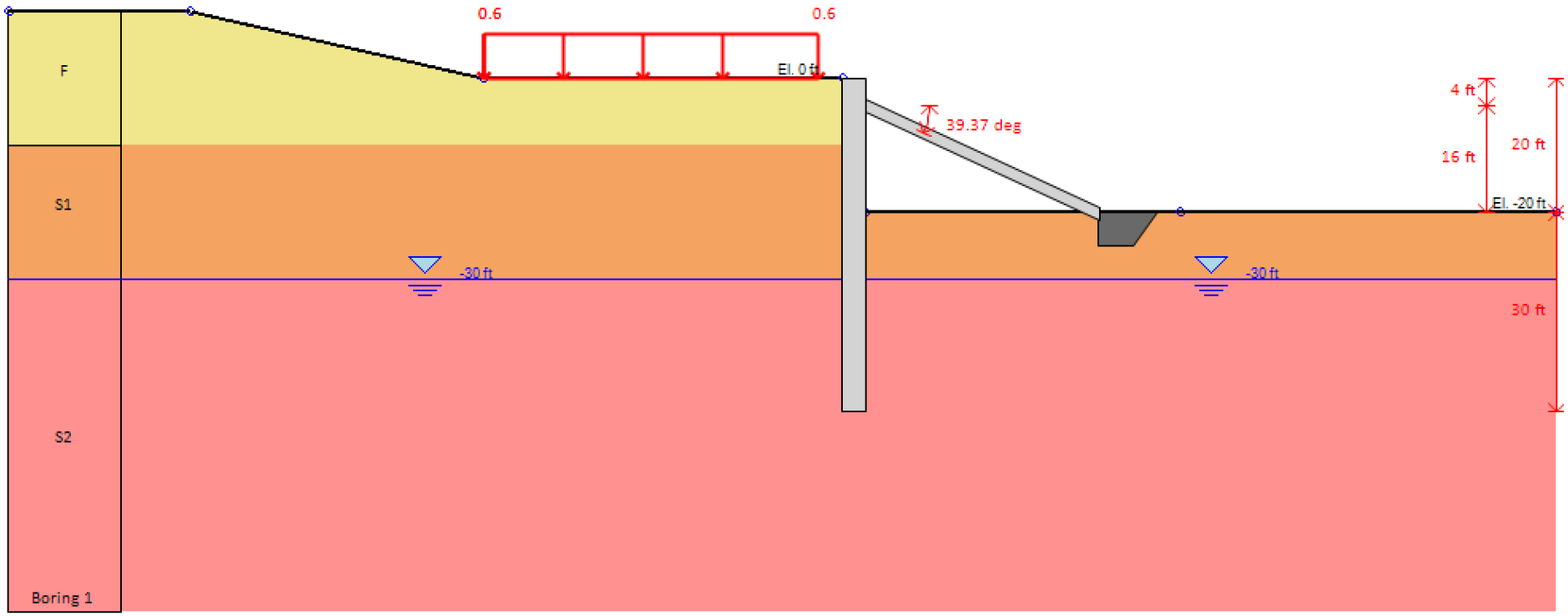
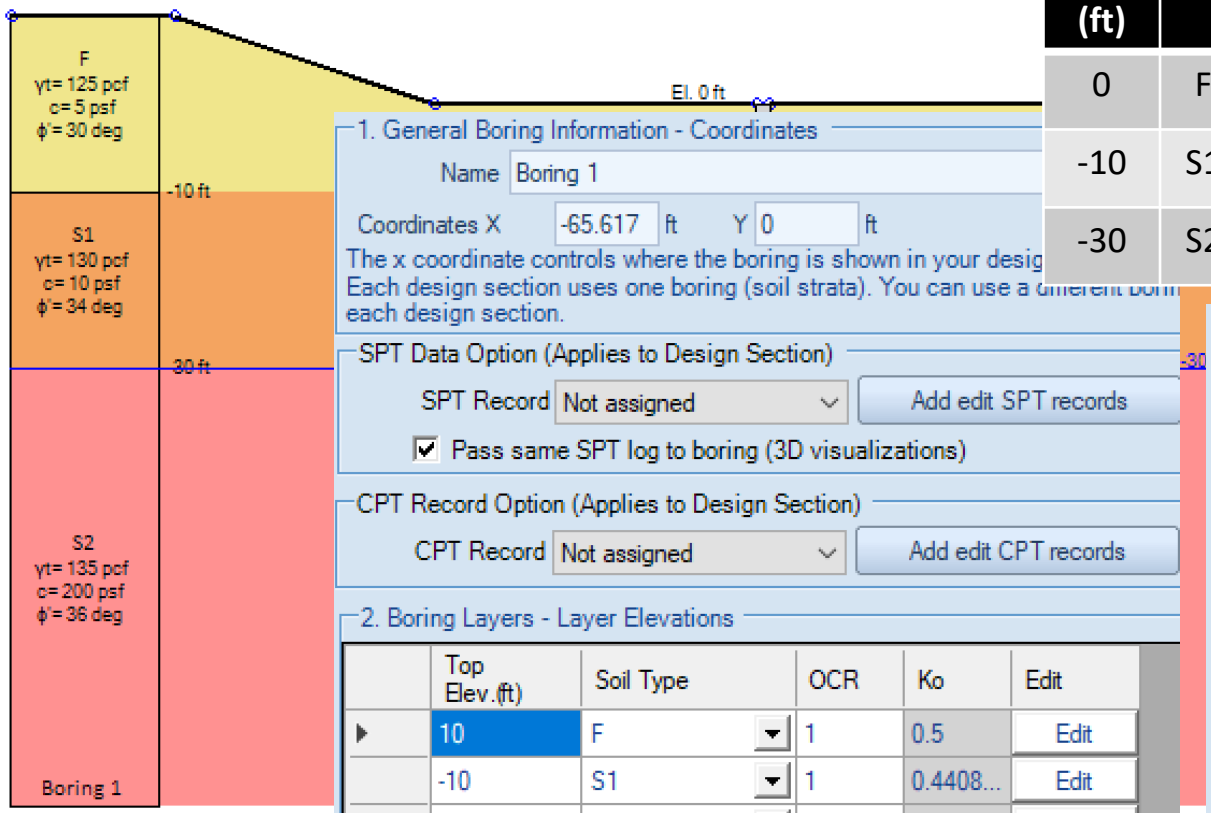
Example 7: Secant Pile Wall Braced with Rakers
Limit Equilibrium – Non-Linear – Finite Element Analysis



