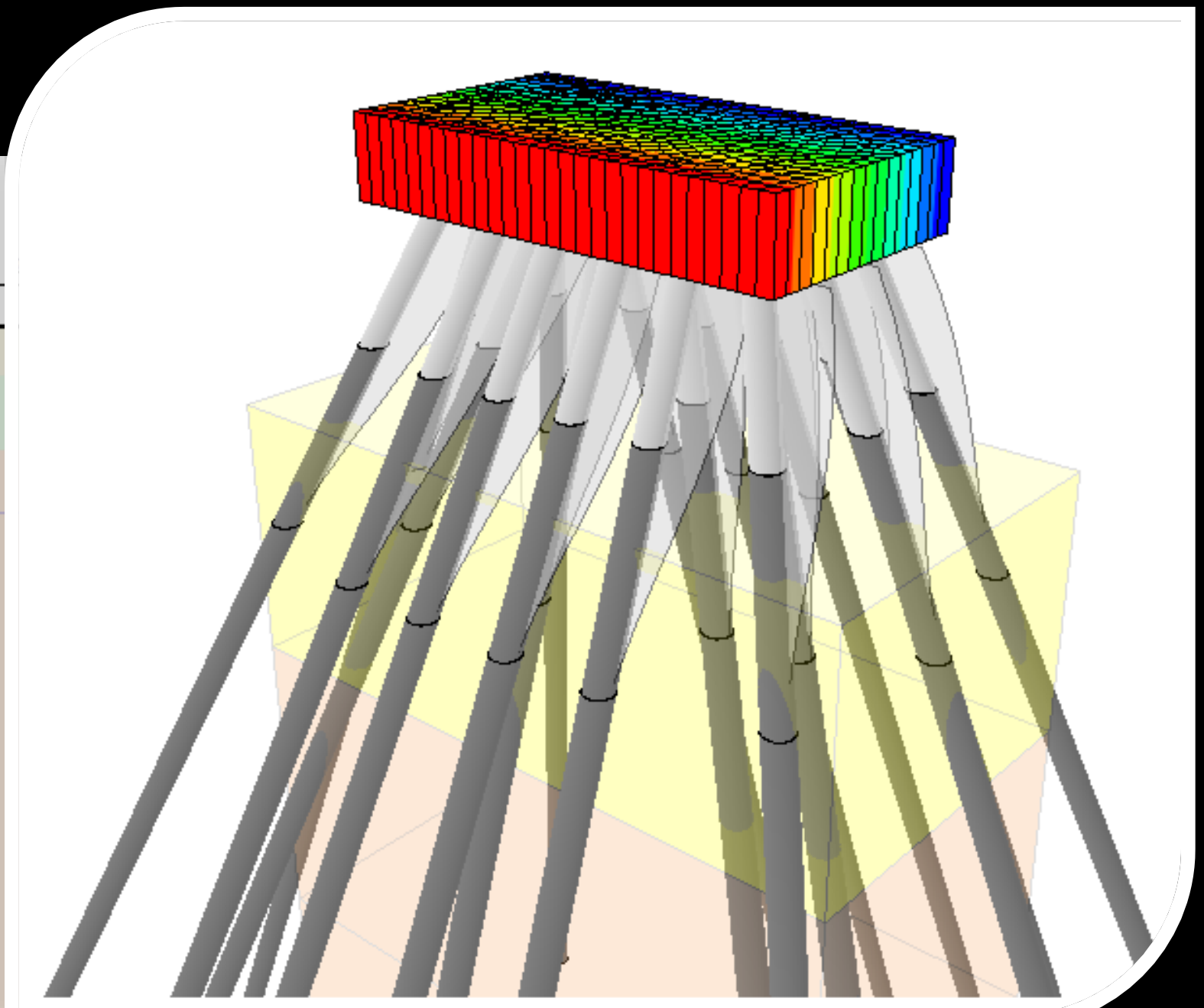
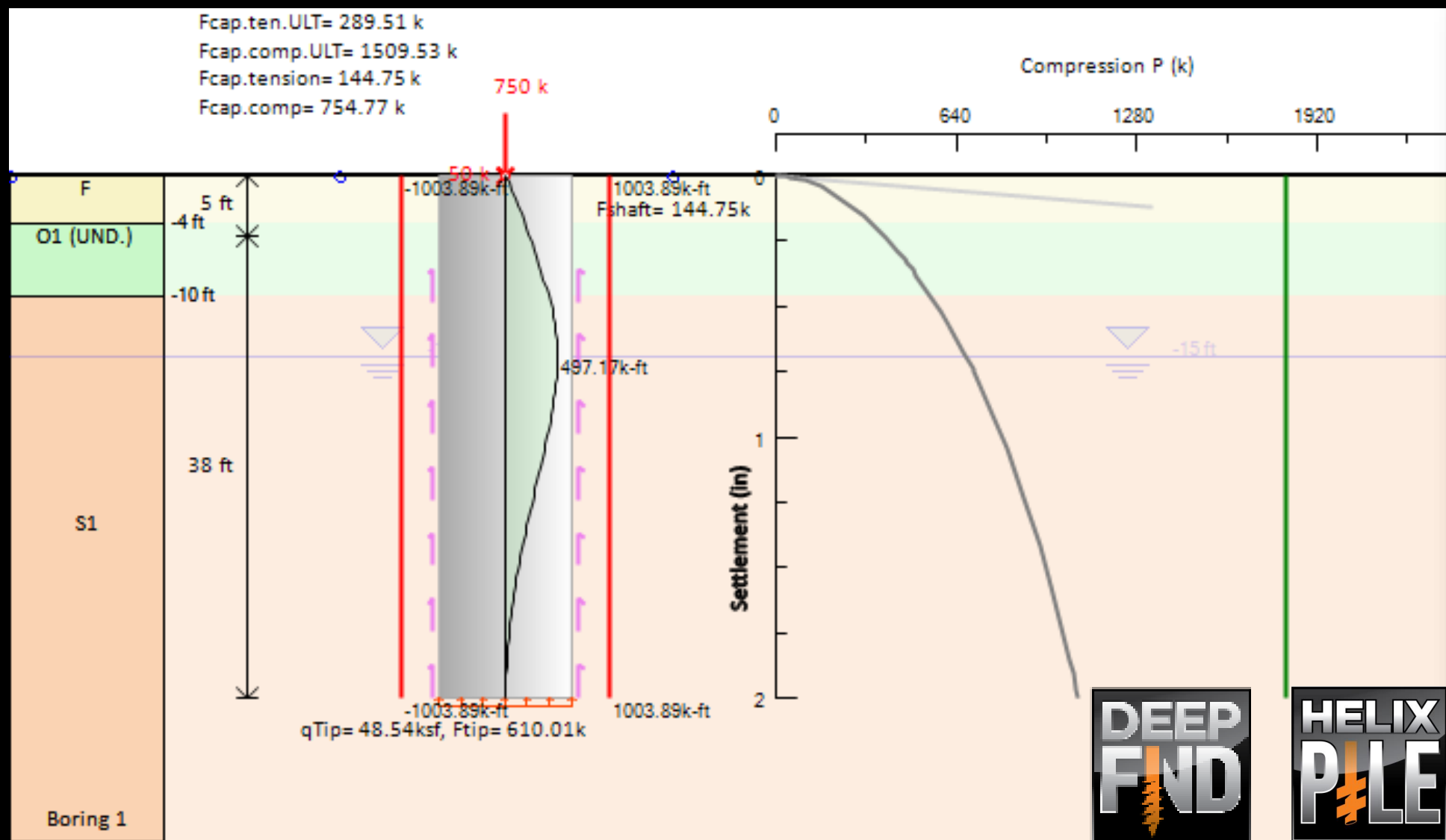


# Design of Deep Foundations - Methods and Software Application

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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



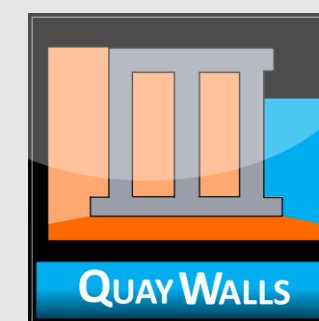
DeepFND



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



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

Single Piles and Pile Groups

Helical Piles

Pile Types - Helix Configuration - Casing:

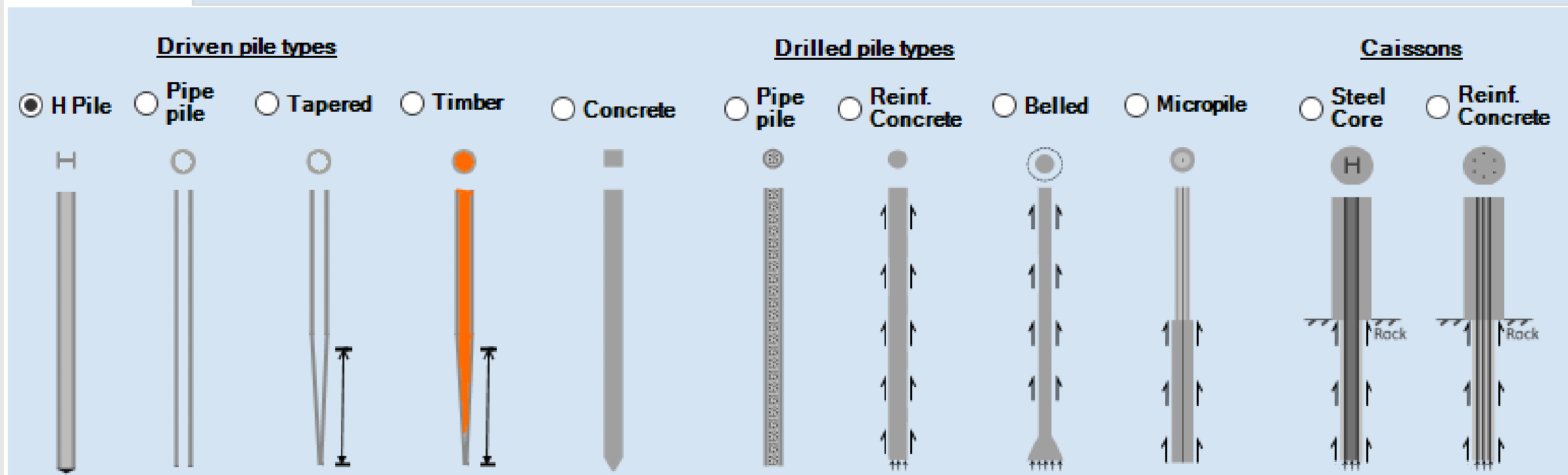
- ✓ Pipes
- ✓ Square Solid
- ✓ Square Hollow
- ✓ Include Several Helix Configurations on each Pile
- ✓ Use of External Casing
- ✓ Option to have Grouted Piles

