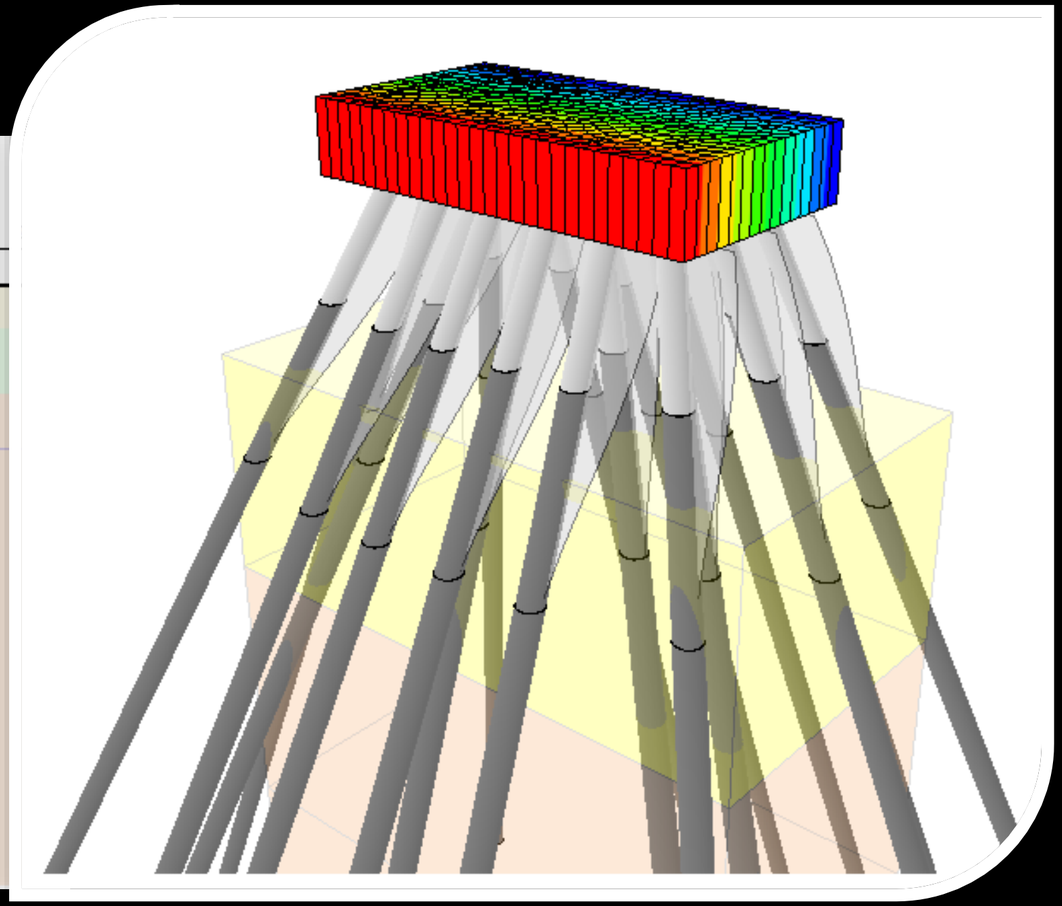

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- Software solutions for excavation and foundation professionals
- Consulting Services - Design of deep excavations and pile foundations
- Virtual Reality applications for geotechnical engineers and contractors

DeepEX | HoloDeepEX | DeepFND | HelixPile | SnailPlus | QuayWalls | SiteMaster

PART 1: DeepFND/HelixPile Software Features and Analysis Methods

More information:

Click here to learn more:
DeepFND - Features and Capabilities

Click here to learn more:
HelixPile - Features and Capabilities

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DeepFND - Foundation Piles Design Software
HelixPile - Helical Piles Design Software

DEEP FND

Lateral and Vertical Analysis and Structural Design of all common pile types

Single Piles and Pile Groups

Non-Helical Piles

Installation Methods:
- ✓ Drilled Piles
- ✓ Driven Piles
- ✓ Caissons
- ✓ Micropiles
- ✓ CFA Piles
- ✓ Drilled-In-Displacement Piles

Pile Types:
- ✓ Concrete Sections: Rectangular, Circular, Circular Hollow, Octagon
  - ✓ Steel Sections (H-Beams, Pipes, Channels)
- ✓ Timber Piles (Wood)
- ✓ Belled Bottom
- ✓ Composite Section Along the Pile

Soil Springs & 3D Finite Element Analysis Methods

Single Piles and Pile Groups

Helical Piles

Pile Types - Helix Configuration - Casing:
- ✓ Pipes
- ✓ Square Solid
- ✓ Square Hollow
- ✓ Include Several Helix Configurations on each Pile
- ✓ Use of External Casing
- ✓ Option to have Grouted Piles

Helical Piles also Analyzed with:

HELIX PILE

HelixPile: Helical Piles Design Software

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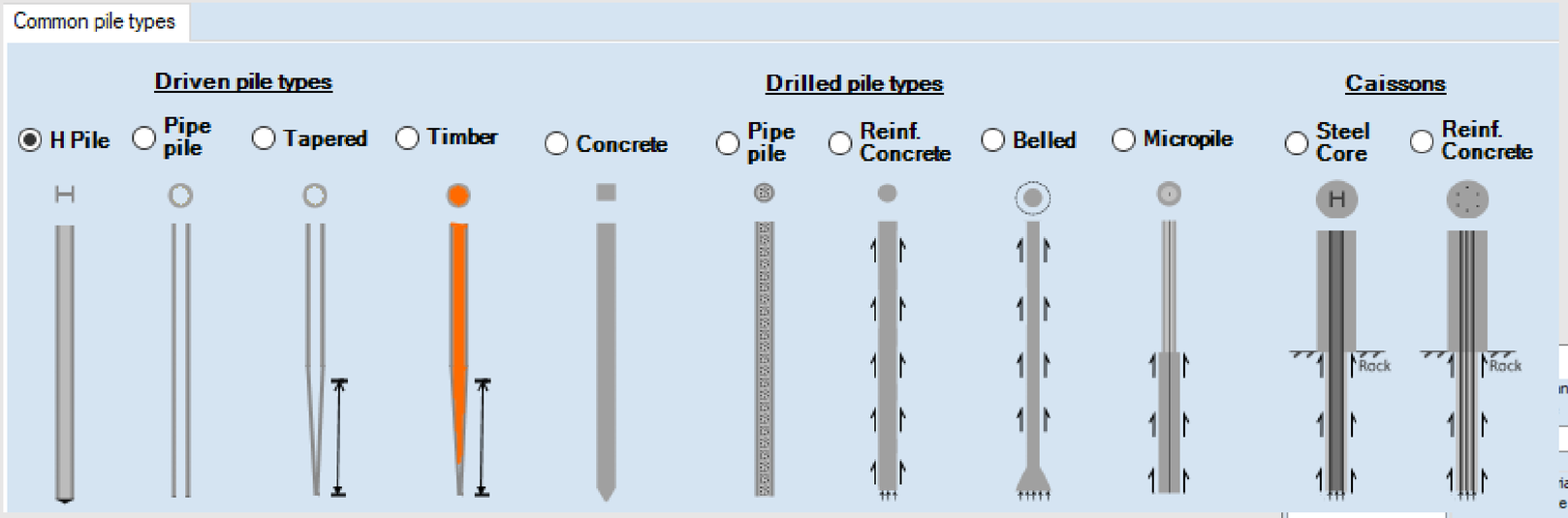
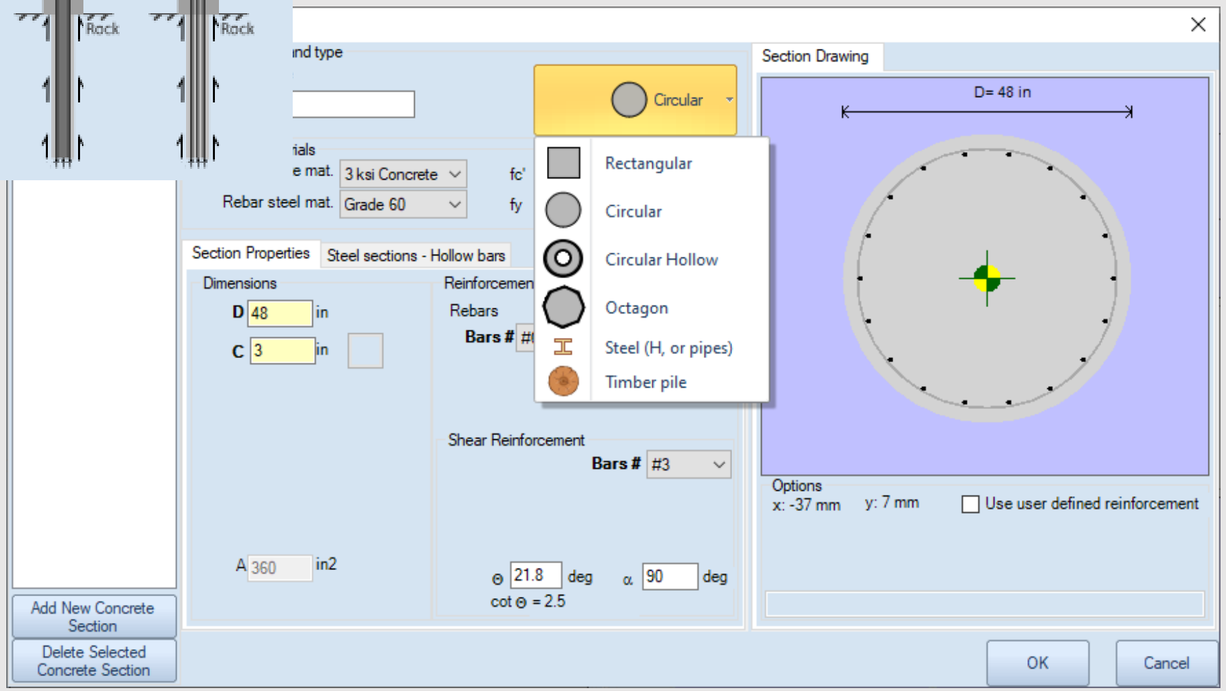
DeepFND - Available Non-Helical Pile Types



