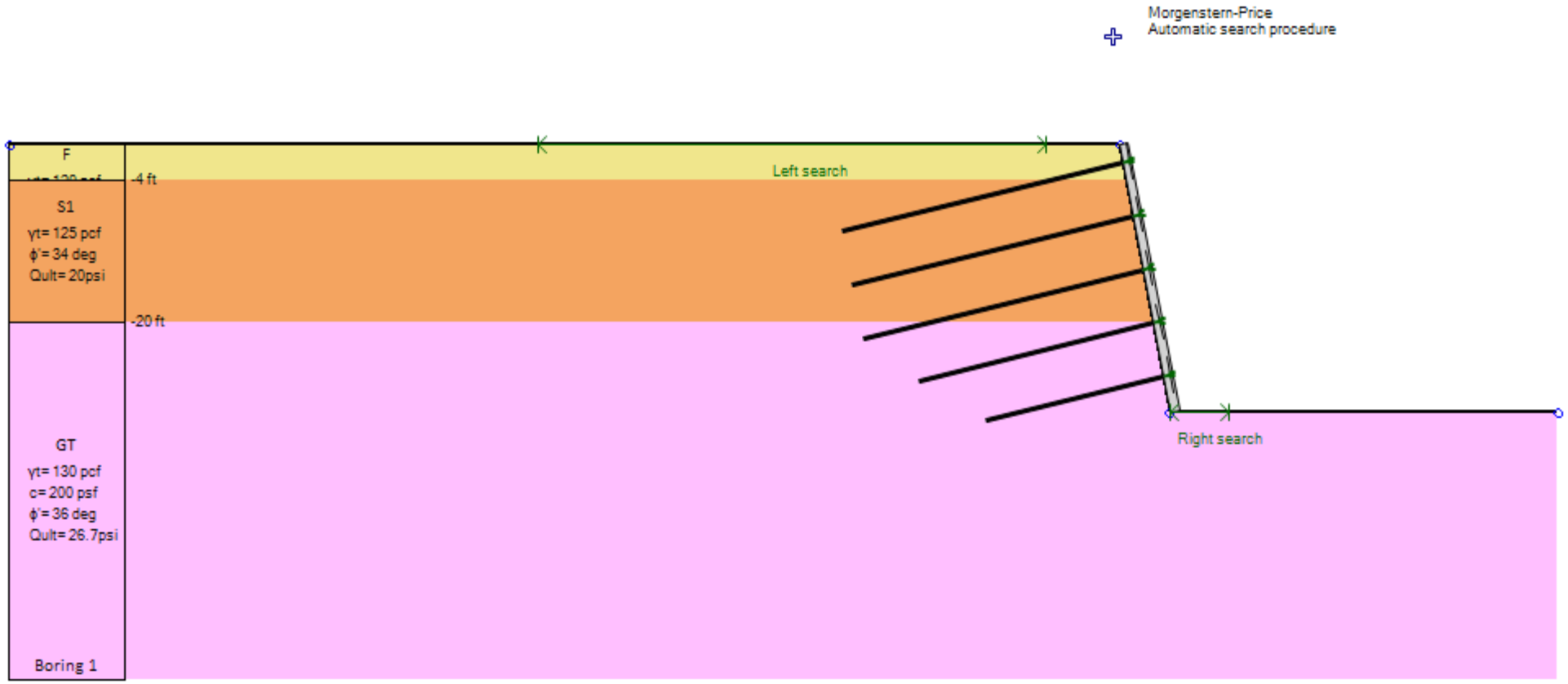
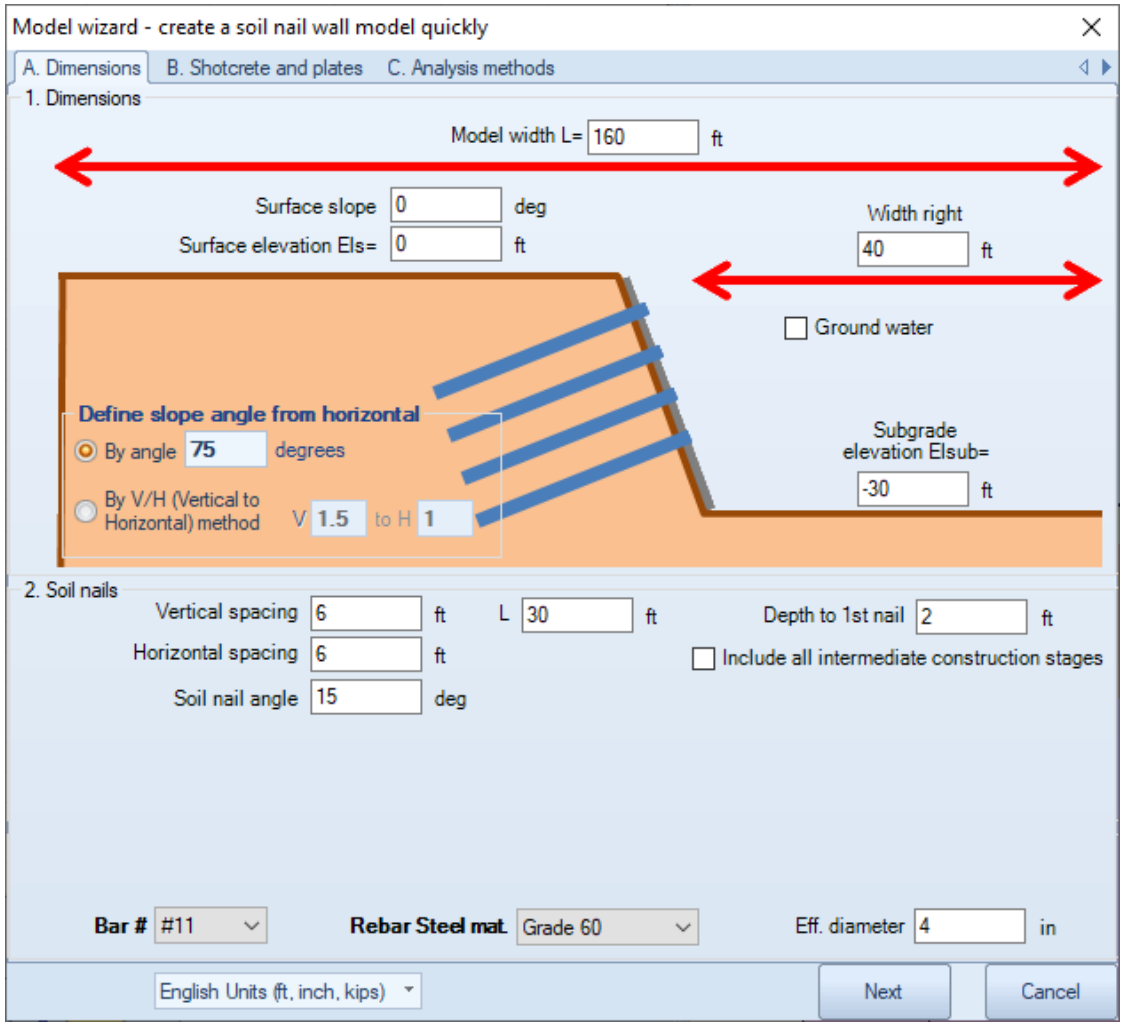
Example 1: Critical Slope Surface Methods in SnailPlus
Global Stability Safety Factors Comparison