Helical Piles also Analyzed with:



HelixPile: Helical Piles  
Design Software

Common pile types



Pile Sections:

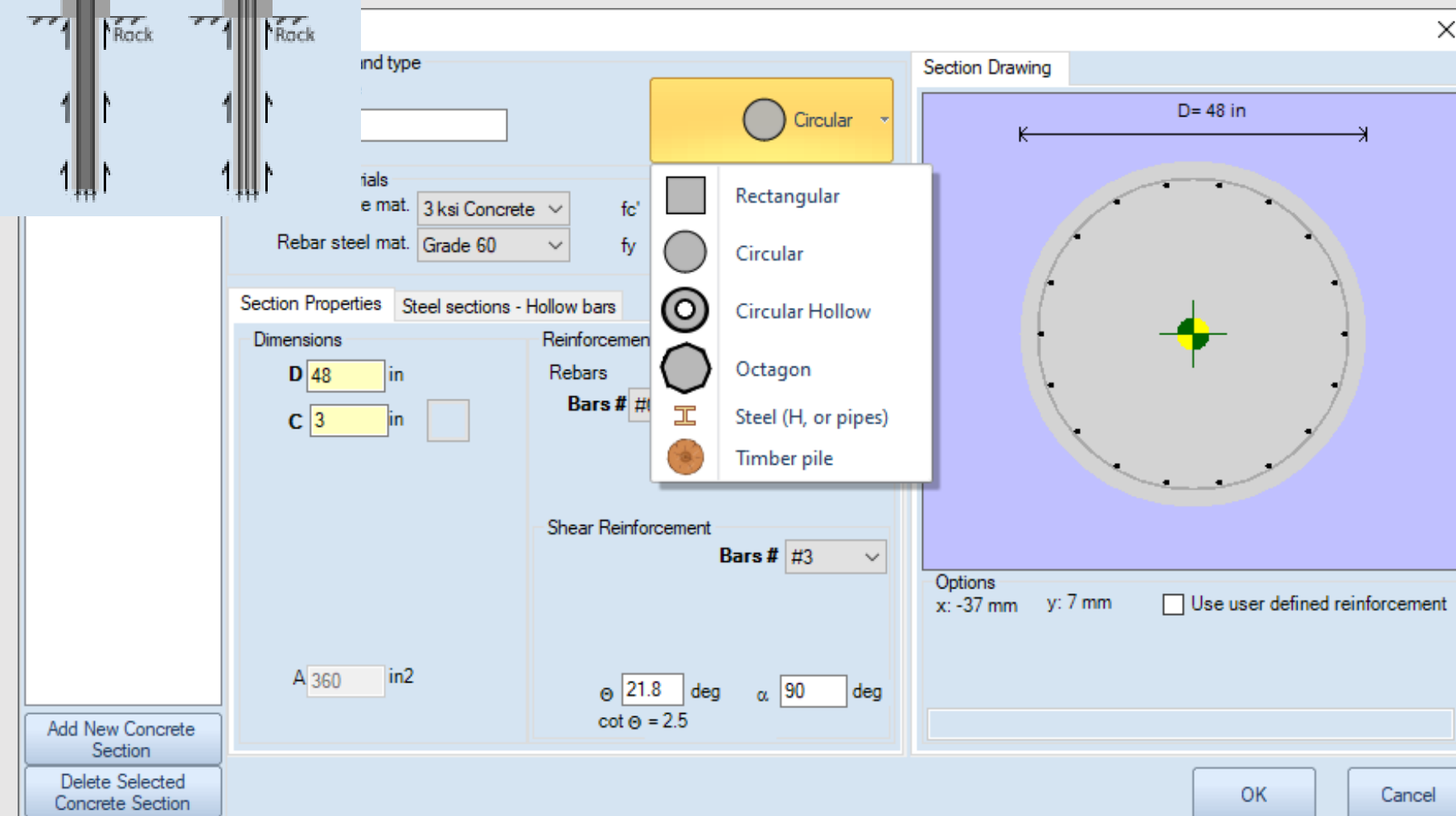
- Concrete Piles (Rectangular, Circular, Octagon)
- Circular Hollow Sections
- Composite Sections
- Steel Beams (Pipes, H beams, channel sections)
- Timber Piles (wood)
- Belled Bottom Piles

Installation Methods:

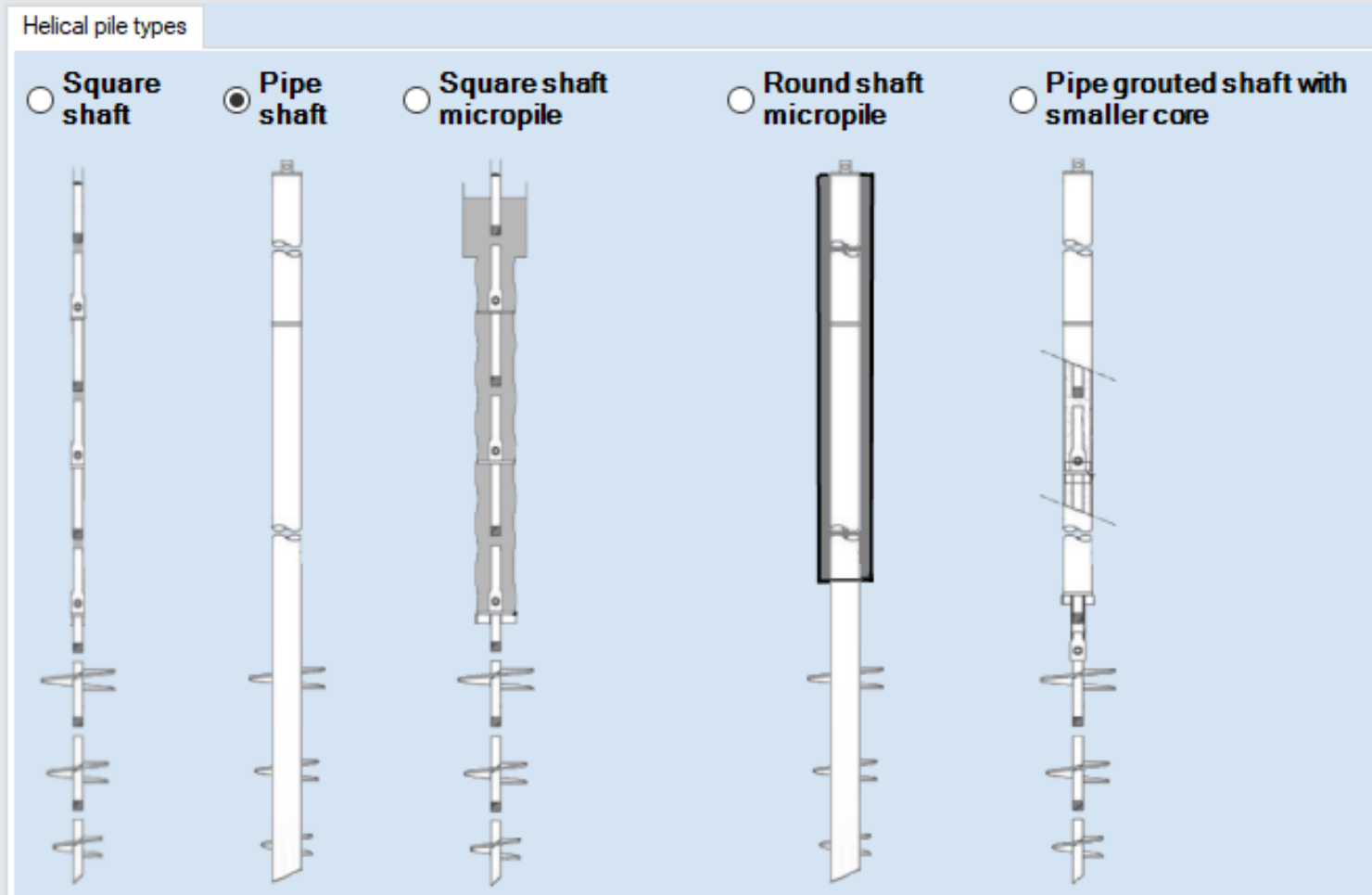
- Drilled Piles
- Driven Piles
- Caissons
- Continuous Flight Auger Piles (CFA)
- Drilled-In-Displacement Piles

Implemented Methods:

- FHWA GEC 8 and GEC 10
- AASHTO LRFD Norlund







- ✓ 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

**Helical anchor sections**

Helical sections

Pipe 3"