Pile Sections:

- Concrete Piles (Rectangular, Circular, Octagon)
- Circular Hollow Sections
- Composite Sections
- Steel Beams (Pipes, H beams, channel sections)
- Timber Piles (wood)
- Belled Bottom Piles



Installation Methods:

- Drilled Piles
- Driven Piles
- Caissons
- Continuous Flight Auger Piles (CFA)
- Drilled-In-Displacement Piles

Implemented Methods:

- FHWA GEC 8 and GEC 10
- AASHTO LRFD Norlund

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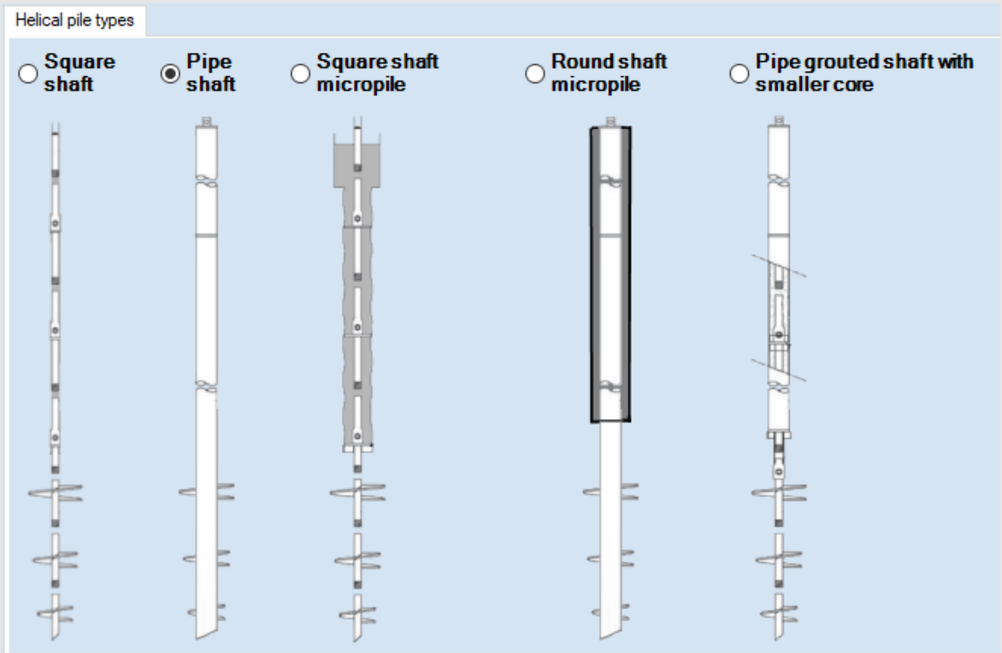
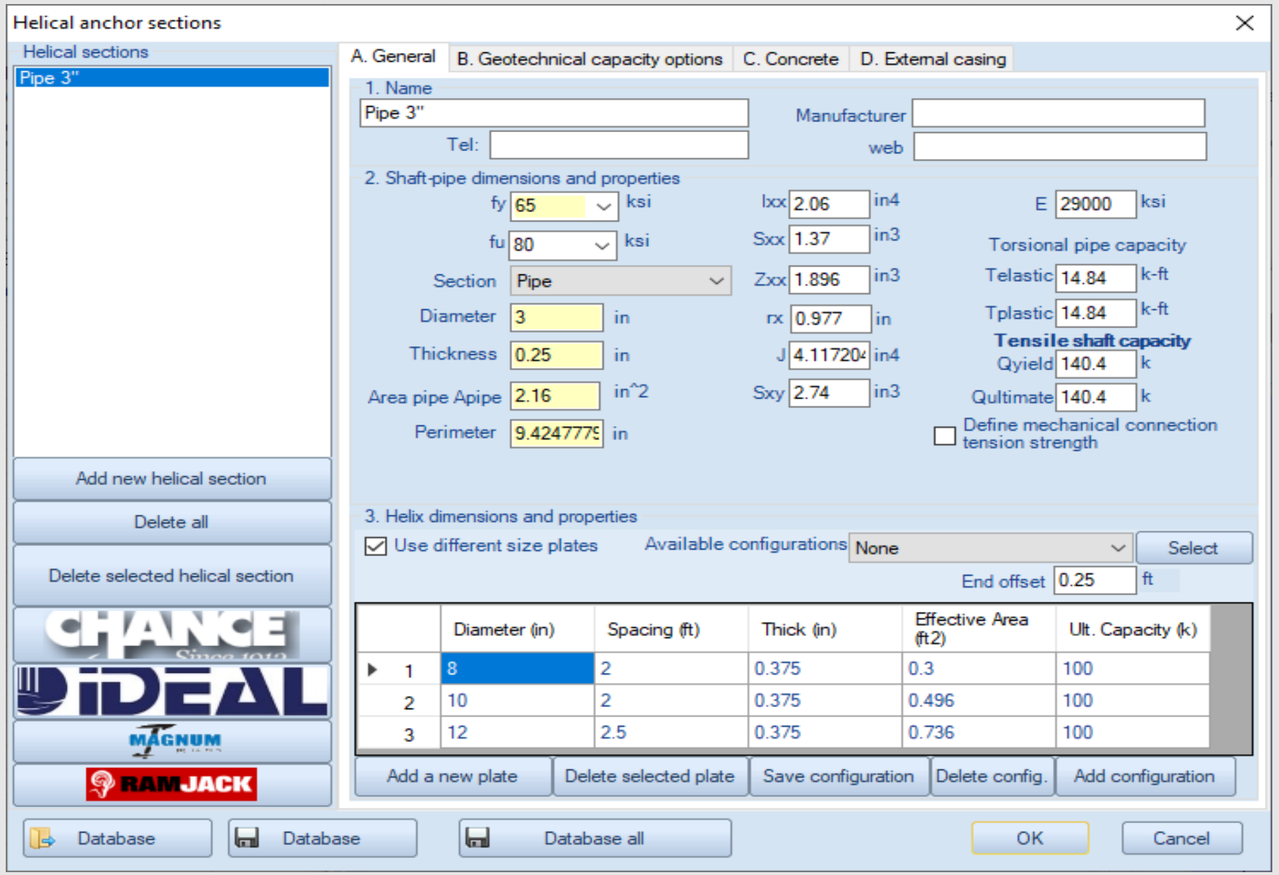
DeepFND/HelixPile - Available Helical Pile Types and Options



- ✓ Create and save to database multiple helical pile sections
- ✓ Each helical pile section can have multiple helix configurations
- ✓ Bearing capacity calculations, lateral pile analysis, installation torque estimation



Available Helical Pile Types:

- Circular Hollow Piles
- Square Solid Piles
- Square Hollow Piles

Bearing Capacity Methods for Helical Piles:

- Cylinder Method
- Individual Plate Method

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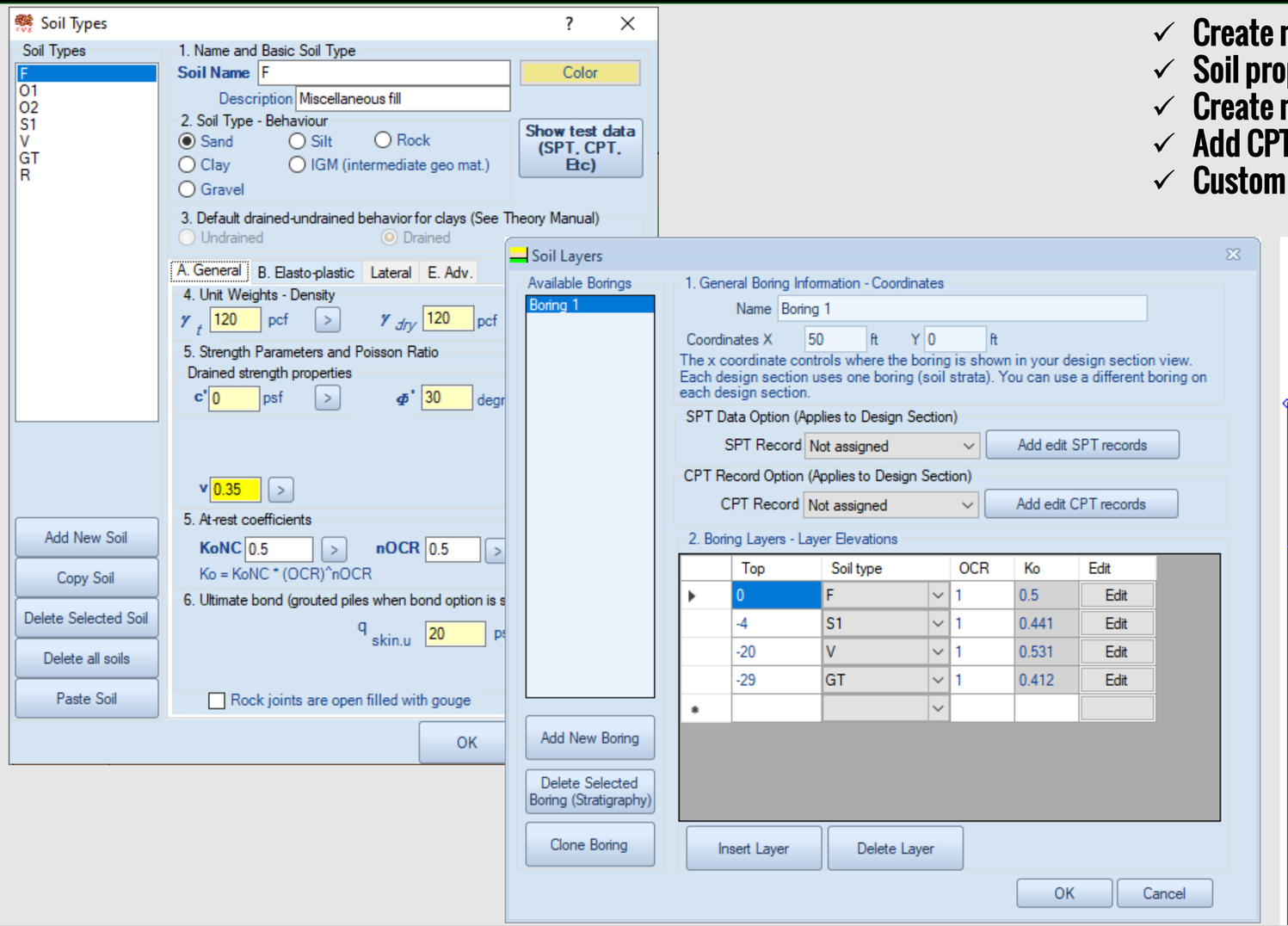
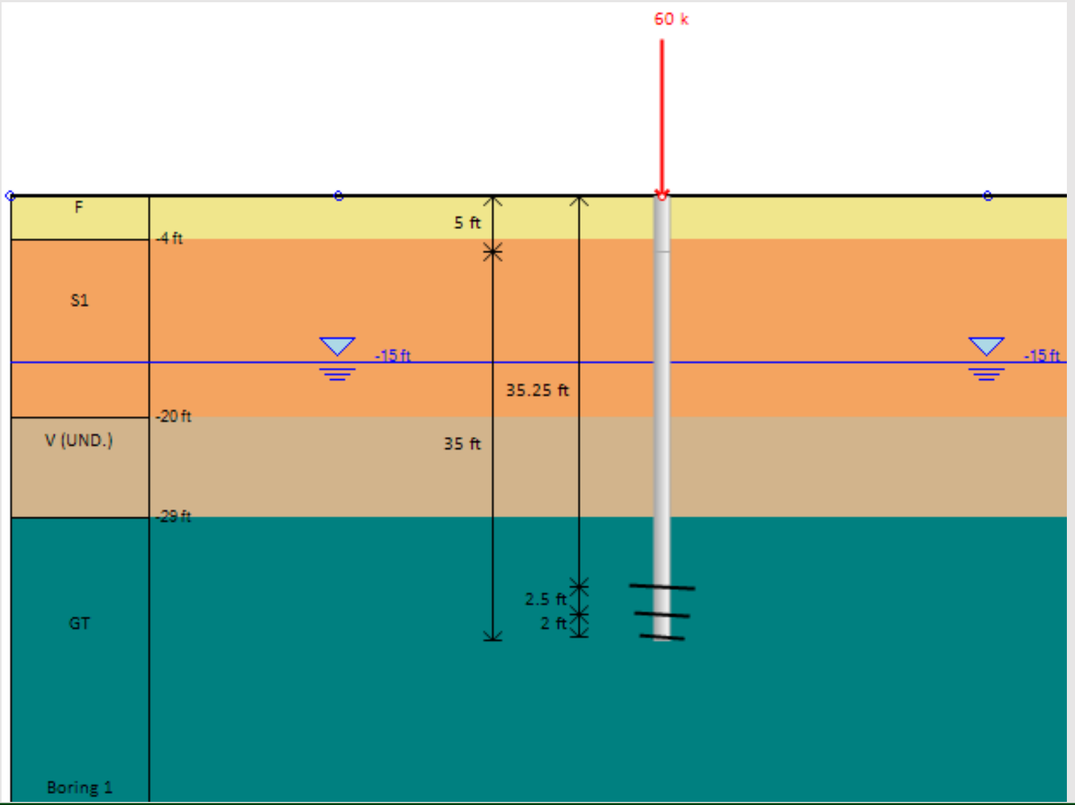
DeepFND/HelixPile - Soils and Stratigraphy



- ✓ Create multiply soil types and define soil properties
- ✓ Soil properties estimation tools (NSPT values - test data)
- ✓ Create multiple borings and define the horizontal stratigraphy
- ✓ Add CPT logs and SPT Records - Estimate properties from records
- ✓ Custom Layer mode: Create inclined soil layers



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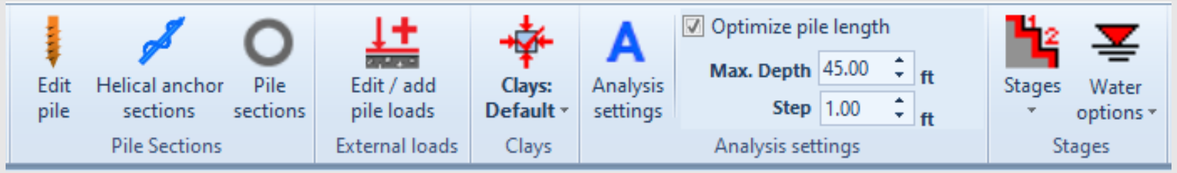
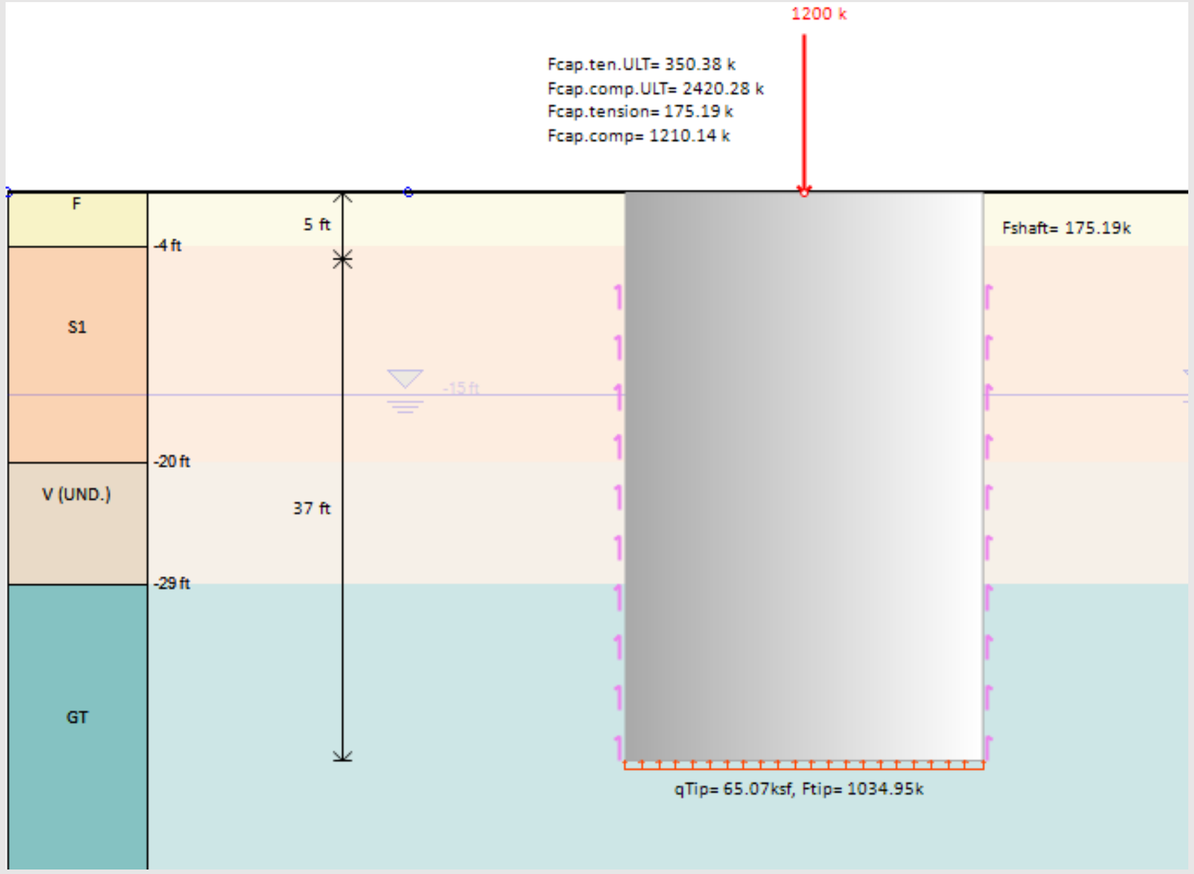
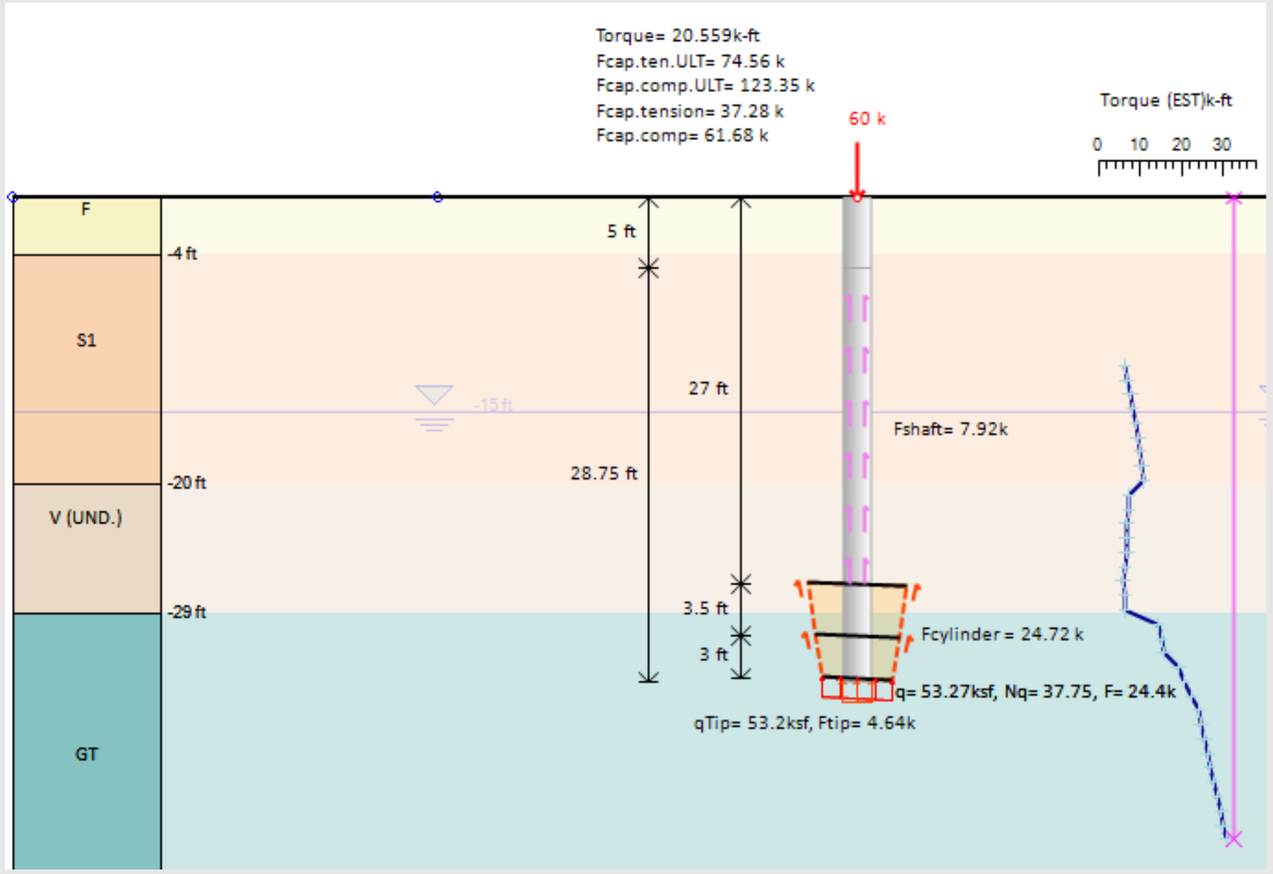
DeepFND/HelixPile - Vertical Analysis - Pile Length Optimization