Example 7: Secant Pile Wall Braced with Rakers

A. Soil Properties and Stratigraphy (Soil Layers)

Elev. (ft)	Soil (-)	γt (pcf)	C' or Su (psf)	ϕ' (deg)	Eoed (ksf)	Eur (ksf)	m (-)
0	F - Sand	125	5	30	500	1500	0.5
-10	S1 - Sand	130	10	34	800	2400	0.4
-30	S2 - Sand	135	200	36	1200	3200	0.4



1. General Boring Information - Coordinates

Name: Boring 1

Coordinates X: -65.617 ft Y: 0 ft

The x coordinate controls where the boring is shown in your desig
Each design section uses one boring (soil strata). You can use a
each design section.

SPT Data Option (Applies to Design Section)

SPT Record: Not assigned — Add edit SPT records

☑ Pass same SPT log to boring (3D visualizations)

CPT Record Option (Applies to Design Section)

CPT Record: Not assigned — Add edit CPT records

2. Boring Layers - Layer Elevations

	Top Elev.(ft)	Soil Type	OCR	Ko	Edit
▶	10	F	1	0.5	Edit
	-10	S1	1	0.4408...	Edit
	-30	S2	1	0.412	Edit
*					

A. General | C. Elasto-plastic | D. Bond | E. Adv. | F. Piles

4. Unit Weights - Density

γ_t 130 pcf > γ_{bulk} 125 pcf γ' = 67.6

5. Strength Parameters and Poisson Ratio

Drained strength properties

c' 10 psf > ϕ' 34 degrees >

Peak - constant vol. (for estimation)