A. General | B. Geotechnical capacity options | C. Concrete | D. External casing

1. Name  
 Pipe 3" Manufacturer  
 Tel: web

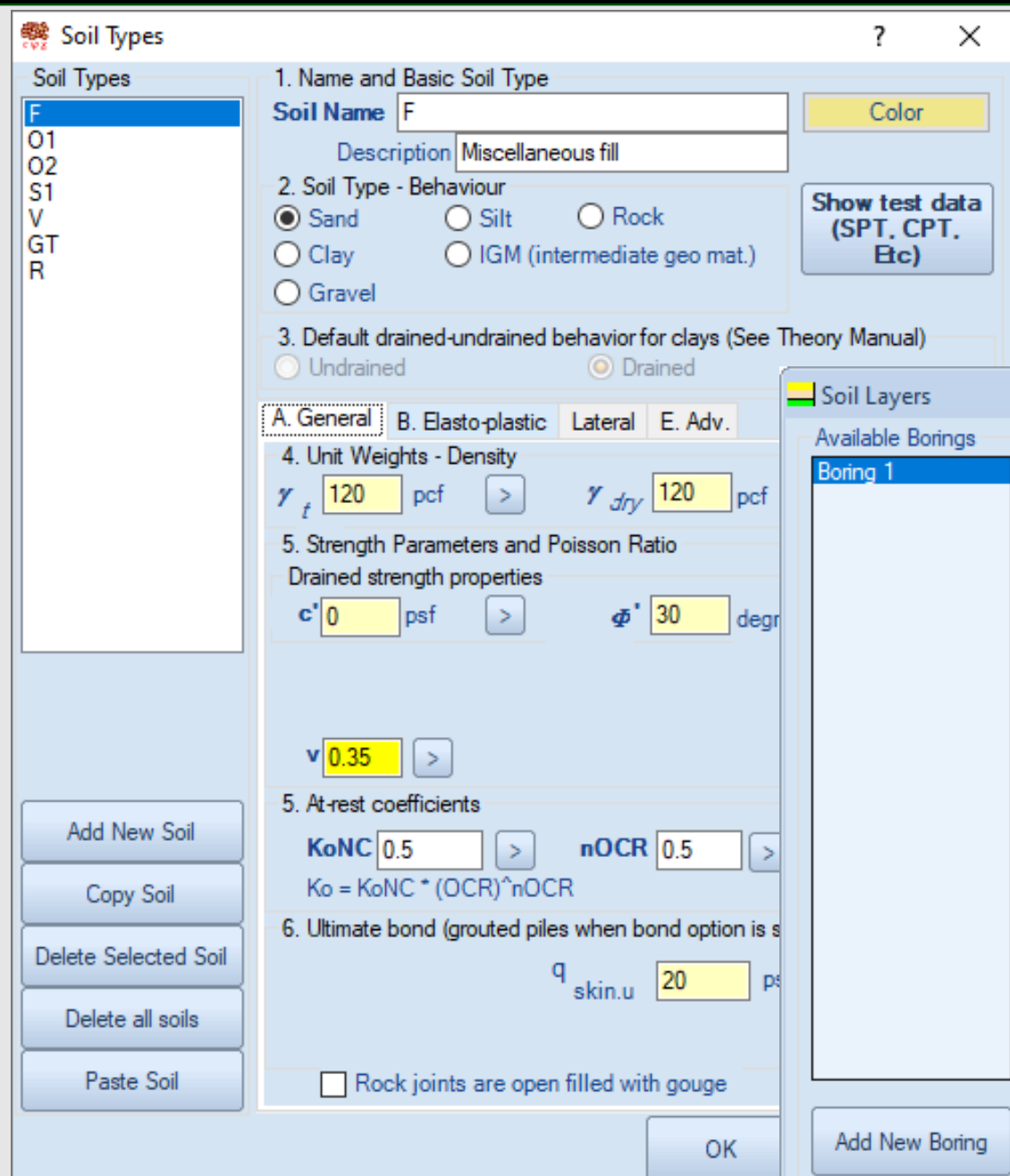
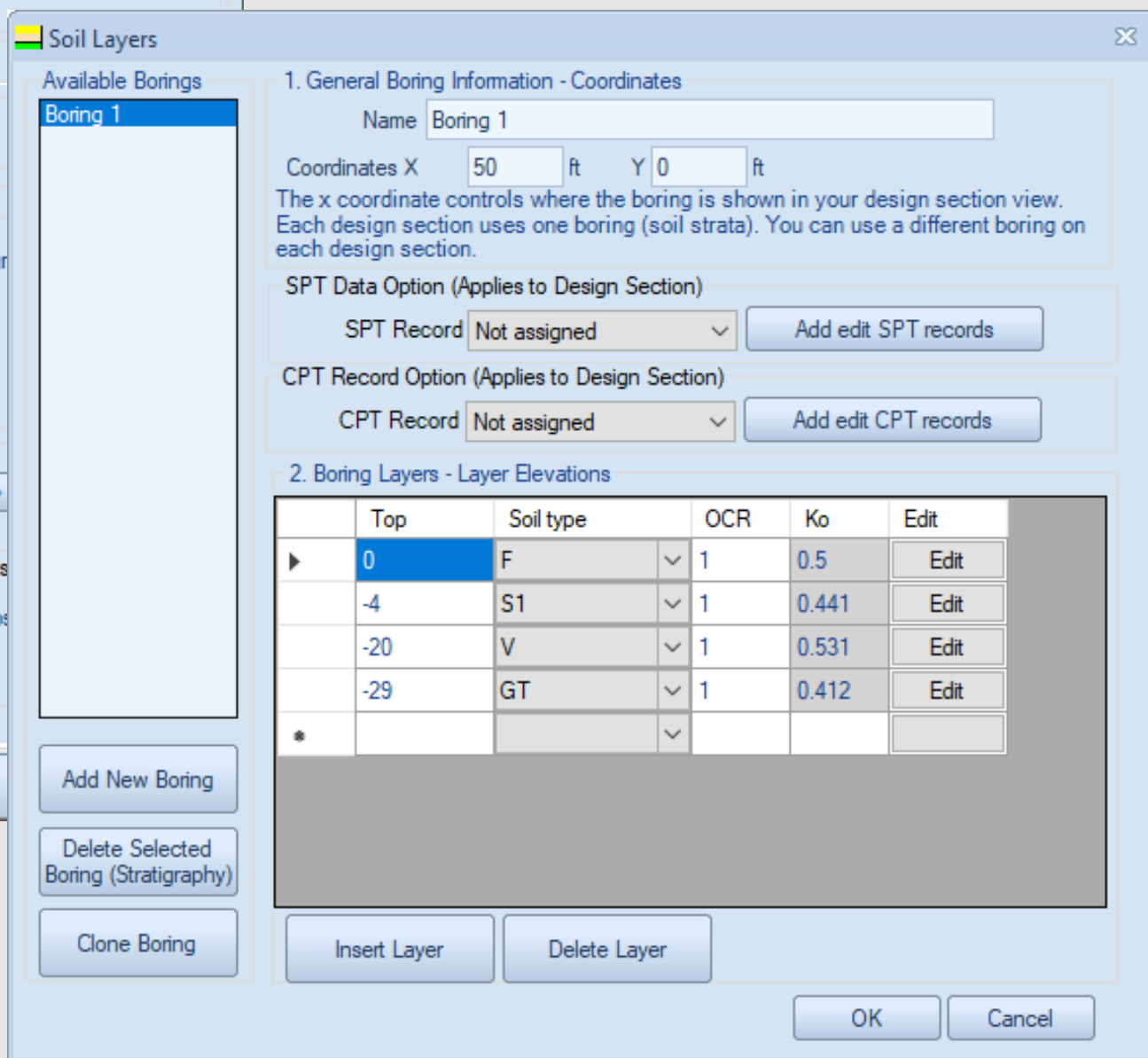
2. Shaft-pipe dimensions and properties  
 fy 65 ksi lxx 2.06 in4 E 29000 ksi  
 fu 80 ksi Sxx 1.37 in3 Torsional pipe capacity  
 Section Pipe Zxx 1.896 in3 Telastic 14.84 k-ft  
 Diameter 3 in rx 0.977 in Tplastic 14.84 k-ft  
 Thickness 0.25 in J 4.117204 in4 **Tensile shaft capacity**  
 Area pipe Apipe 2.16 in<sup>2</sup> Sxy 2.74 in3 Qyield 140.4 k  
 Perimeter 9.4247779 in Qultimate 140.4 k  
 Define mechanical connection tension strength

3. Helix dimensions and properties  
 Use different size plates Available configurations None Select  
 End offset 0.25 ft

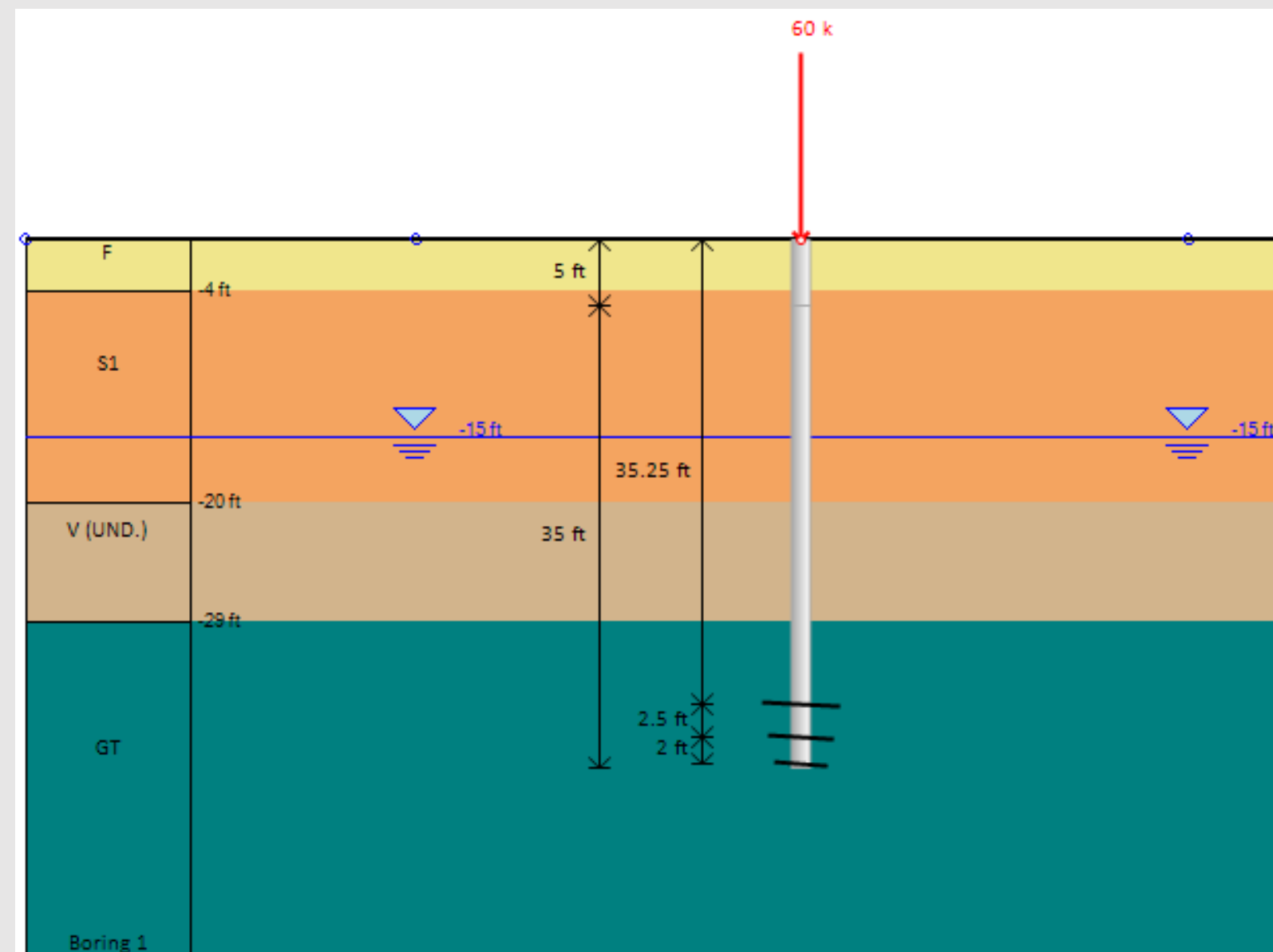
	Diameter (in)	Spacing (ft)	Thick (in)	Effective Area (ft <sup>2</sup> )	Ult. Capacity (k)
▶ 1	8	2	0.375	0.3	100
2	10	2	0.375	0.496	100
3	12	2.5	0.375	0.736	100