- ✓ Add axial loads on the pile head (tension - compression)
- ✓ Calculate tension - compression bearing capacity
- ✓ Optimize pile length for the defined tension and compression loads





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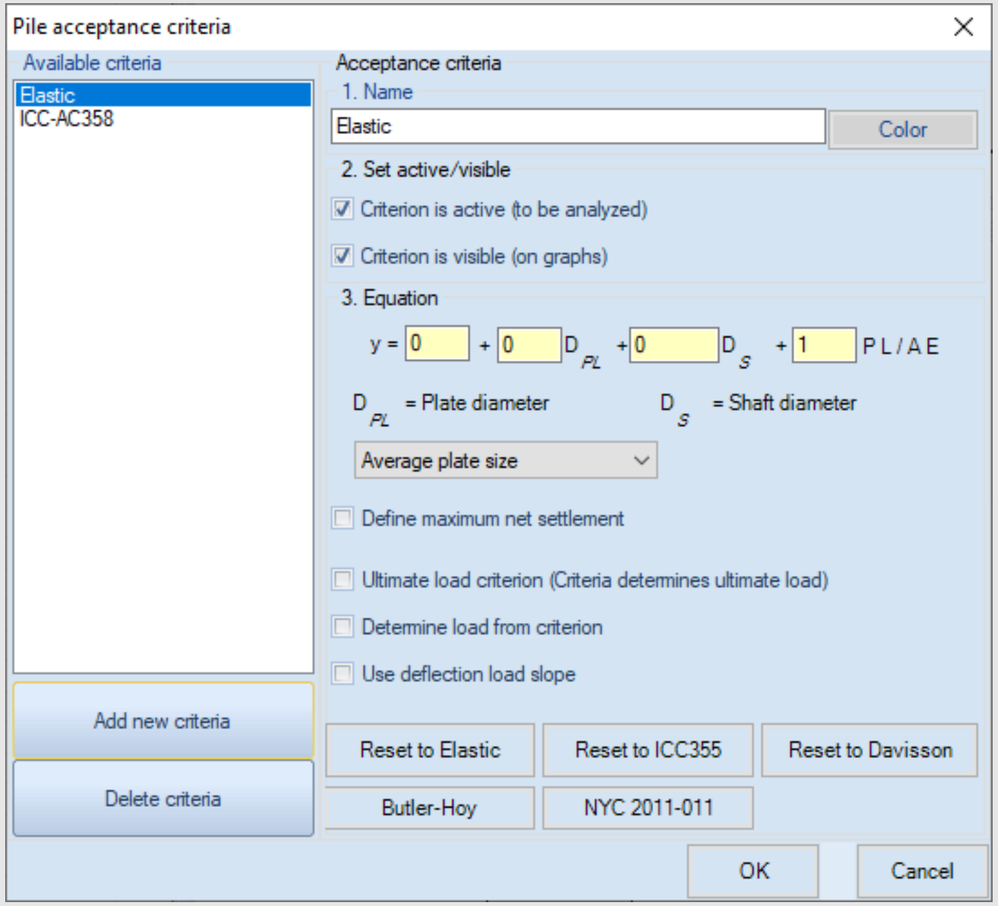
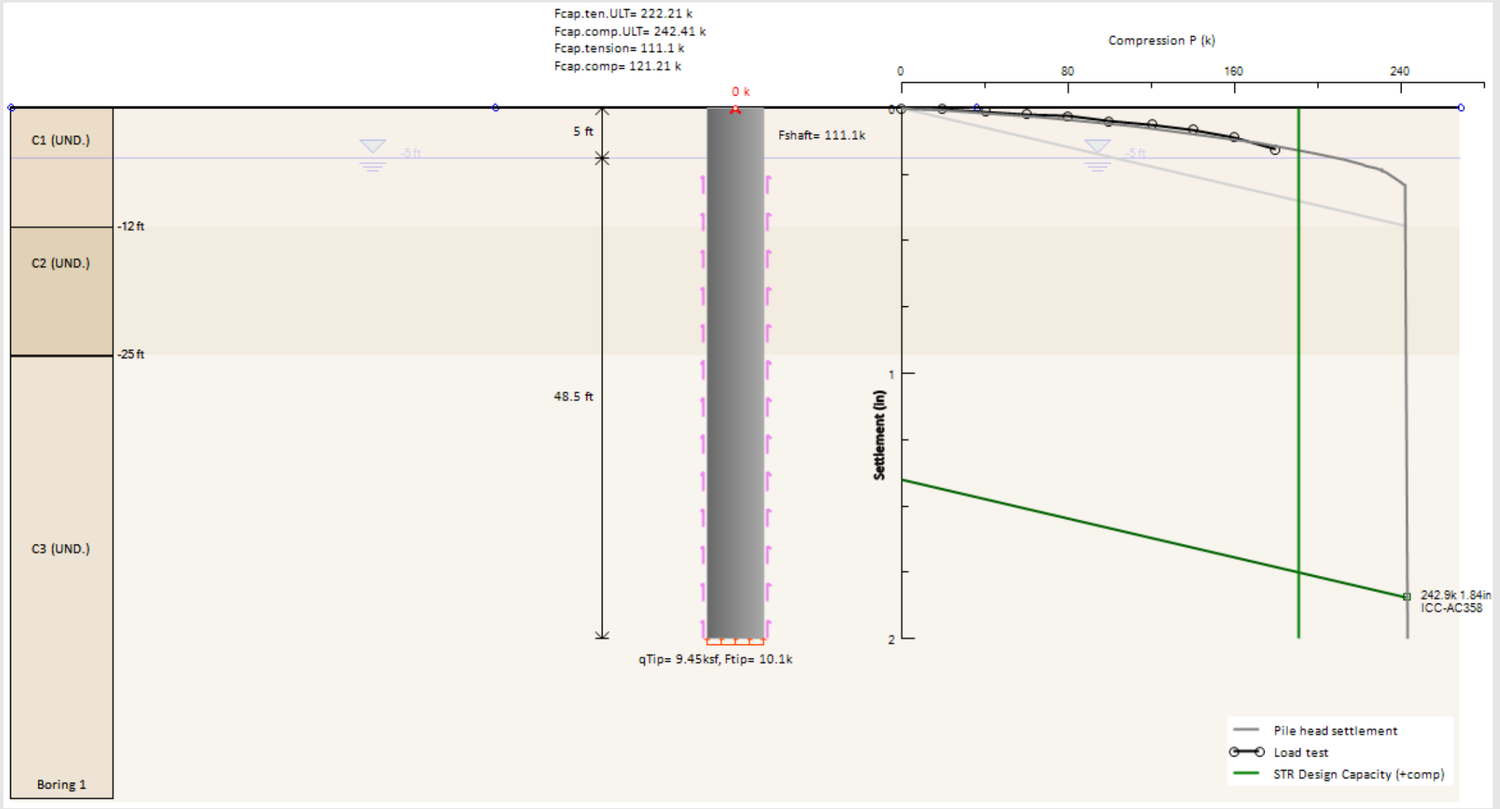
DeepFND/HelixPile - Settlement Analysis Options