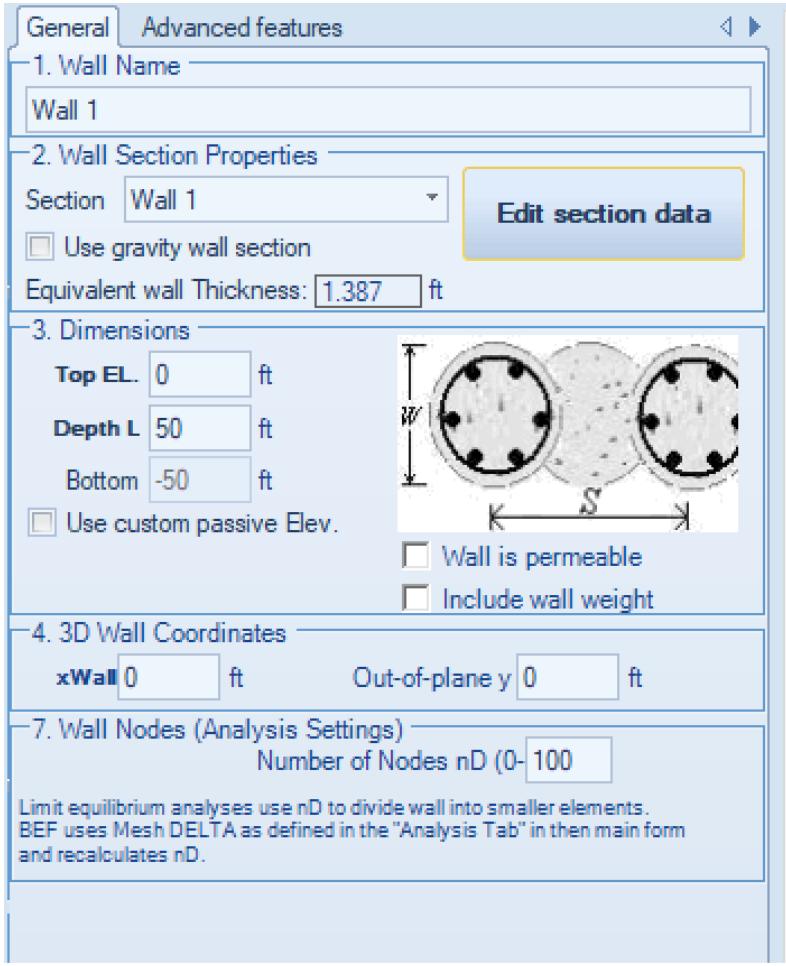
Φ cv' Omitted degrees >

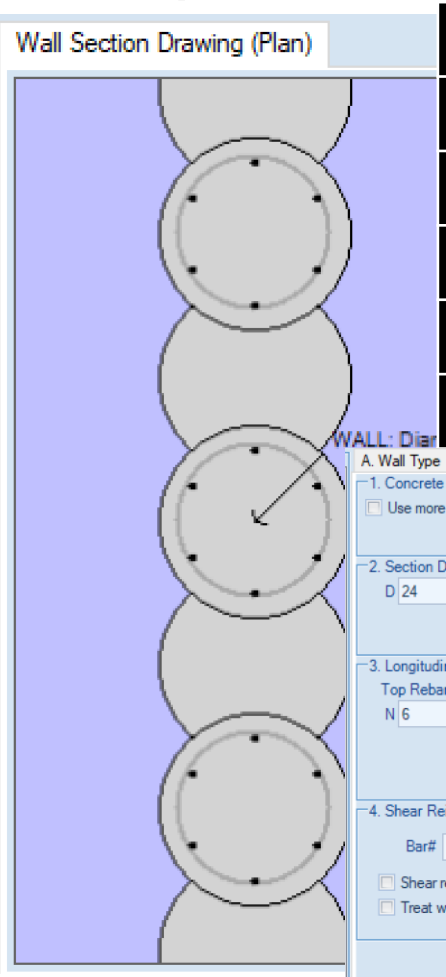
Φ peak' Omitted degrees >

v 0.35 >

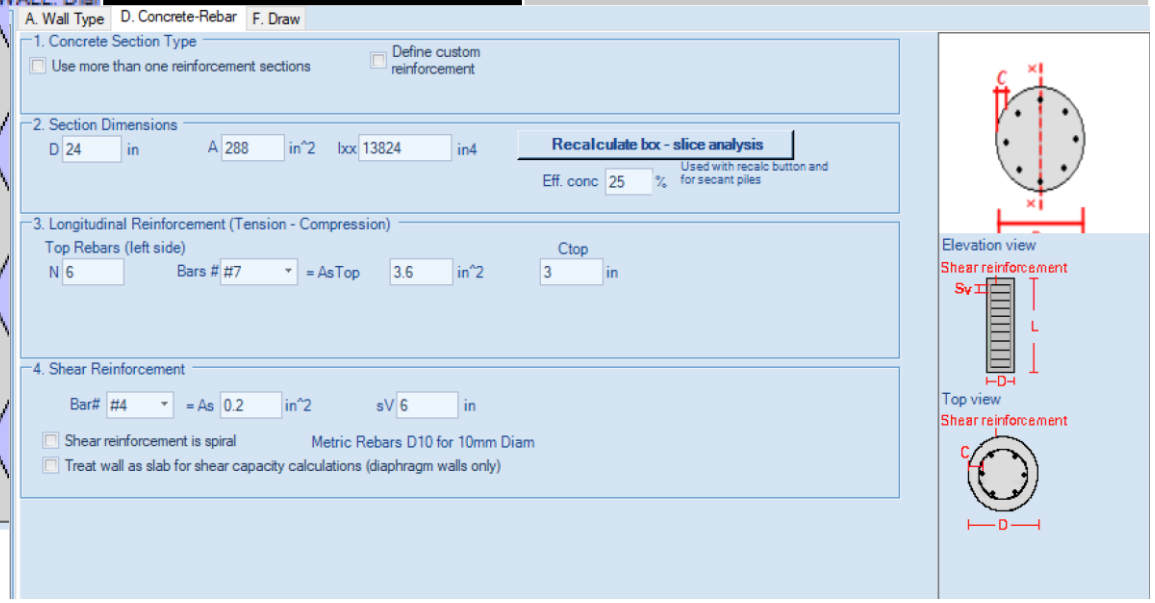
Example 7: Secant Pile Wall Braced with Rakers

B. Wall Section Properties, Wall Position and Depth





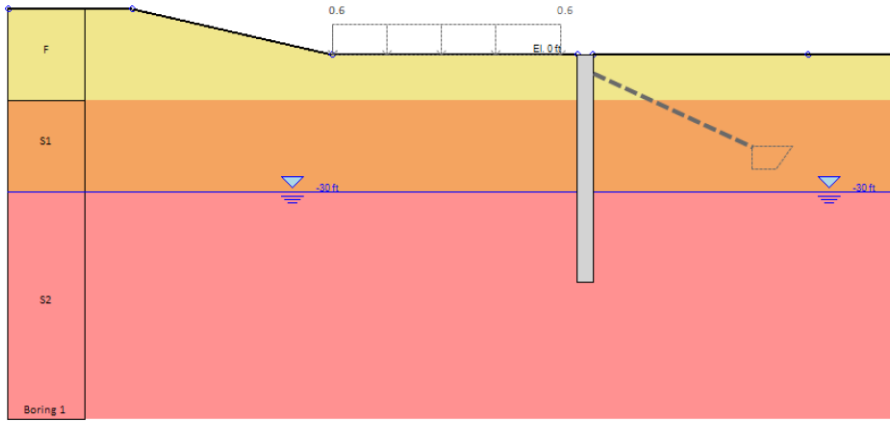
X-Coordinate	X = 0
Wall Type	RC Secant Piles