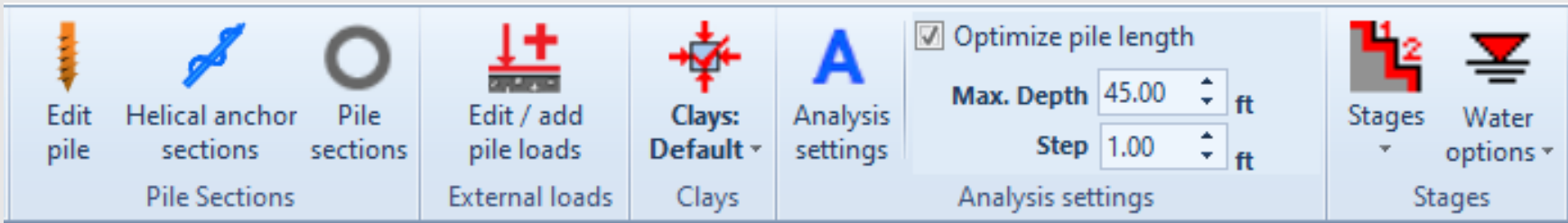
Buttons: Add new helical section, Delete all, Delete selected helical section, Add a new plate, Delete selected plate, Save configuration, Delete config., Add configuration, Database, Database all, OK, Cancel

- ✓ 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

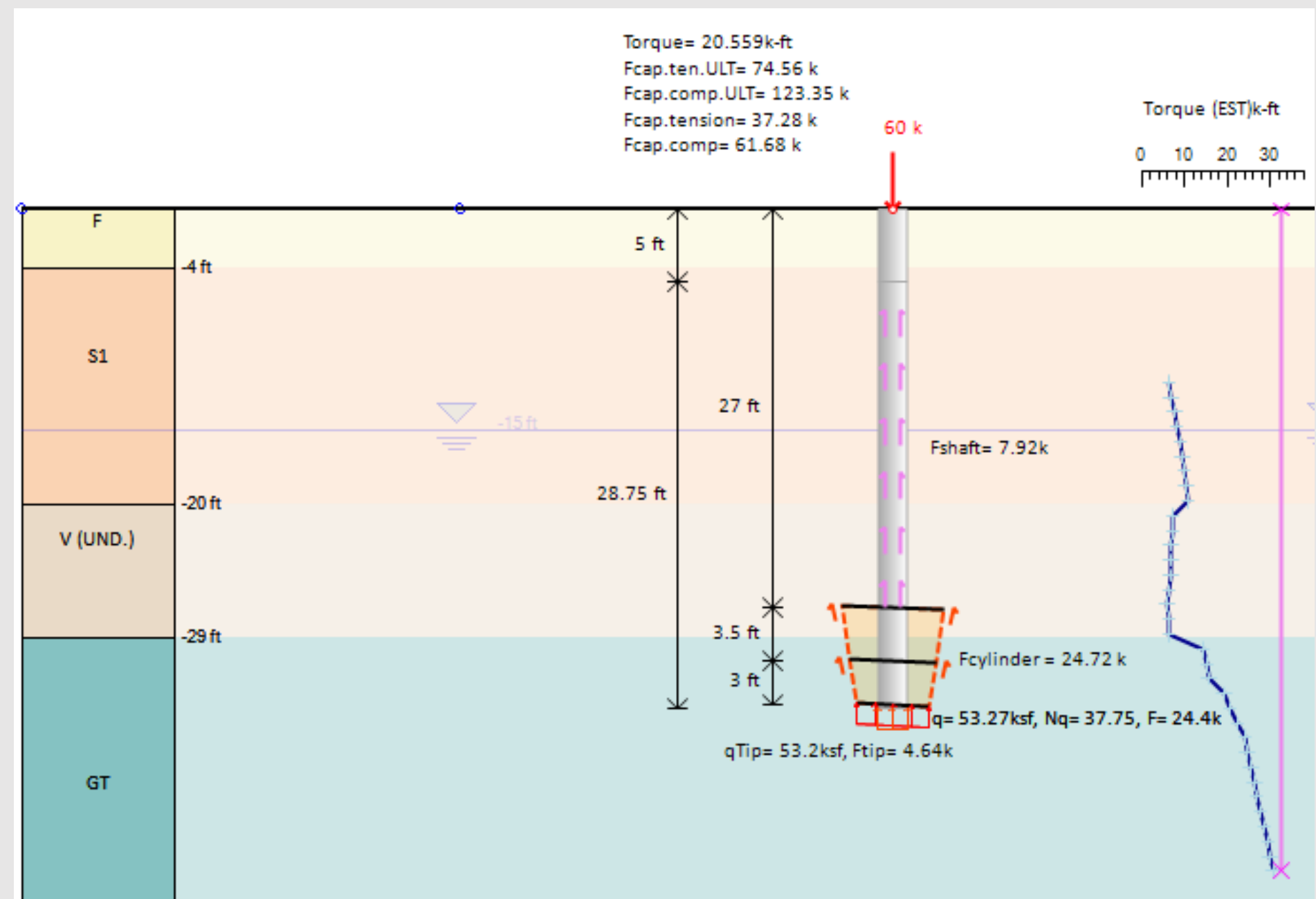
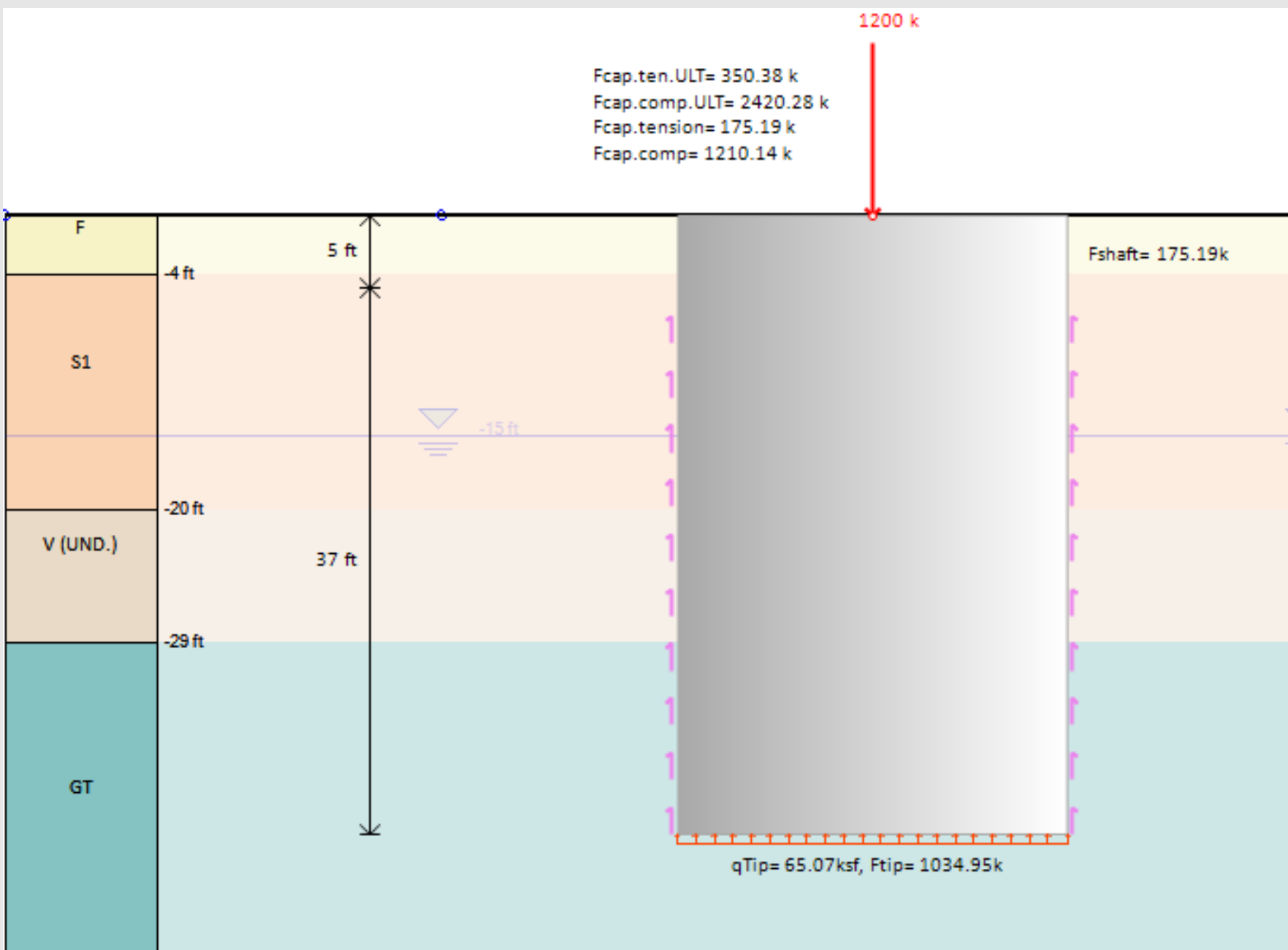
Top	Soil type	OCR	Ko	Edit
0	F	1	0.5	Edit
-4	S1	1	0.441	Edit
-20	V	1	0.531	Edit
-29	GT	1	0.412	Edit