SnailPlus Example: Critical Slope Surface Methods

A1. Model Wizard - Project Geometry & Soil Nails Layout

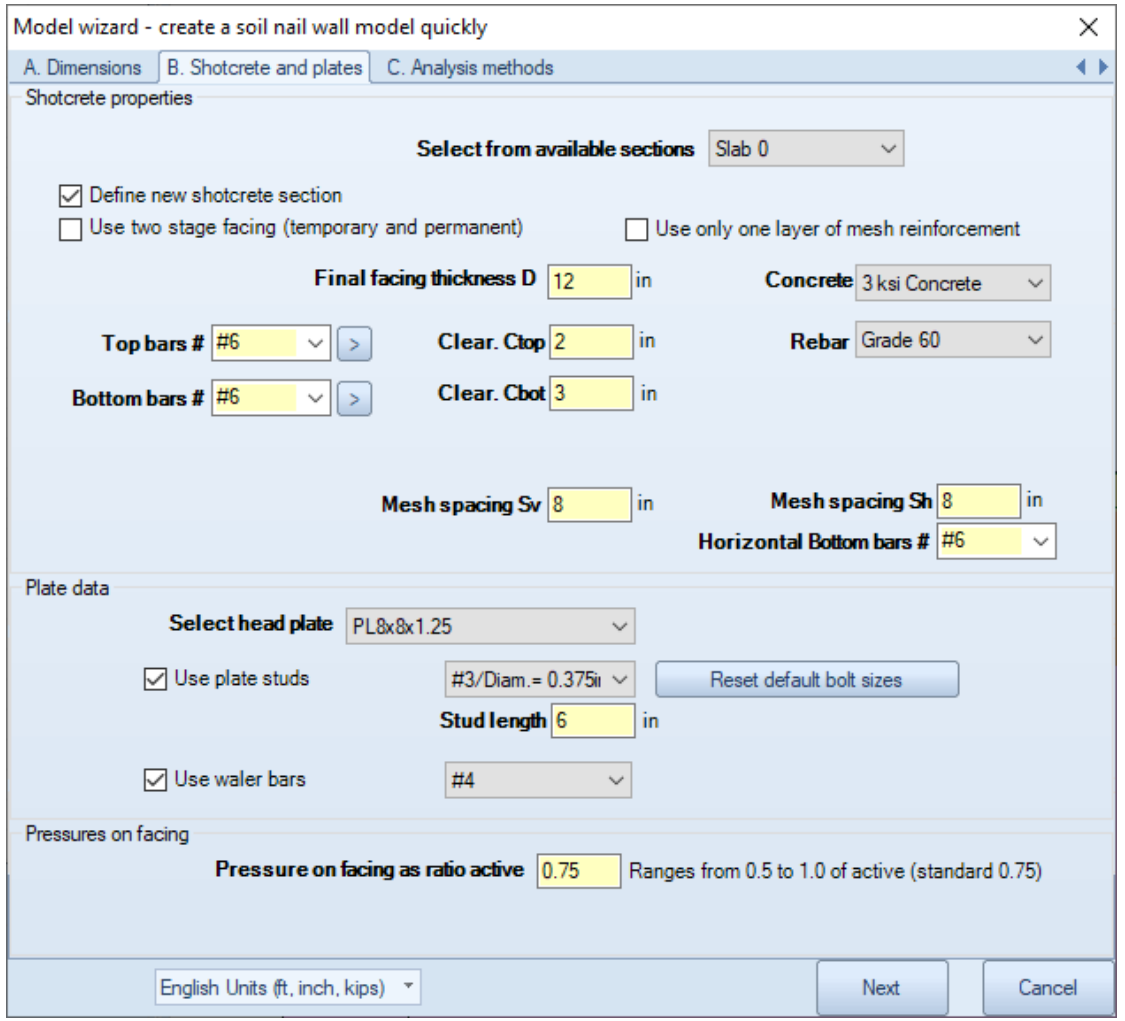


Geometry:
- 30ft Excavation
- 160ft Model Width
- 40ft Distance from the Base of the Wall to the right
- 75deg Slope Angle from Horizontal

Soil Nails Layout:
- 6ft Vertical Spacing
- 6ft Horizontal Spacing
- 30ft Fixed Length for the Soil Nails
- 15deg Inclined from Horizontal
- Do not include all Construction Stages

Soil Nails Section:
- #11 Rebar Steel
- Grade 60 Steel Material
- 4inches Hole Diameter