Pile Diameter	2 ft
Long. Reinforcement	6 #7 Rebars
Shear Reinforcement	#4 Bars @ 6in Spacing
Materials	Grade 75 Rebars, 4 ksi Concrete



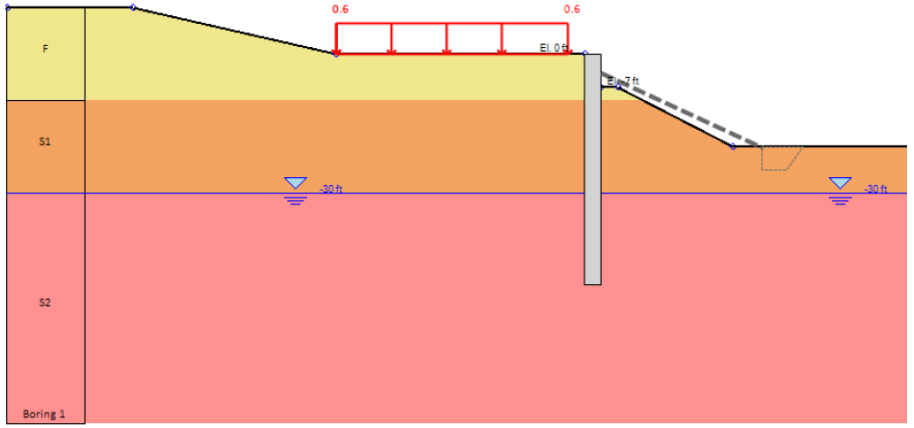
C. Support Section Properties and Elevation

Support Type	Rakers
Elevation on Wall	Z = -4 ft
Hor. Spacing	15 ft
Installation Angle	40 deg
Support Section	HP12x74 (H Beams)