- ✓ Option to estimate pile settlements
- ✓ Pile acceptance criteria: Davisson, ICC 355, NYC 2011, Butler-Hoy and more
- ✓ Estimate pile structural capacity from pile criteria
- ✓ Add and review Axial Load Tests





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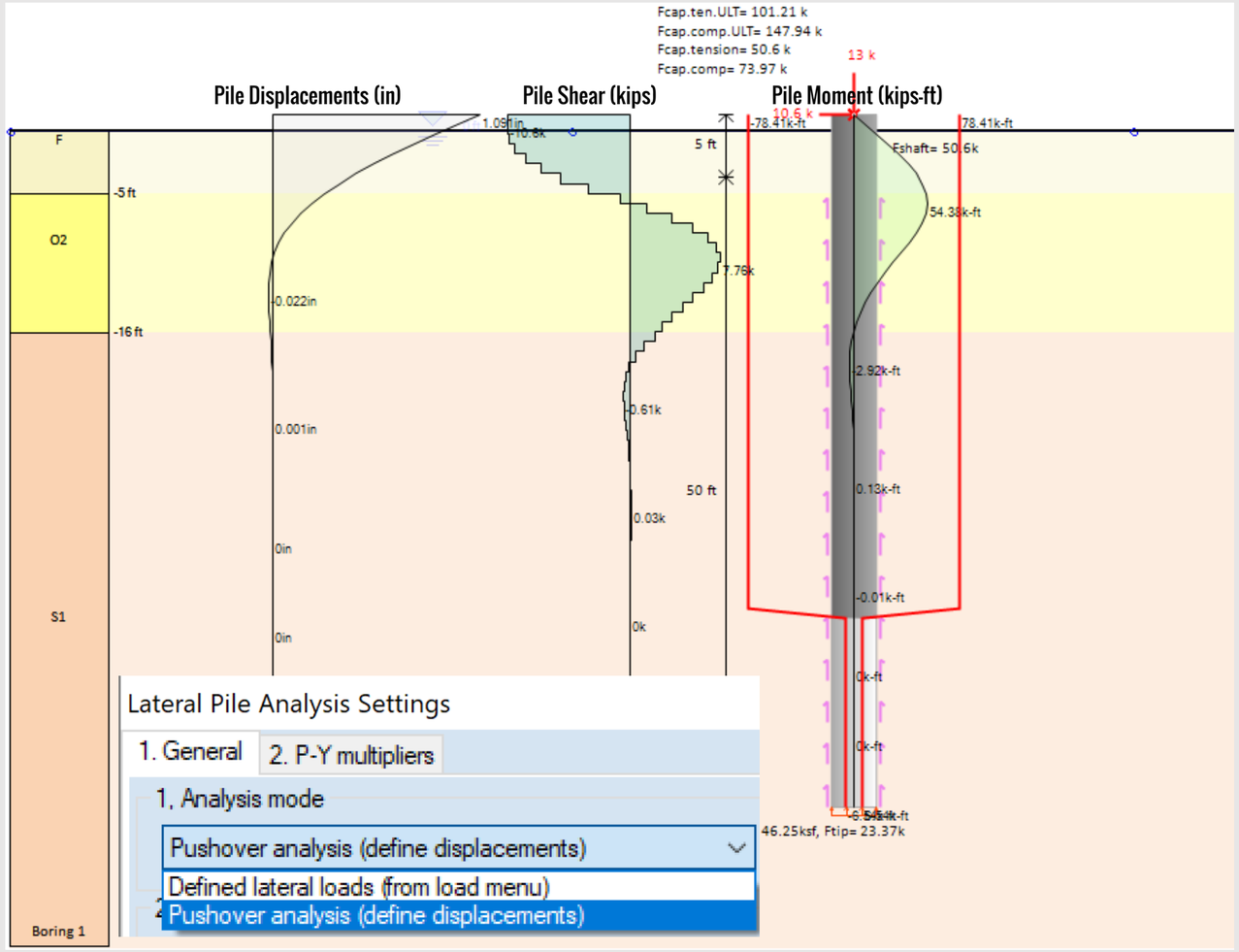
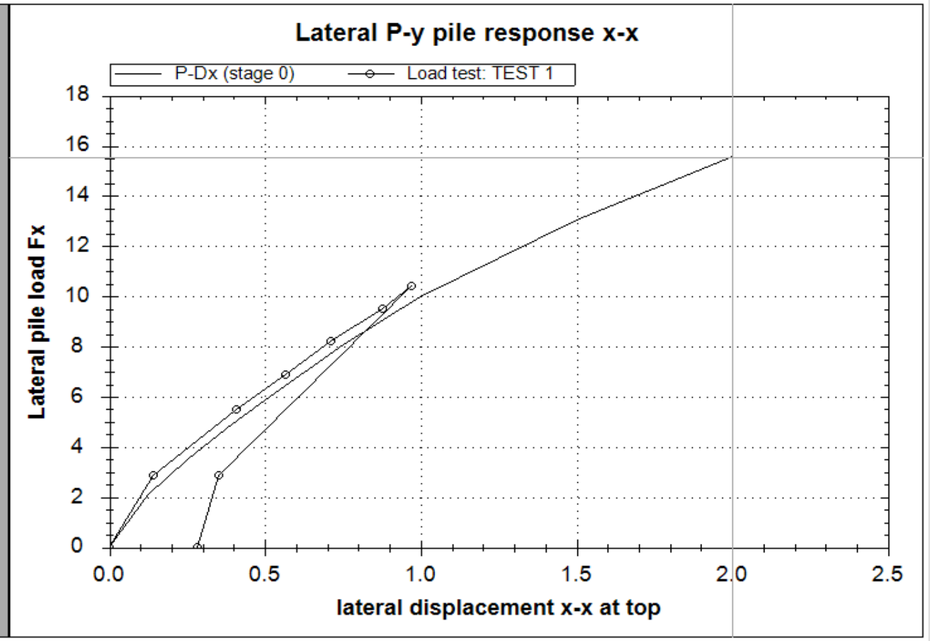
DeepFND/HelixPile - Lateral Pile Analysis Options



- ✓ Define lateral loads on the pile head (both local X and Y directions)
- ✓ Define lateral soil properties (implemented PY models for different soil types)
- ✓ Calculate lateral pile displacements for defined loads
- ✓ Perform pushover analysis
- ✓ Add and review lateral load tests
- ✓ Calculate pile moment and shear diagrams

A. General | B. Prestress-Unbraced | C. Corrosion | D. Results | P-y | Lateral x-x | Lateral y-y

	Displacement x (in)	Lateral Load Fx (k)	Moment Mx (k-ft)
▸	0	0	0
	0.125	2.12	-8.09
	0.25	3.5	-14.62
	0.375	4.73	-20.94
	0.5	5.9	-26.96
	0.75	8.07	-38.73
	1	9.96	-50.3
	1.5	13.06	-71.15
	2	15.56	-90.15