A2. Model Wizard - Shotcrete Facing & Head Plate Sections

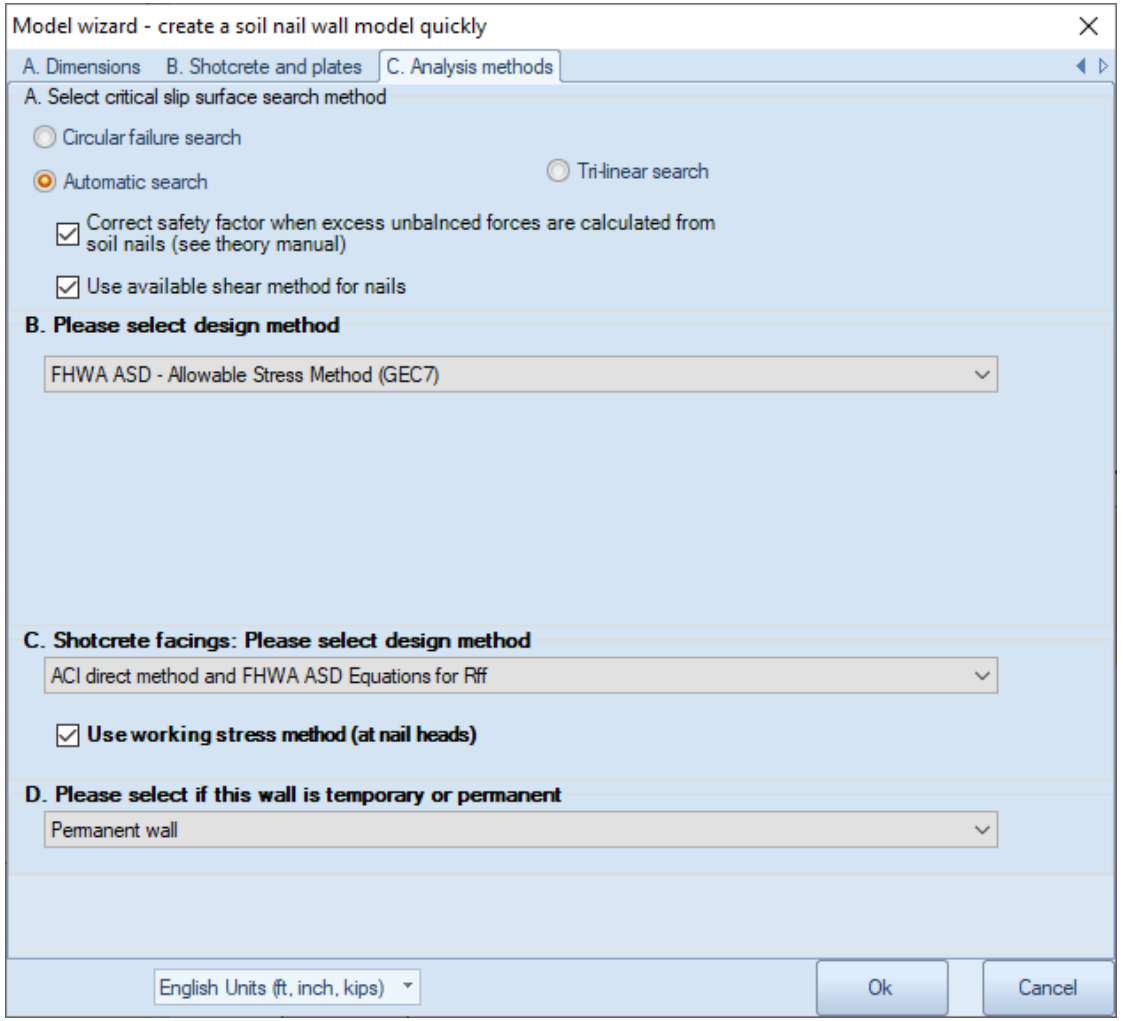


Shotcrete Facing Section:
- Permanent Facing with 2 Rows of Rebars
- 12in Thick Facing
- #6 Bars @ 8in Spacing Horizontal & Vertical
- 3 ksi Concrete, Grade 60 Rebar Steel Materials

Head Plate Section:
- Plate 8in x 8in x 1.25in
- 6in Long #3 Rebar Studs
- #4 Waler Rebars