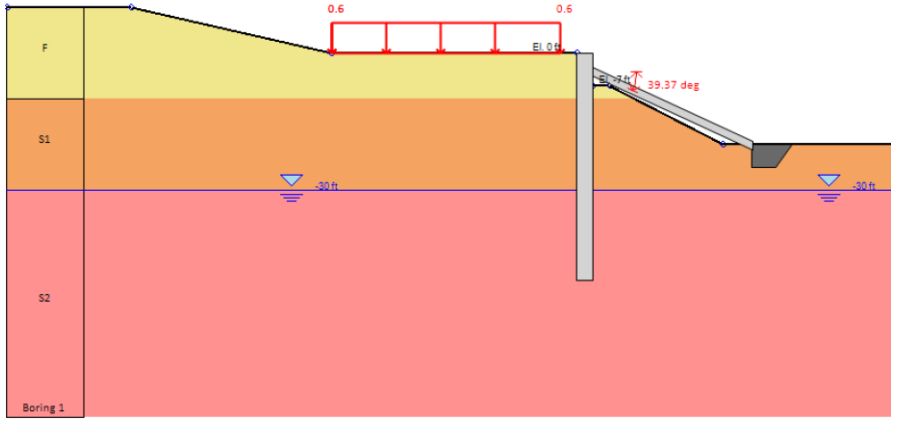
D. Model in Construction Stages



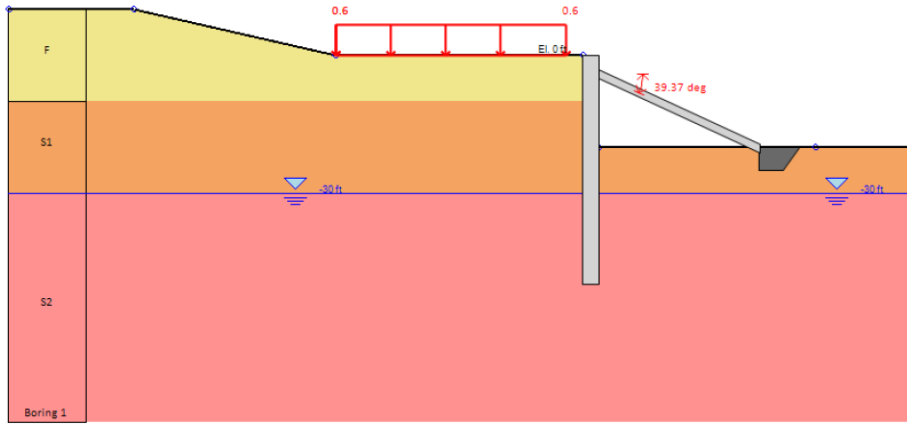
Stage 0: At-rest Conditions



Stage 1: Berm Excavation



Stage 2: Raker & Heelblock Installation

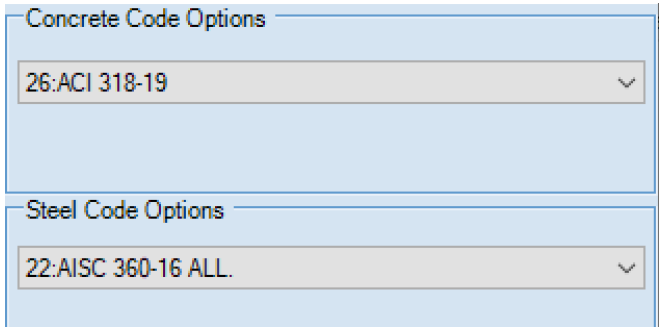


Stage 3: Final Excavation

E1. Analysis Settings & Design Codes

- Wall Friction: 50% of the soil friction
- Water Pressures: Simplified Flow
- Cantilever Method (LEM): Free Earth Method
- Beam Analysis Method: Blum's
- Soil Pressures: Active & Passive (All Stages)

- Steel Code: AISC 360-16 Allowable
- Concrete Code: ACI 318-19
- Analysis Code: None (Service Conditions)