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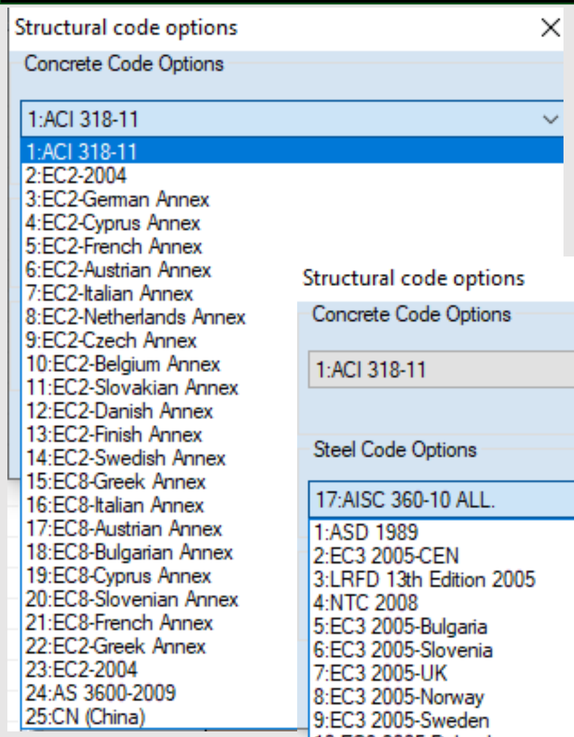
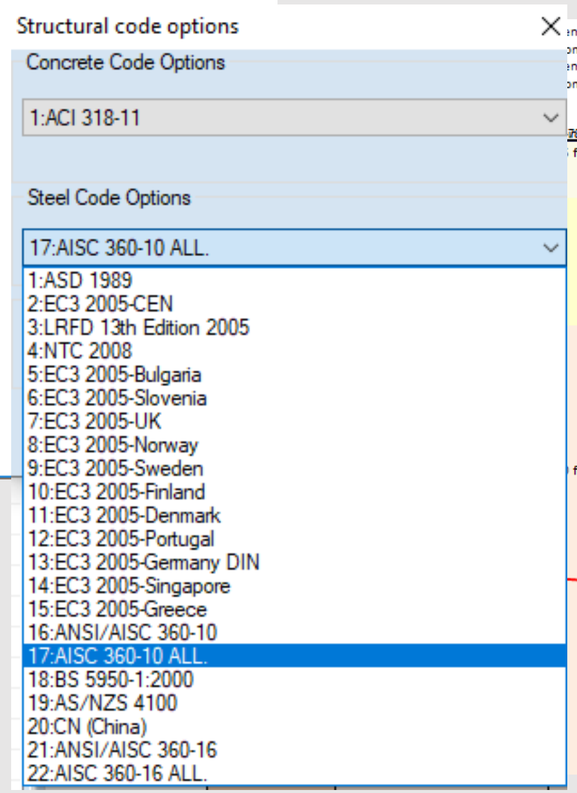
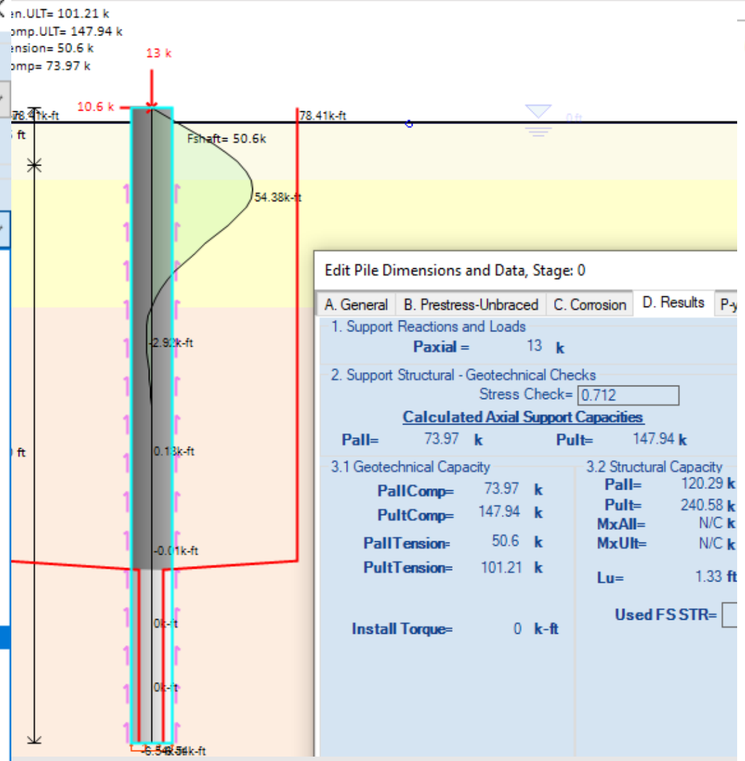
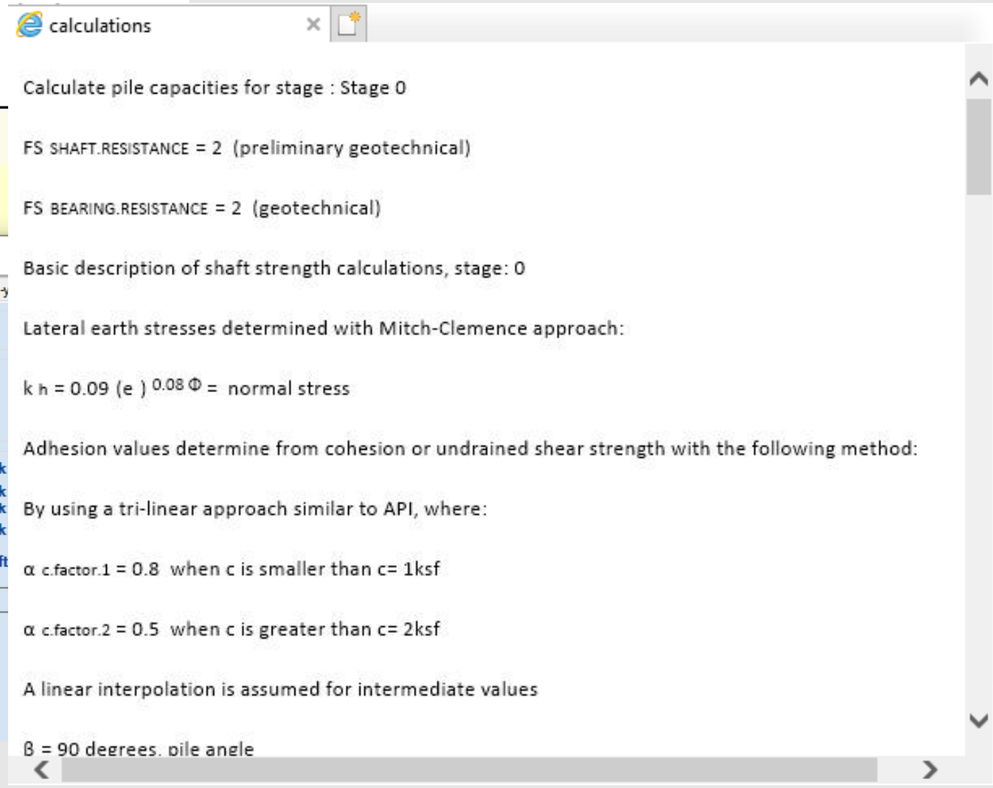
DeepFND/HelixPile - Structural Design of Piles









- ✓ Structural Design Codes: ACI, AISC, LRFD, Eurocodes 2, 3 & 8, AS3600, AS 4100, CN + more
- ✓ Calculate moment capacity
- ✓ Perform all checks according to the selected design standard
- ✓ Export detailed report with all structural design calculations

PART 2: DeepFND/HelixPile Additional Modules and Standard Packages

More information:

Click here to learn more:
DeepFND - Features and Capabilities

Click here to learn more:
HelixPile - Features and Capabilities

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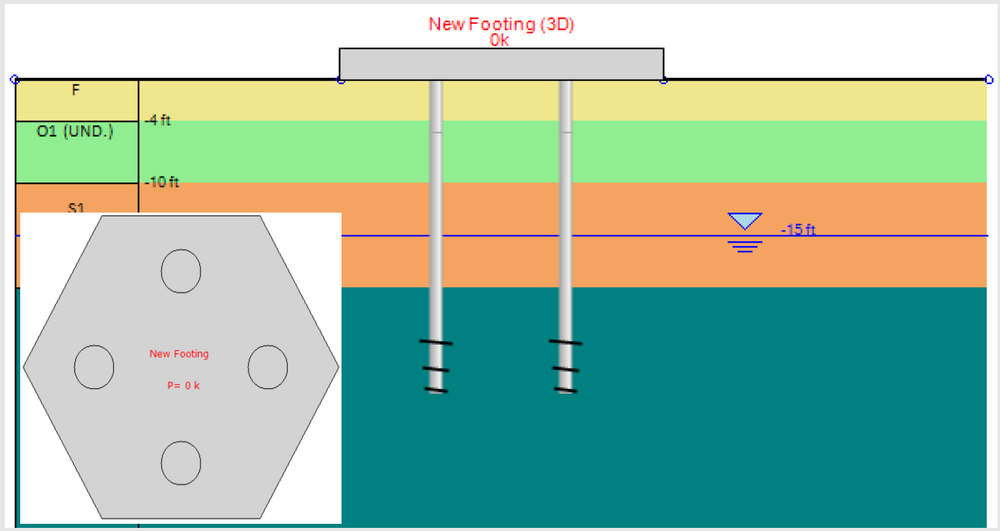
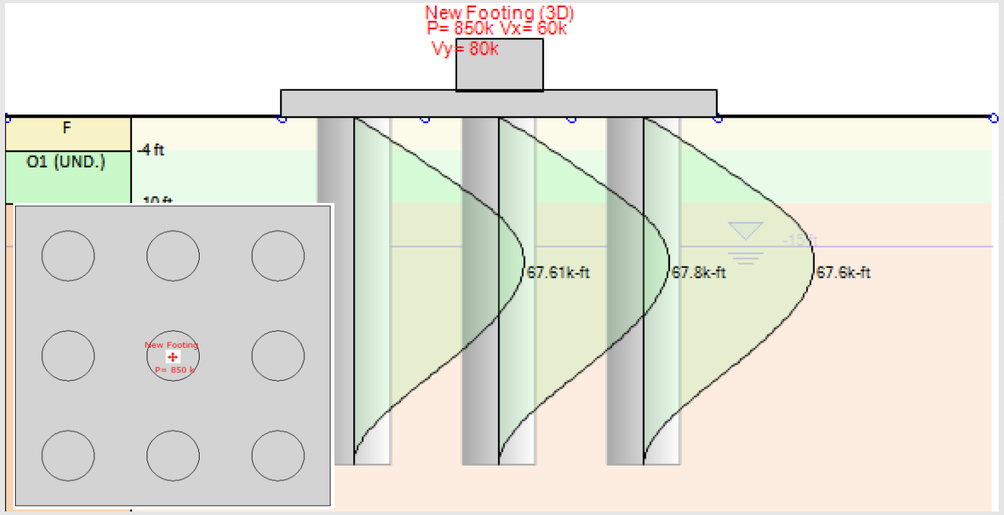
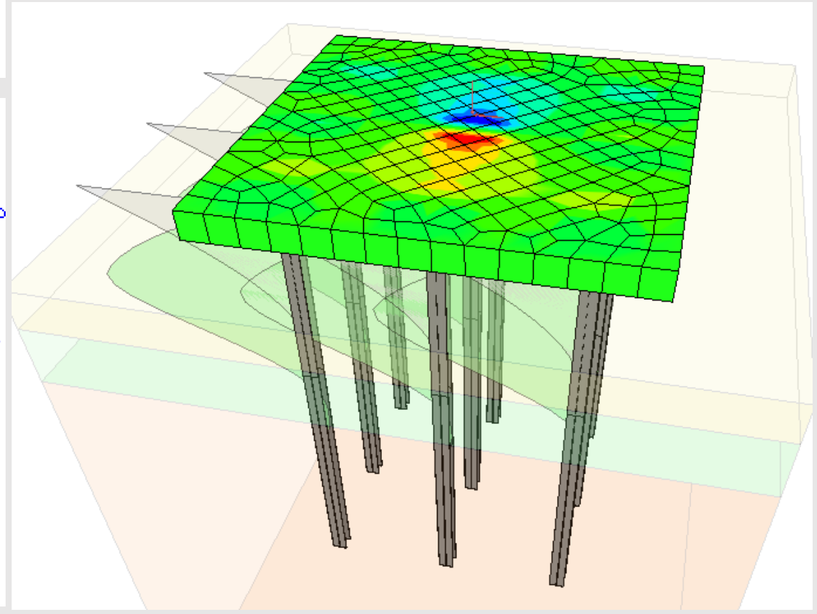
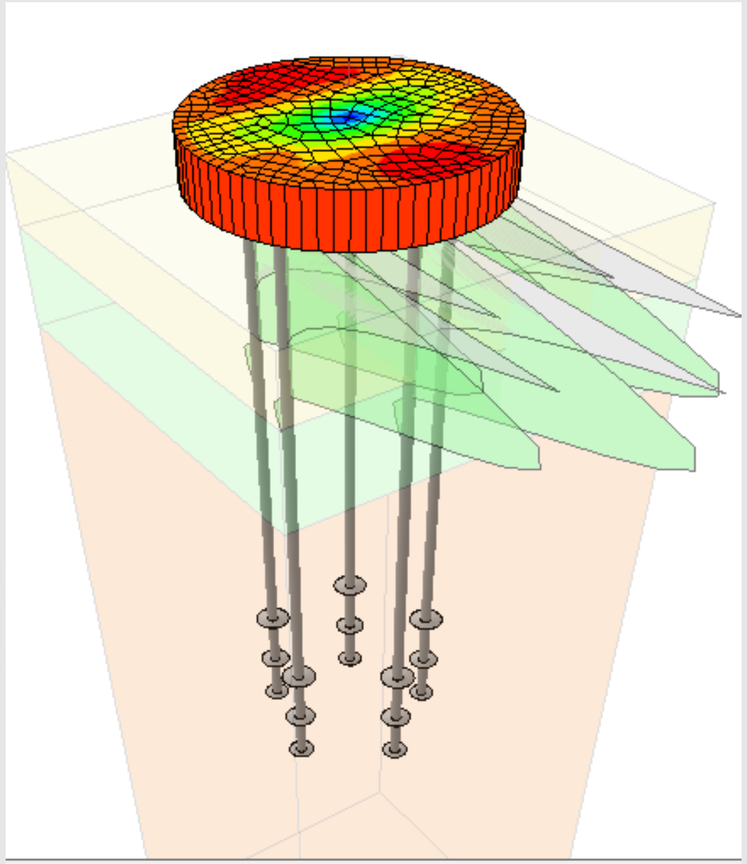
DeepFND/HelixPile - Pile Groups and Pile Rafts