SnailPlus Example: Critical Slope Surface Methods

A3. Model Wizard - Analysis Methods & Codes

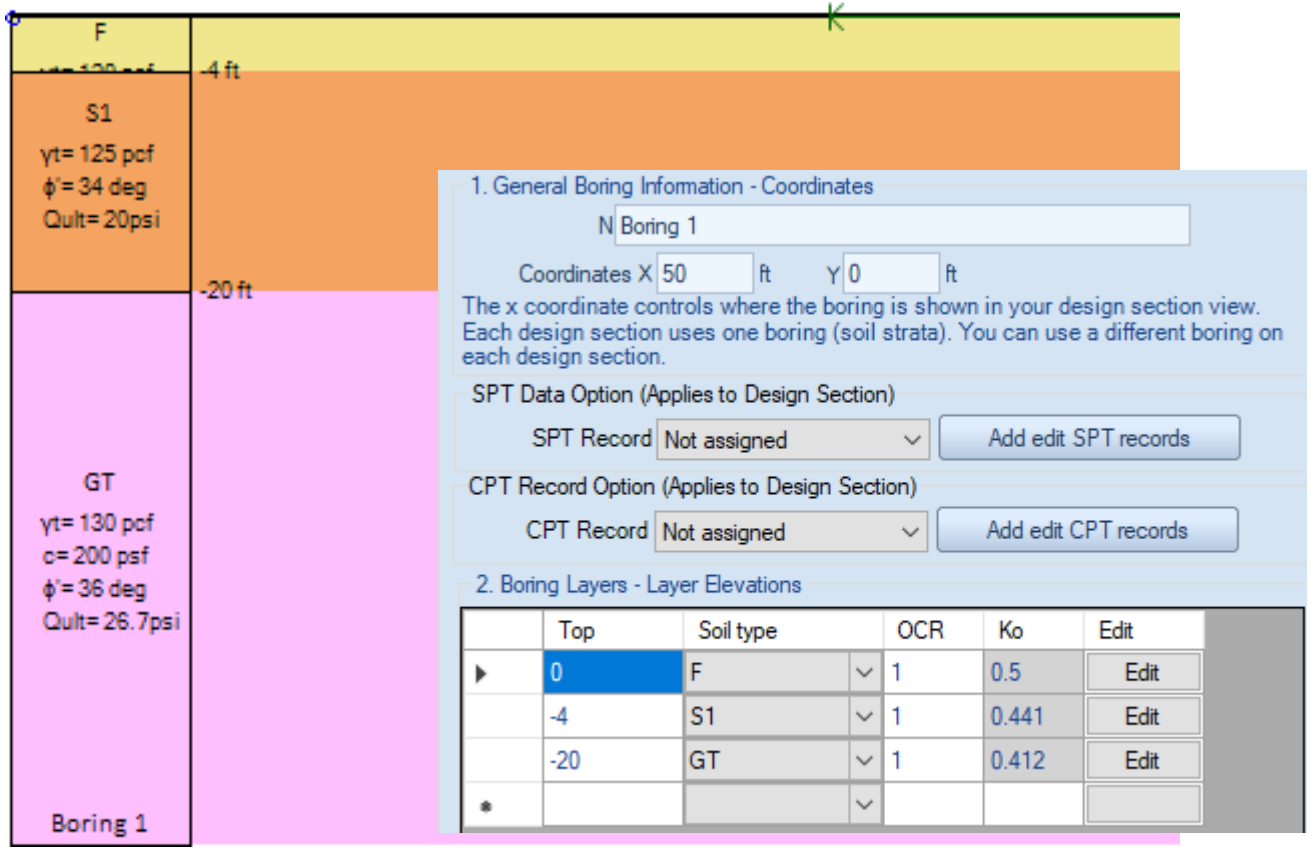


Initial Slope Surface Search Method:
- Automatic Search Approach

Geotechnical Design Method:
- FHWA Allowable Stress Method (GEC 7)

Structural Design Codes:
- ACI direct Method for the Shotcrete Facing
- FHWA Allowable Stress Design Equations for Steel Members

B. Soil Properties and Stratigraphy (Soil Layers)



1. General Boring Information - Coordinates

N Boring 1

Coordinates X 50 ft Y 0 ft

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

SPT Data Option (Applies to Design Section)

SPT Record Not assigned — Add edit SPT records

CPT Record Option (Applies to Design Section)

CPT Record Not assigned — Add edit CPT records

2. Boring Layers - Layer Elevations

	Top	Soil type	OCR	Ko	Edit
▶	0	F	1	0.5	Edit
	-4	S1	1	0.441	Edit
	-20	GT	1	0.412	Edit
*					

Elev. (ft)	Soil (-)	γt (pcf)	C' or Su (psf)	ϕ' (deg)
0	F - Sand	120	0	30
-4	S1 - Sand	125	0	34
-20	GT - Till	130	200	36