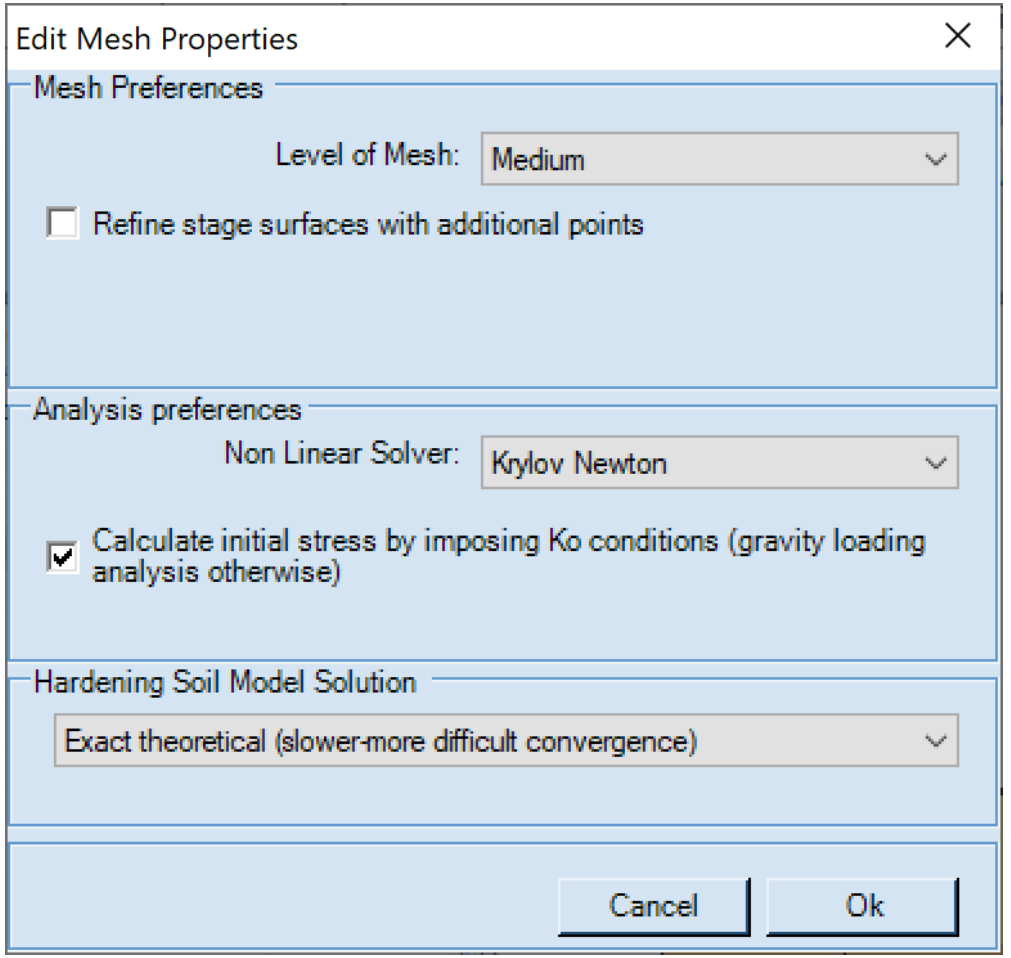


E2. Additional FEM Analysis Settings & Tips

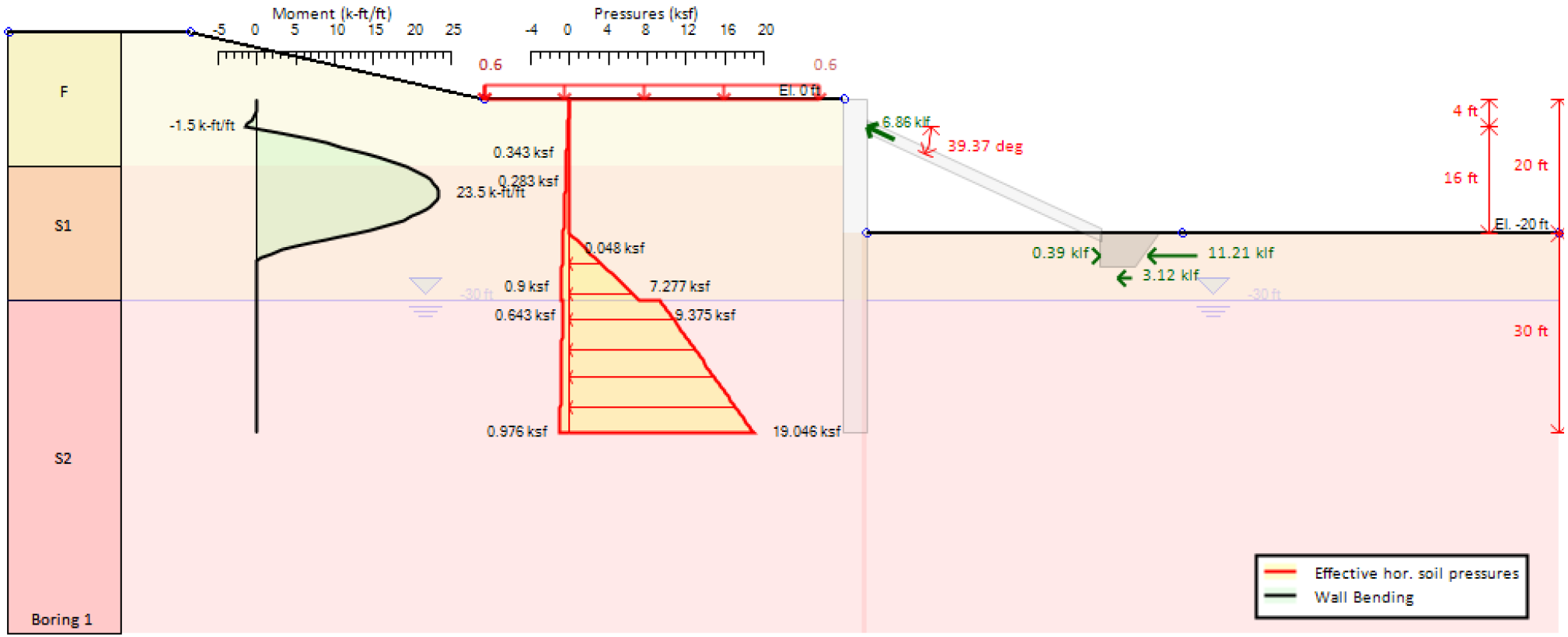
- Generated Mesh Density: Medium
- Non-Linear Solver: Krylov Newton Method
- Hardening Soil Model: Exact Theoretical

FEM Analysis - Model Convergence Tips:

- ✓ Always consider a small cohesion for frictional soils
- ✓ Always use wall friction for all your walls
- ✓ Create a strict staging
- ✓ Sometimes an initial stage with green field conditions (not activated walls) might be required
- ✓ Always assume realistic prestress values for the anchors (if used)