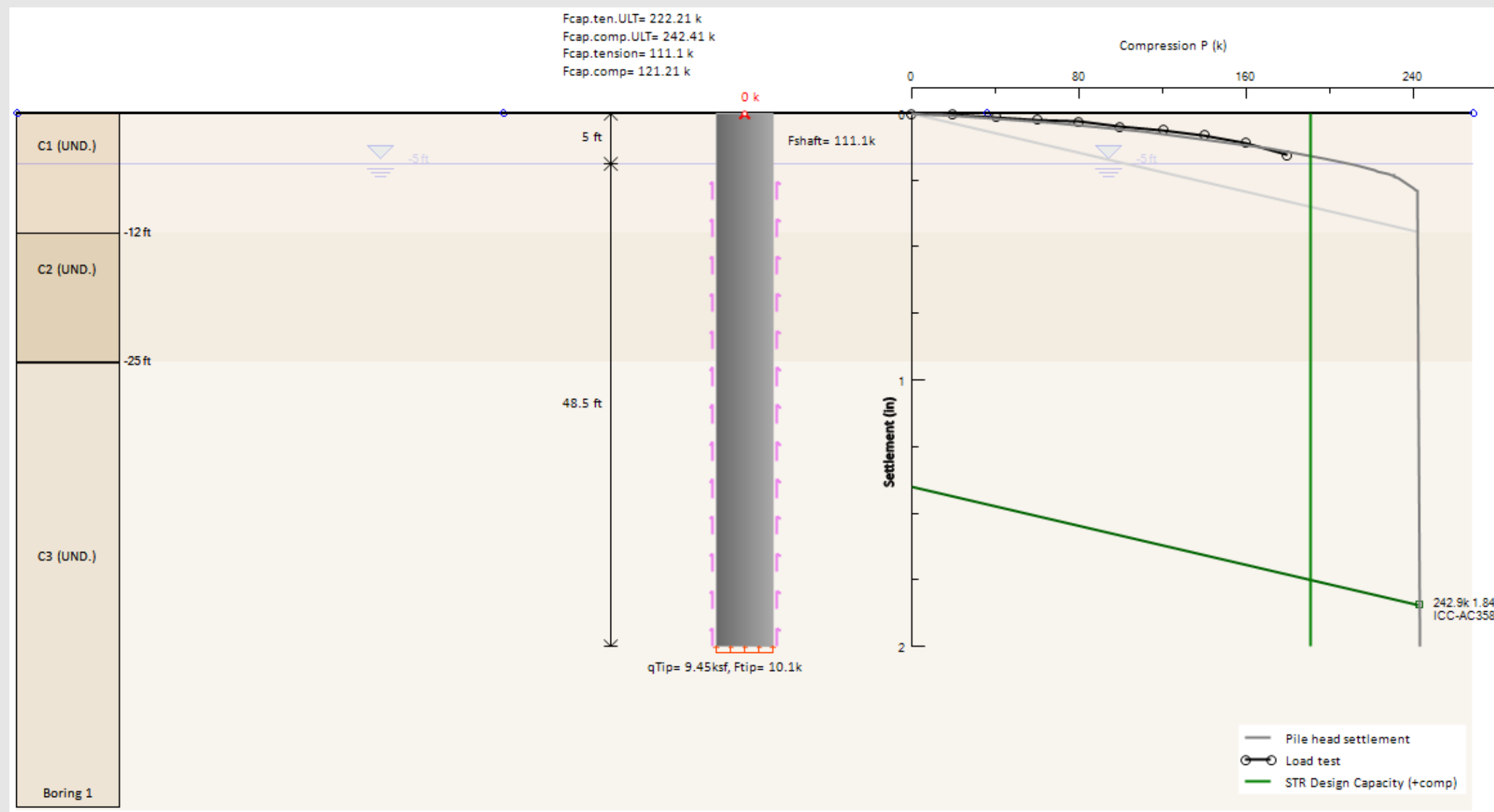
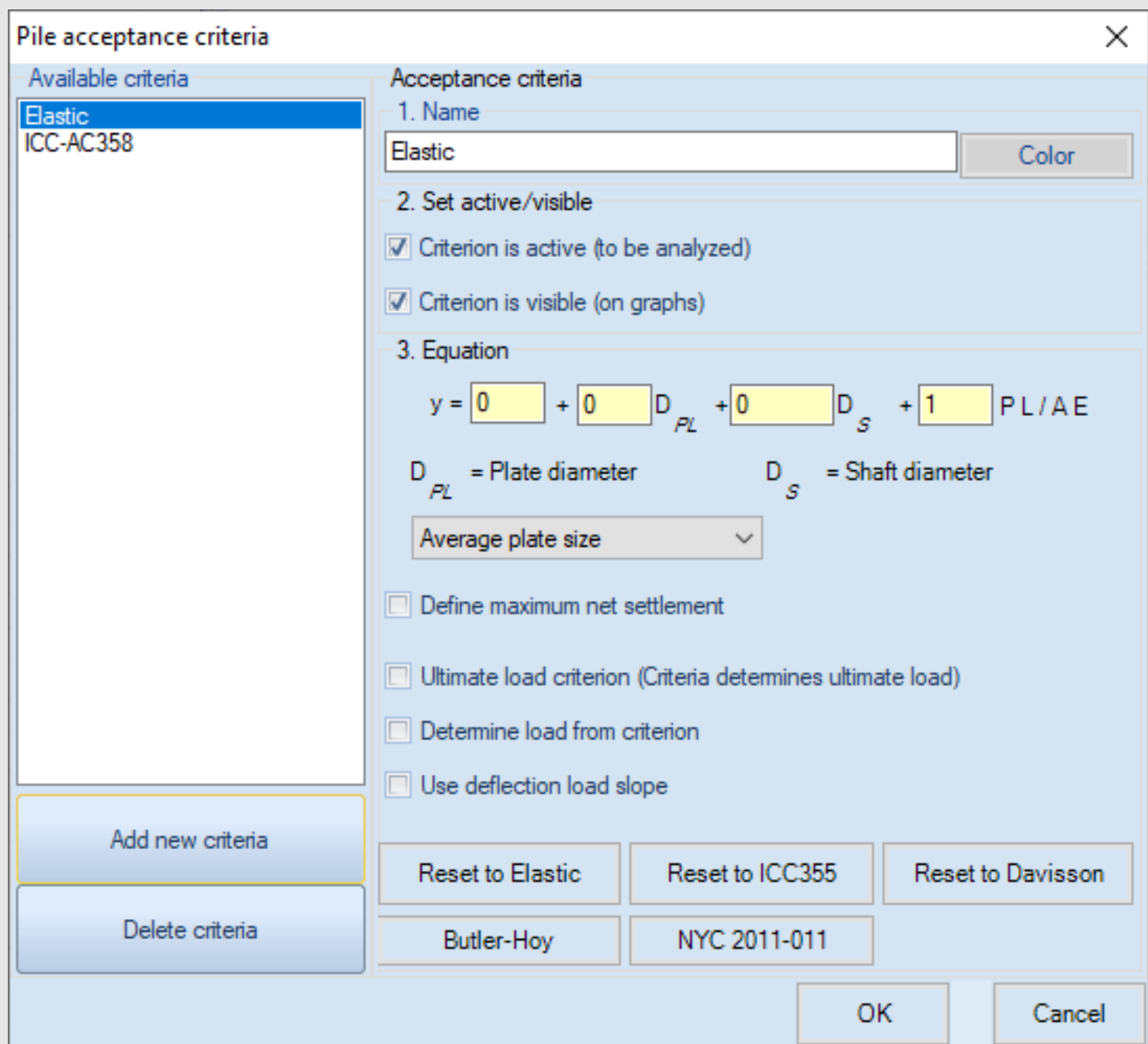
Optimize pile length  
 Max. Depth 45.00 ft  
 Step 1.00 ft  
 Analysis settings