A. General | B. Elasto-plastic | Lateral | E. Adv.

4. Unit Weights - Density

γ_t 120 pcf > γ_{dry} 120 pcf γ' = 57.6

5. Strength Parameters and Poisson Ratio

Drained strength properties

c' 0 psf > ϕ' 30 degrees >

v 0.35 >

5. At-rest coefficients

KoNC 0.5 > nOCR 0.5 >

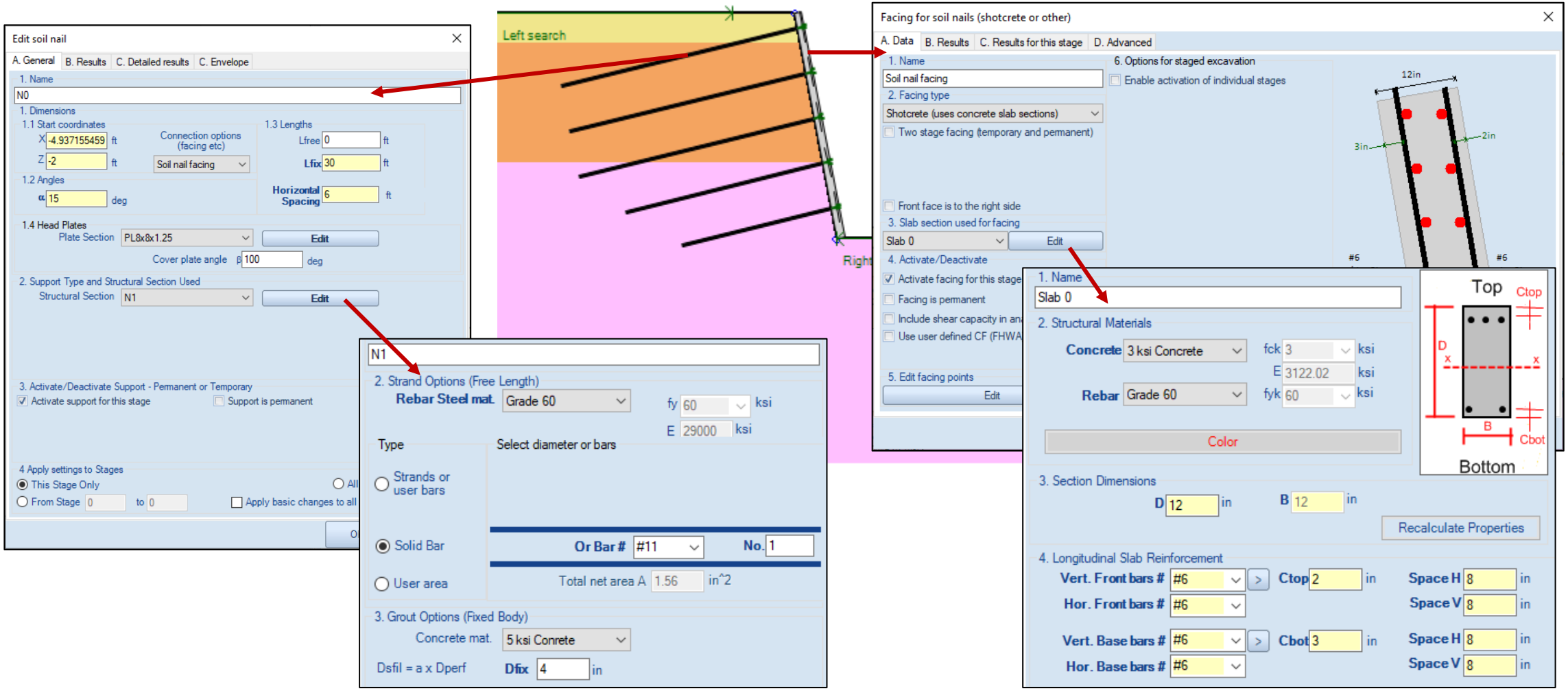