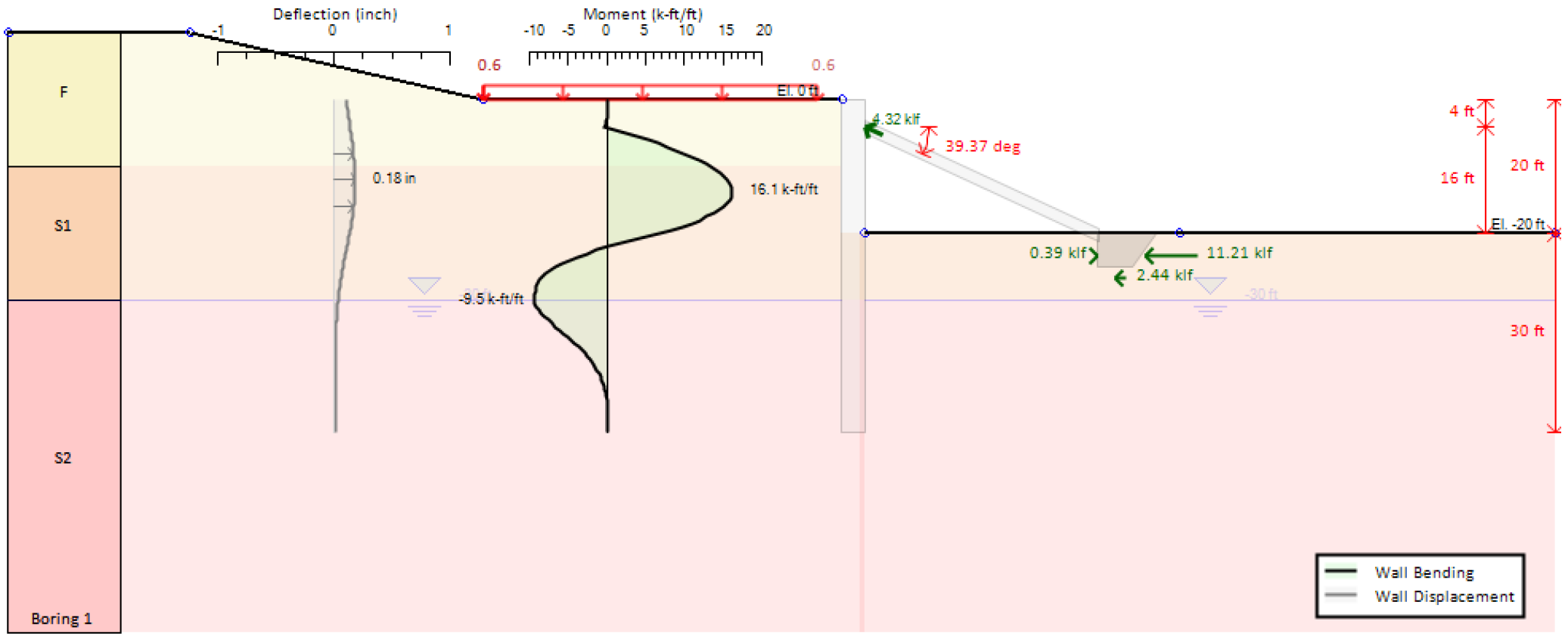


F. LEM Analysis Results



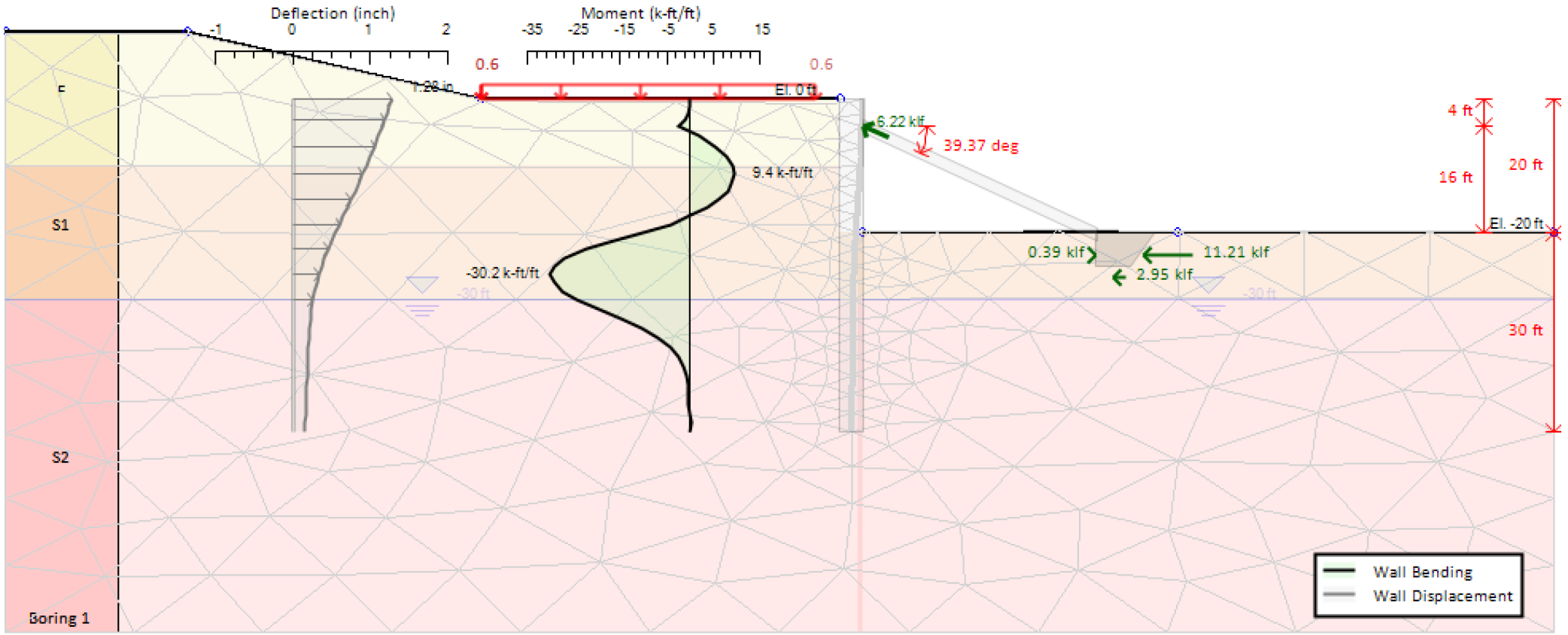
Wall Moments, Support Reactions & Soil Pressures - Stage 4

G. Non-Linear Analysis Results



Wall Moments, Displacements & Support Reactions - Stage 5

H. FEM Analysis Results



Wall Moments, Displacements & Support Reactions - Stage 5

Thank You!

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