- ✓ Create pile caps of any shape
- ✓ Define pile configurations (positions, structural sections)
- ✓ Distribute the loads applied on the cap to each pile, according to the pile position
- ✓ Design all piles and the pile cap
- ✓ Top view/side section view/3D model
- ✓ Option that the pile cap behaves as pile raft





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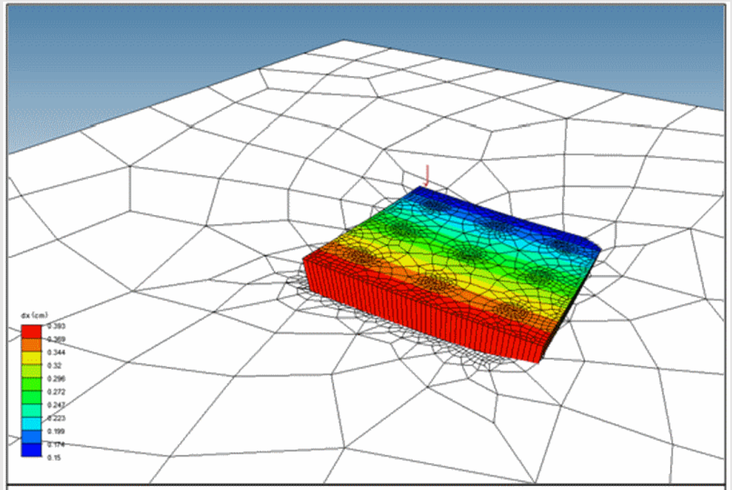
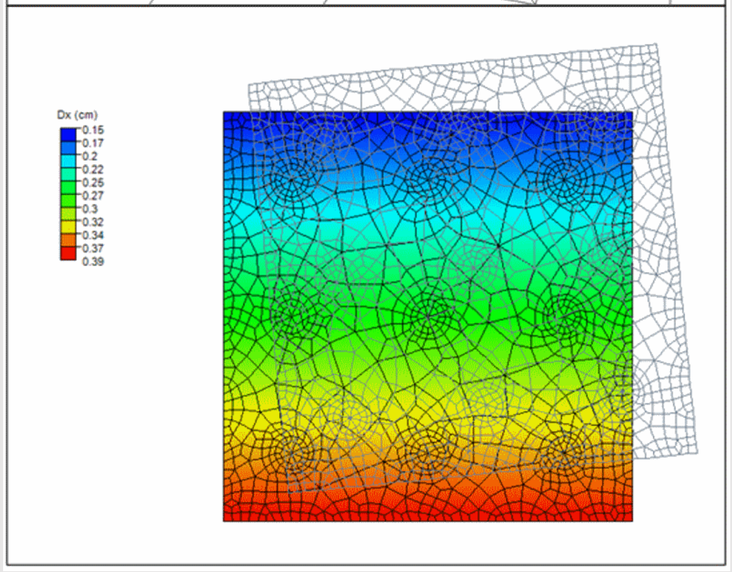
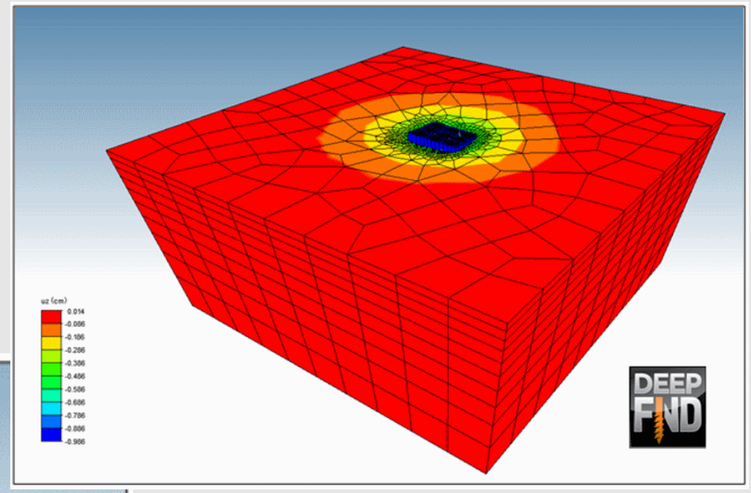
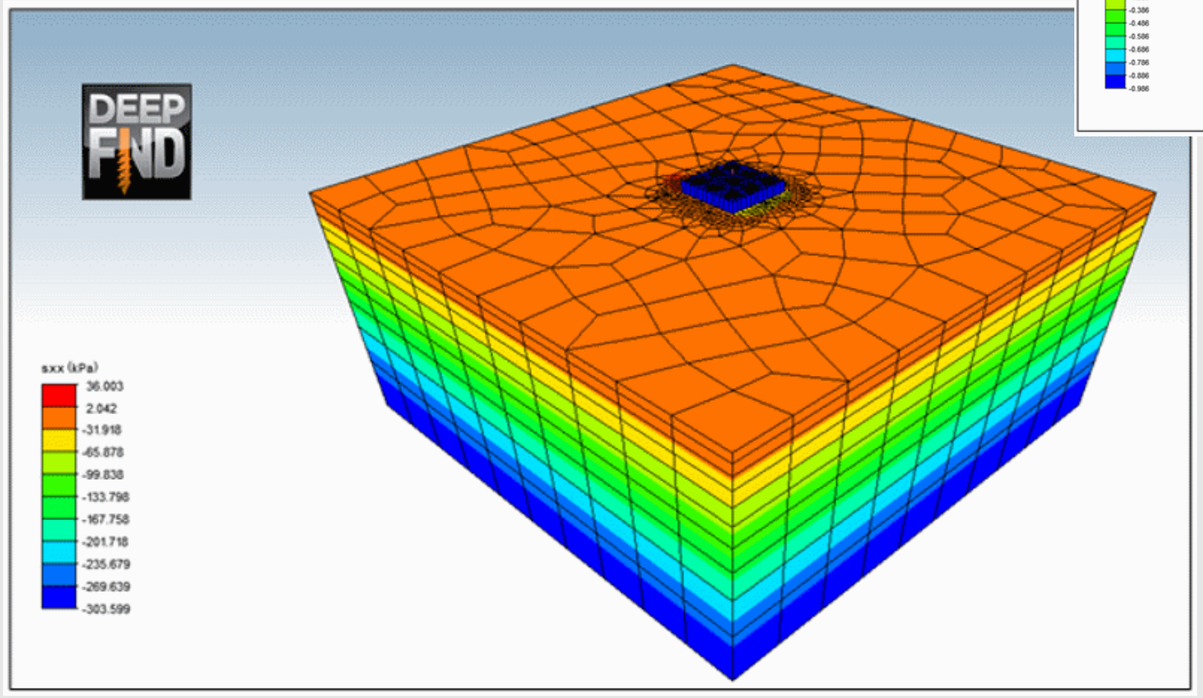
DeepFND - 3D Finite Element Analysis