Ko = KoNC * (OCR)^nOCR

6. Ultimate bond (grouted piles when bond option is selected)

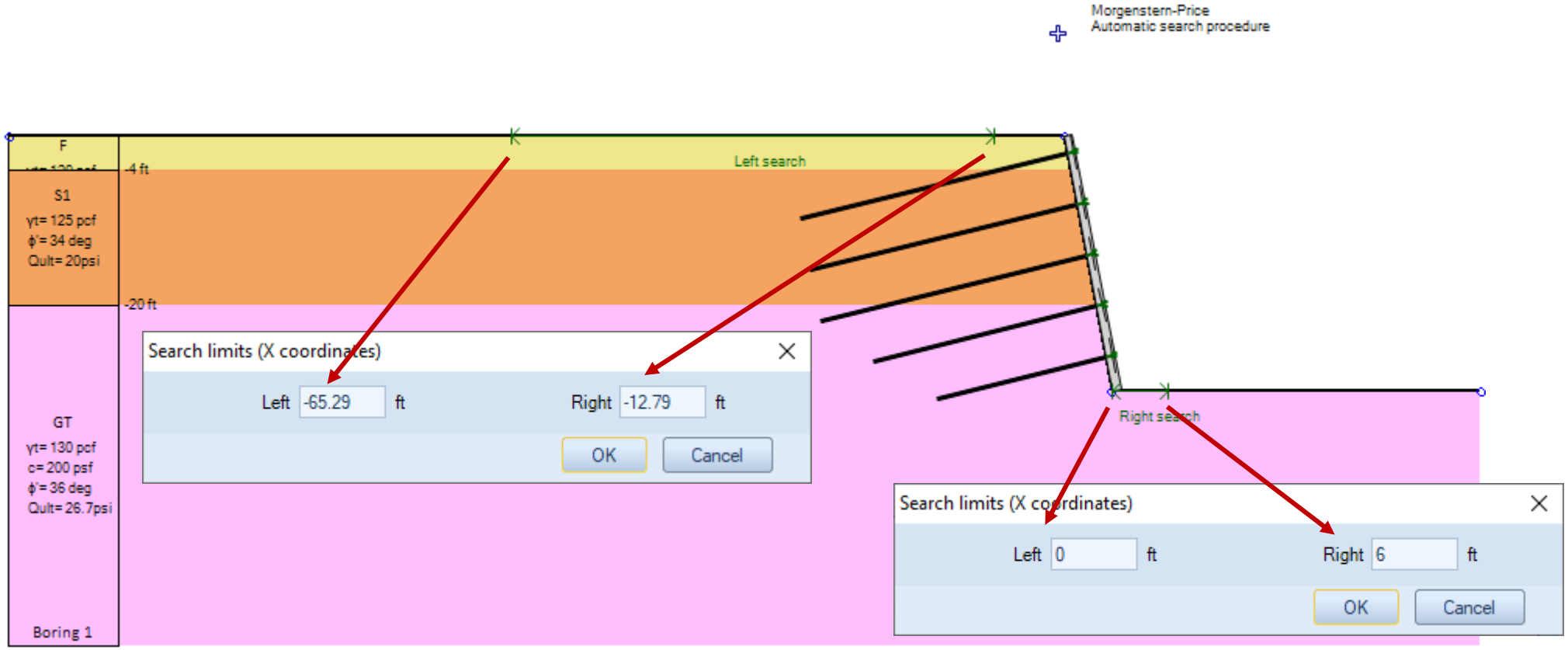
$q_{skin.u}$ 20 psi >

SnailPlus Example: Critical Slope Surface Methods

C. Structural Sections - Manual Review/Input

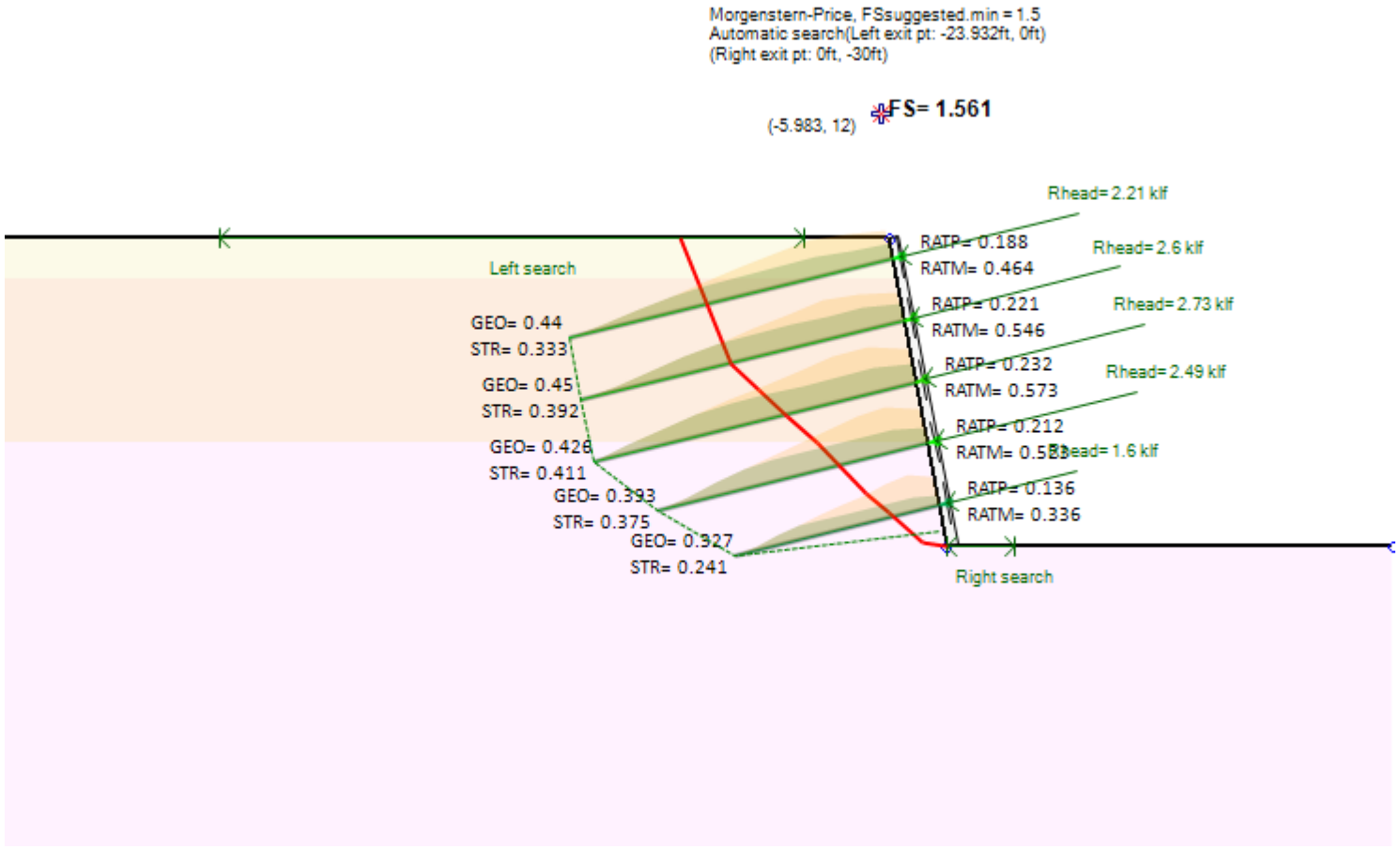