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

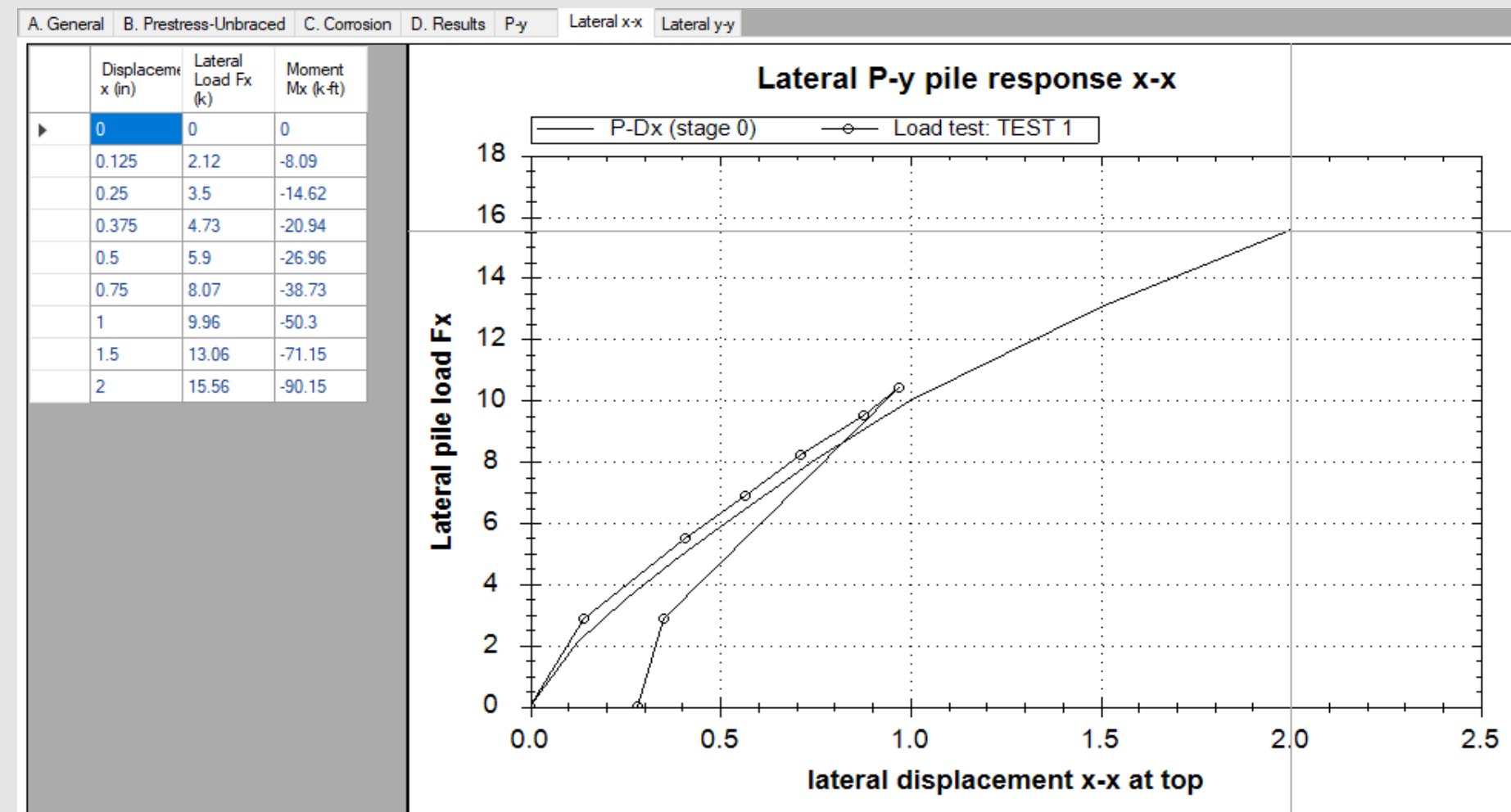
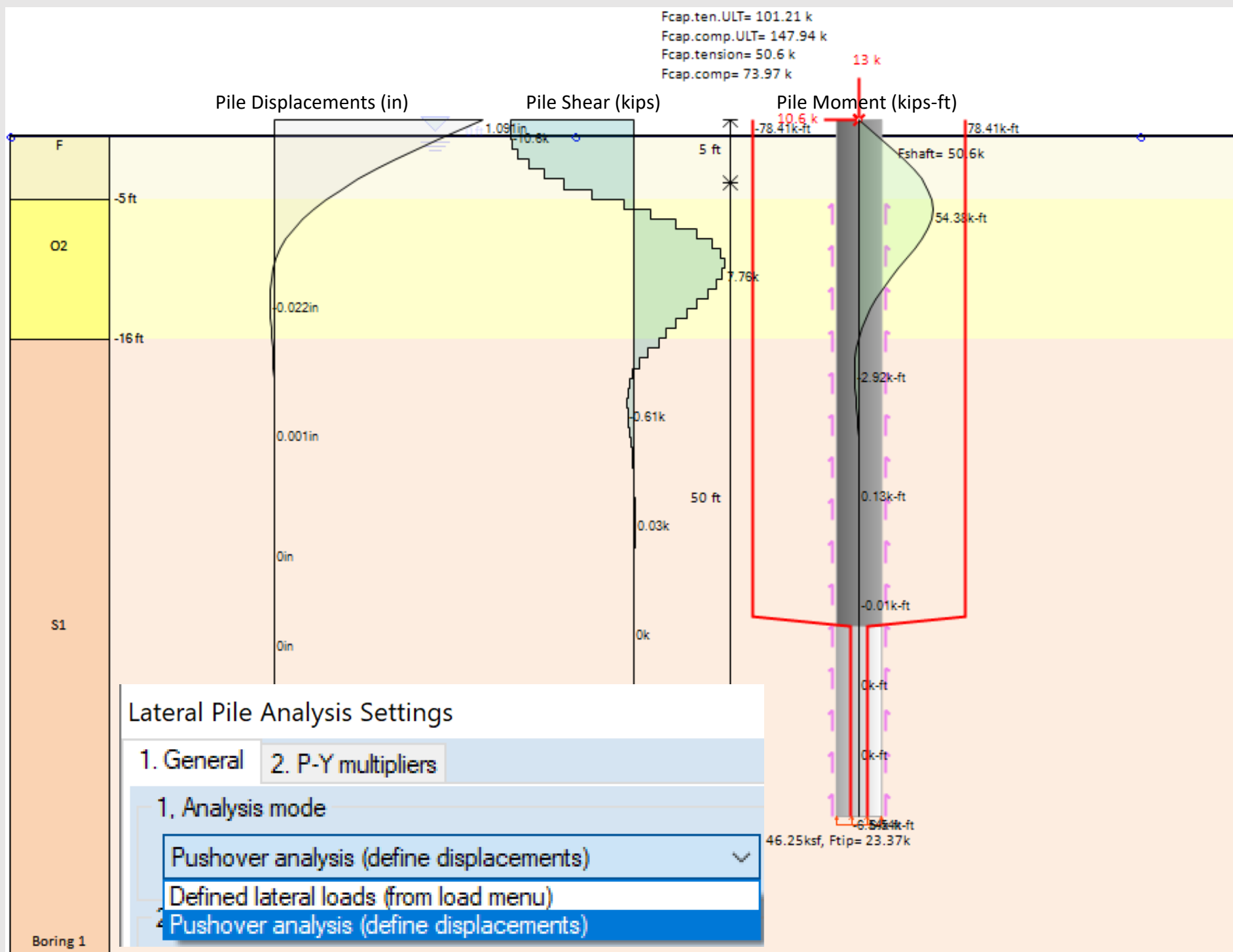




- ✓ Option to estimate pile settlements
- ✓ Pile acceptance criteria: Davisson, ICC 355, NYC 2011, Butler-Hoy and more
- ✓ Estimate pile structural capacity from pile criteria
- ✓ Add and review Axial Load Tests



- ✓ 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



- ✓ 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

Structural code options

Concrete Code Options

- 1:ACI 318-11
- 2:EC2-2004
- 3:EC2-German Annex
- 4:EC2-Cyprus Annex
- 5:EC2-French Annex
- 6:EC2-Austrian Annex
- 7:EC2-Italian Annex
- 8:EC2-Netherlands Annex
- 9:EC2-Czech Annex
- 10:EC2-Belgium Annex
- 11:EC2-Slovakian Annex
- 12:EC2-Danish Annex
- 13:EC2-Finish Annex
- 14:EC2-Swedish Annex
- 15:EC8-Greek Annex
- 16:EC8-Italian Annex
- 17:EC8-Austrian Annex
- 18:EC8-Bulgarian Annex
- 19:EC8-Cyprus Annex
- 20:EC8-Slovenian Annex
- 21:EC8-French Annex
- 22:EC2-Greek Annex
- 23:EC2-2004
- 24:AS 3600-2009
- 25:CN (China)