- ✓ Model the interaction effects of pile rafts and pile groups in a detailed manner
- ✓ Monitor stress and displacement/settlement at any location at the surface and within the soil medium
- ✓ Use sophisticated constitutive laws to simulate soil behavior
- ✓ Calculate the response of your foundation system under dynamic excitation





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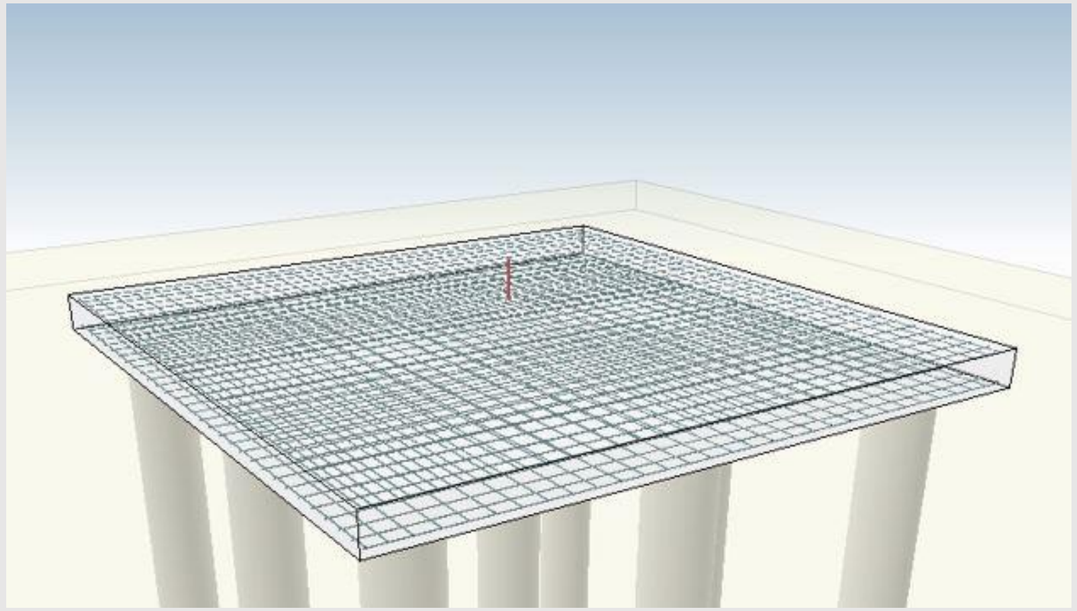
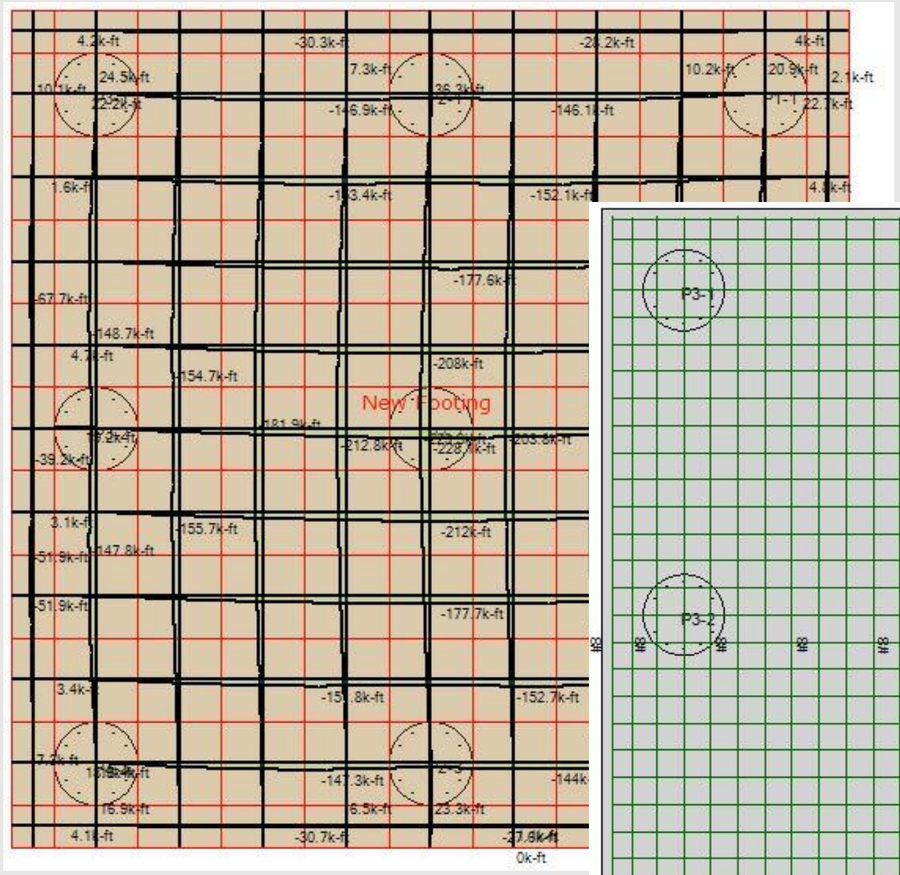
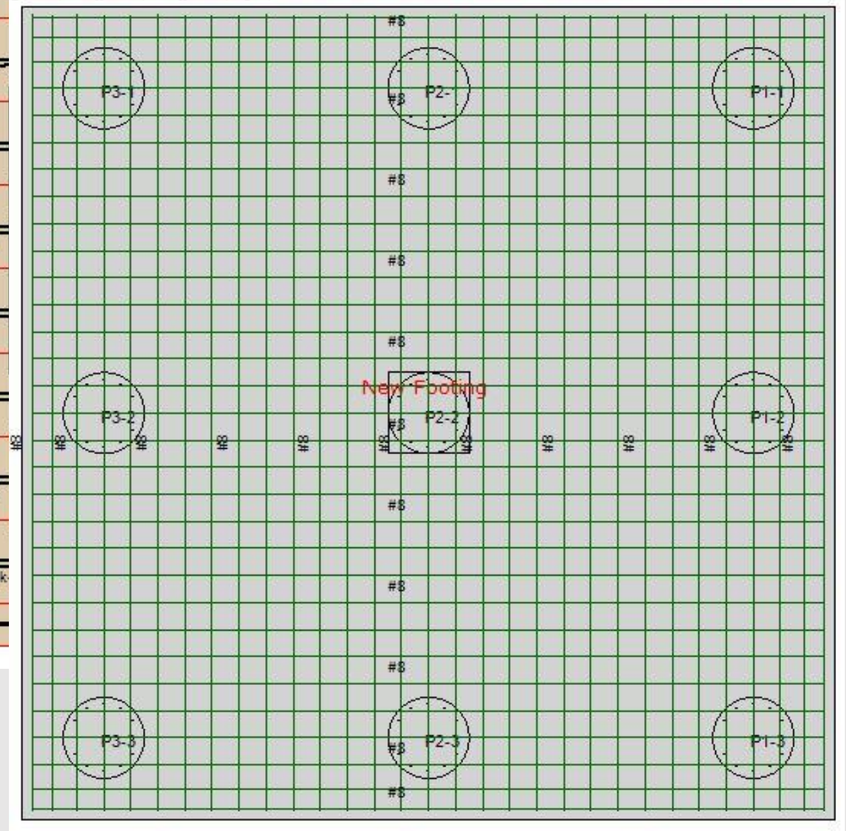
DeepFND - Pile Cap Design & Structural Checks

- ✓ Generate pile cap reinforcement strips
- ✓ Optimize cap reinforcement with a click of a button
- ✓ Calculate punching strength for concrete caps for each pile







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DeepFND/HelixPile - Software Versions

Standard DeepFND Software Packages

DeepFND Basic
Vertical and Lateral Analysis of Single Helical & Non-Helical Piles

DeepFND Pro
Vertical and Lateral Analysis of Single Helical & Non-Helical Piles
Analysis or Pile Caps and Rafts (PY Spring Method)

DeepFND Pro+
Vertical and Lateral Analysis of Single Helical & Non-Helical Piles
Analysis or Pile Caps and Rafts (PY Spring Method)
Pile Cap Design

DeepFND Expert
Vertical and Lateral Analysis of Single Helical & Non-Helical Piles
Analysis or Pile Caps and Rafts (PY Spring & 3D FEM)

DeepFND Expert+
Vertical and Lateral Analysis of Single Helical & Non-Helical Piles
Analysis or Pile Caps and Rafts (PY Spring & 3D FEM)
Pile Cap Design

Standard HelixPile Software Packages

HelixPile - Single Piles
Vertical and Lateral Analysis of Single Helical Piles

HelixPile Full
Vertical and Lateral Analysis of Single Helical Piles
+ Pile Caps with Pile Groups
+ Pile Rafts

- 1 Year of full Technical Support (training, questions, file reviews) is included in any software purchase
- Optional Annual Maintenance options (after the first year)
- Discounts for Additional Licenses
- Additional Modules can be purchased and activated at any point in any software version

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