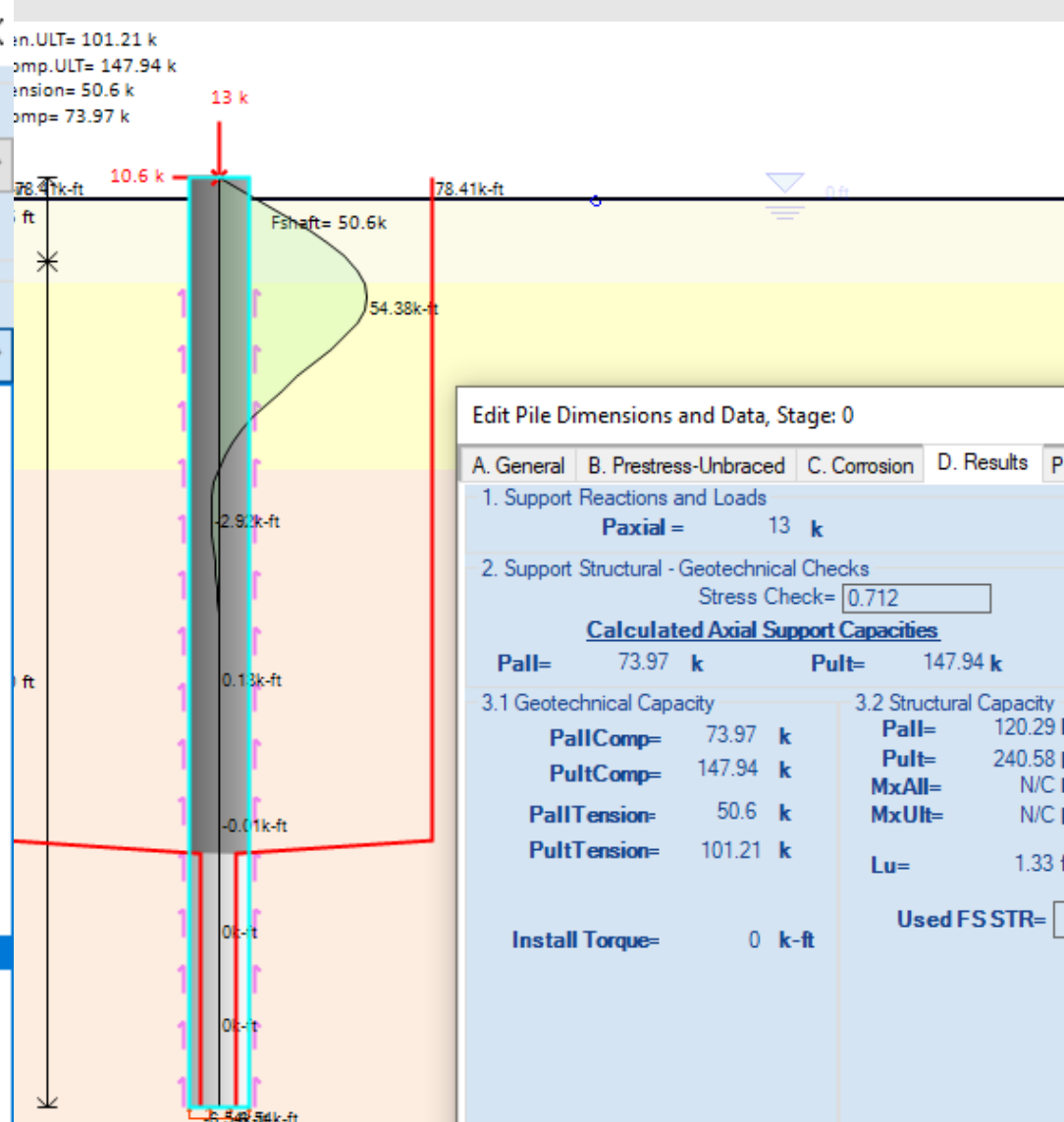
Structural code options

Concrete Code Options

- 1:ACI 318-11

Steel Code Options

- 17:AISC 360-10 ALL.
- 1:ASD 1989
- 2:EC3 2005-CEN
- 3:LRFD 13th Edition 2005
- 4:NTC 2008
- 5:EC3 2005-Bulgaria
- 6:EC3 2005-Slovenia
- 7:EC3 2005-UK
- 8:EC3 2005-Norway
- 9:EC3 2005-Sweden
- 10:EC3 2005-Finland
- 11:EC3 2005-Denmark
- 12:EC3 2005-Portugal
- 13:EC3 2005-Germany DIN
- 14:EC3 2005-Singapore
- 15:EC3 2005-Greece
- 16:ANSI/AISC 360-10
- 17:AISC 360-10 ALL.
- 18:BS 5950-1:2000
- 19:AS/NZS 4100
- 20:CN (China)
- 21:ANSI/AISC 360-16
- 22:AISC 360-16 ALL.



Edit Pile Dimensions and Data, Stage: 0

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

1. Support Reactions and Loads

Paxial = 13 k

2. Support Structural - Geotechnical Checks

Stress Check= 0.712

Calculated Axial Support Capacities

Pall=	73.97 k	Pult=	147.94 k
PallComp=	73.97 k	PultComp=	147.94 k
PallTension=	50.6 k	PultTension=	101.21 k
Install Torque=	0 k-ft		

3.1 Geotechnical Capacity

PallComp=	73.97 k	PultComp=	147.94 k
PallTension=	50.6 k	PultTension=	101.21 k

3.2 Structural Capacity

Pall=	120.29 k	Pult=	240.58 k
MxAll=	N/C k	MxUlt=	N/C k
Lu=	1.33 ft		

Used FSSTR=

calculations

Calculate pile capacities for stage : Stage 0

FS SHAFT.RESISTANCE = 2 (preliminary geotechnical)

FS BEARING.RESISTANCE = 2 (geotechnical)

Basic description of shaft strength calculations, stage: 0

Lateral earth stresses determined with Mitch-Clemence approach:

$k_h = 0.09 (e)^{0.08 \Phi} = \text{normal stress}$

Adhesion values determine from cohesion or undrained shear strength with the following method:

By using a tri-linear approach similar to API, where:

$\alpha \text{ c.factor.1} = 0.8$  when  $c$  is smaller than  $c = 1\text{ksf}$

$\alpha \text{ c.factor.2} = 0.5$  when  $c$  is greater than  $c = 2\text{ksf}$

A linear interpolation is assumed for intermediate values

$\beta = 90$  degrees. pile angle

## PART 2: DeepFND/HelixPile Additional Modules and Standard Packages

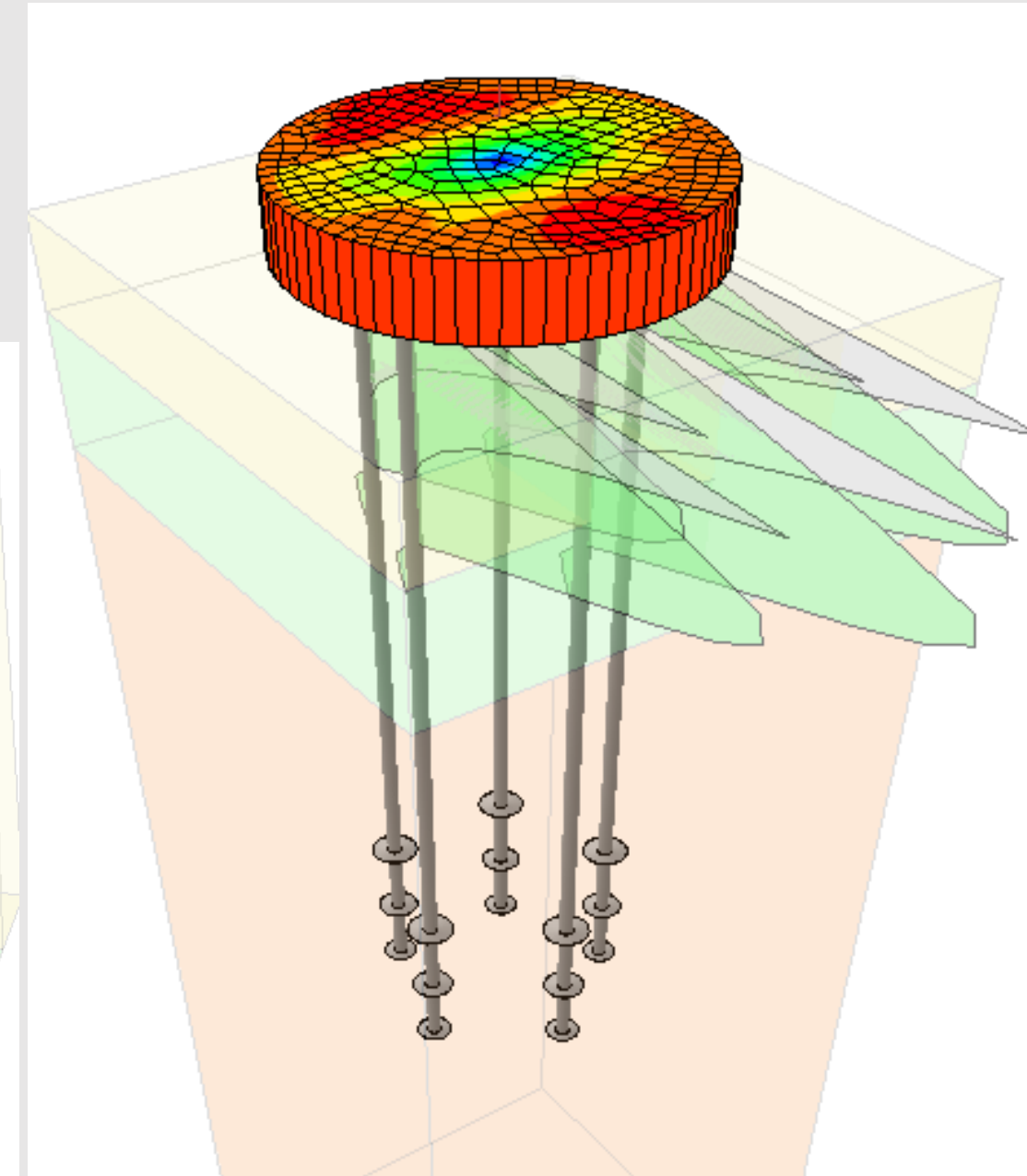
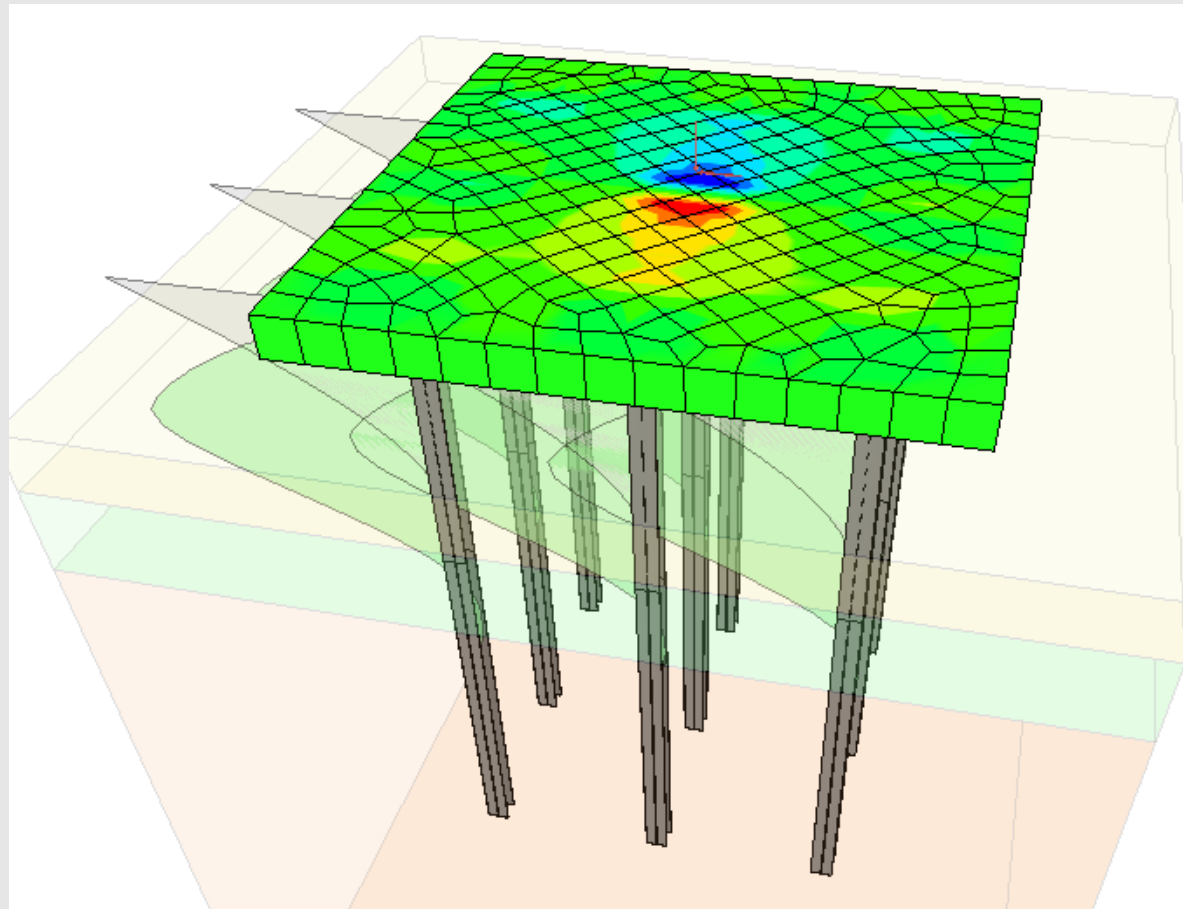
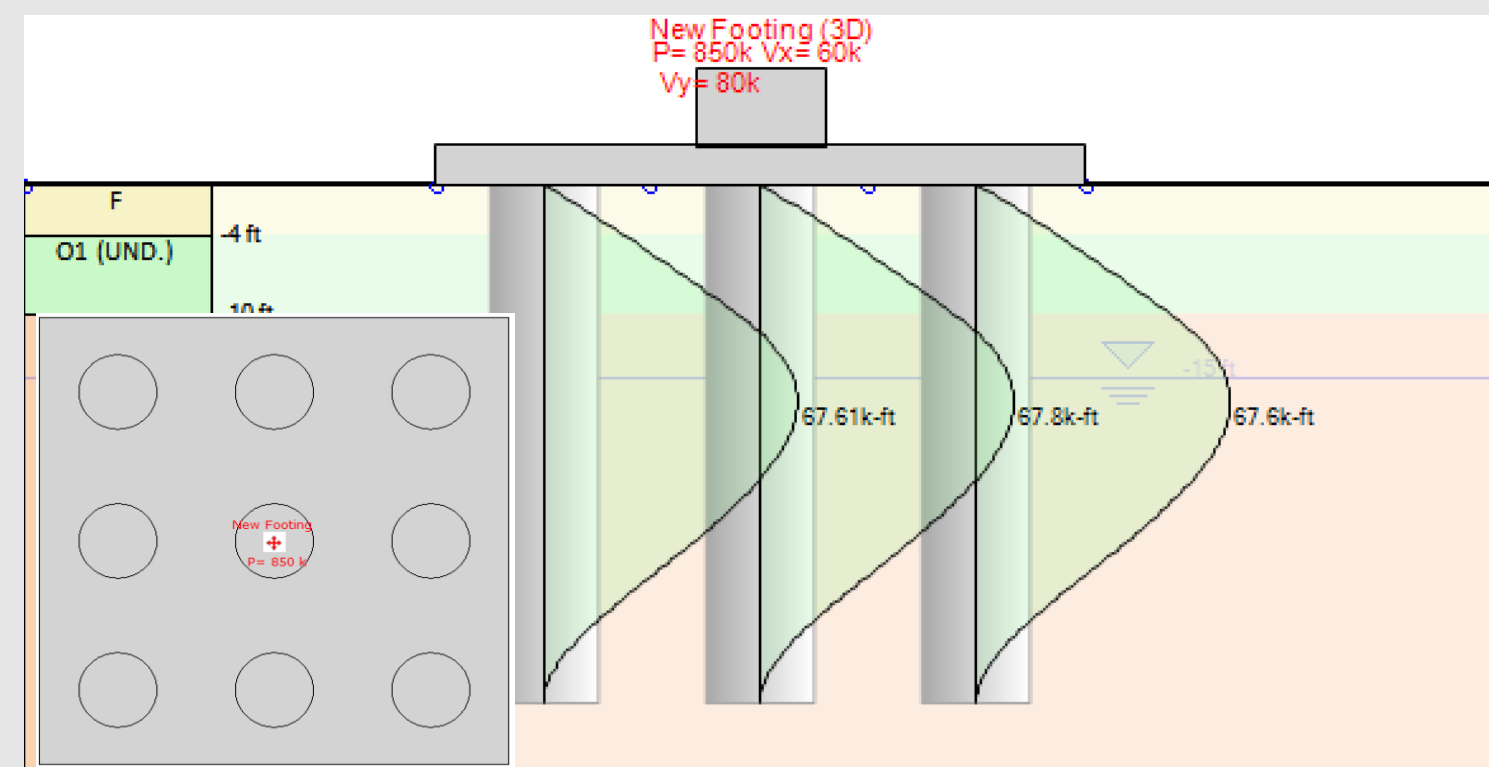
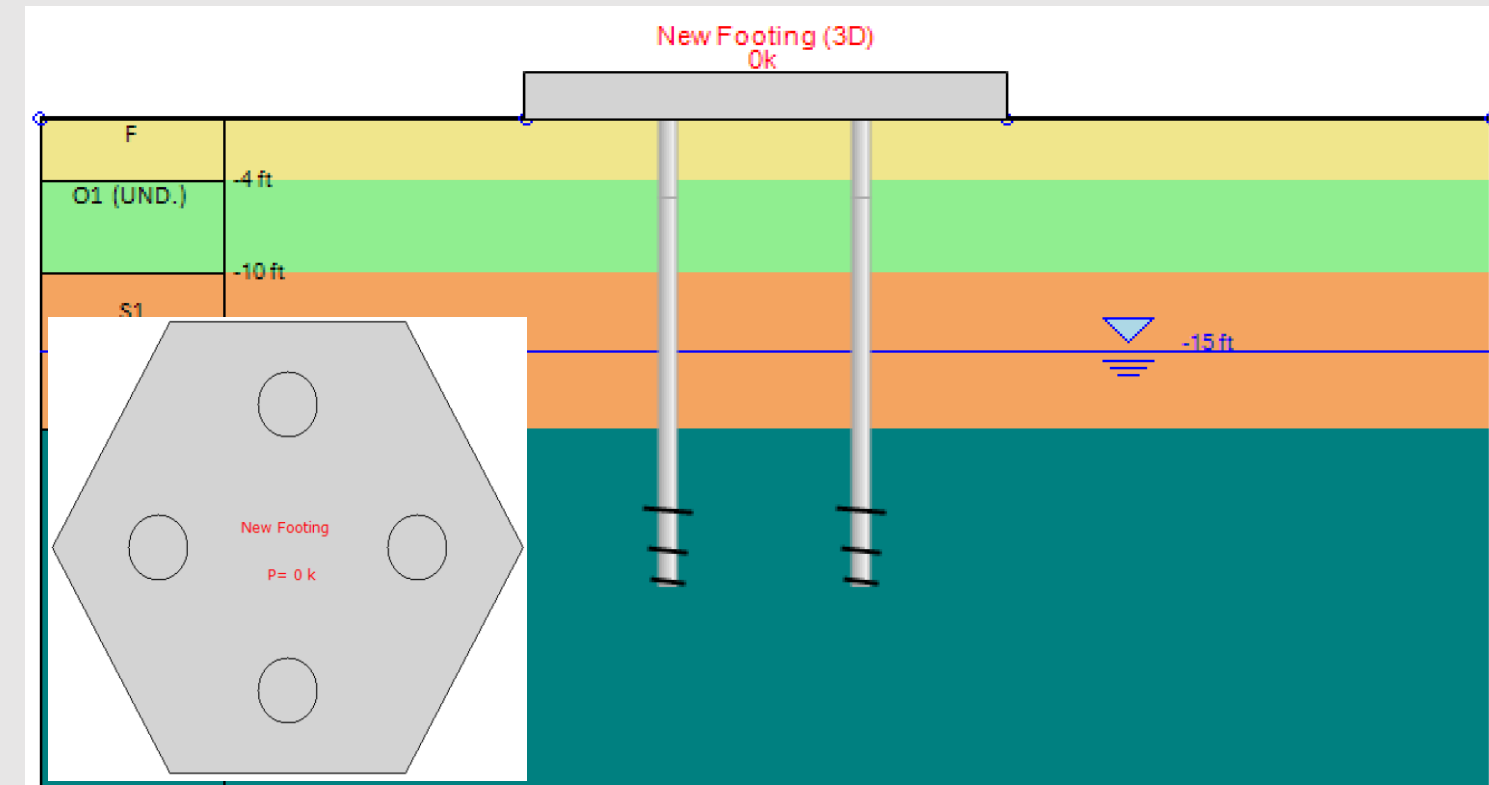
More information:

Click here to learn more:  
DeepFND – Features and  
Capabilities

Click here to learn more:  
HelixPile – Features and  
Capabilities



- ✓ 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





# DeepFND/HelixPile - Software Versions

## Standard DeepFND Software Packages

**DeepFND – Single Piles**  
Vertical and Lateral Analysis of  
Single Non-Helical Piles  
**Optional:** Helical Piles Analysis

**DeepFND + Pile Groups**  
Vertical and Lateral Analysis of  
Single Non-Helical Piles  
+ Pile Caps with Pile Groups  
**Optional:** Helical Piles Analysis

**DeepFND Full**  
Vertical and Lateral Analysis of  
Single Non-Helical Piles  
+ Pile Caps with Pile Groups  
+ Pile Rafts  
**Optional:** Helical Piles Analysis

## Standard HelixPile Software Packages

**HelixPile – Single Piles**  
Vertical and Lateral Analysis of  
Single Helical Piles

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

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

## DeepEX Licensing Options

- Single Licenses (activated in specific devices), Single USB Keys, Network USB Key Solutions
- 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

## THANK YOU!

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