D1. Automatic Surface Search Method - Input



Automatic Surface Search Method:
SnailPlus checks non circular slope surfaces that pass from 2 predefined limits (left and right)

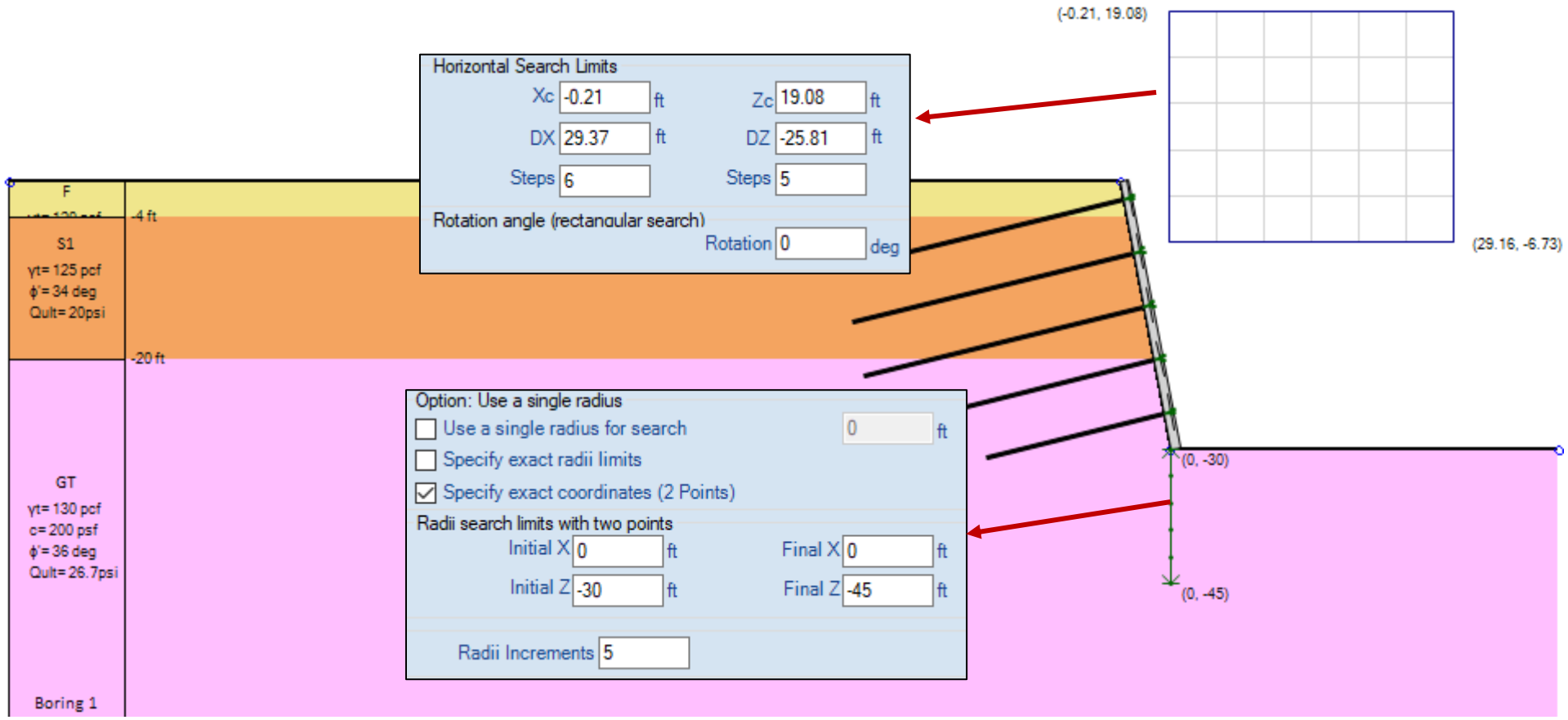
D2. Automatic Surface Search Method - Slope Stability FS



Presented Results:

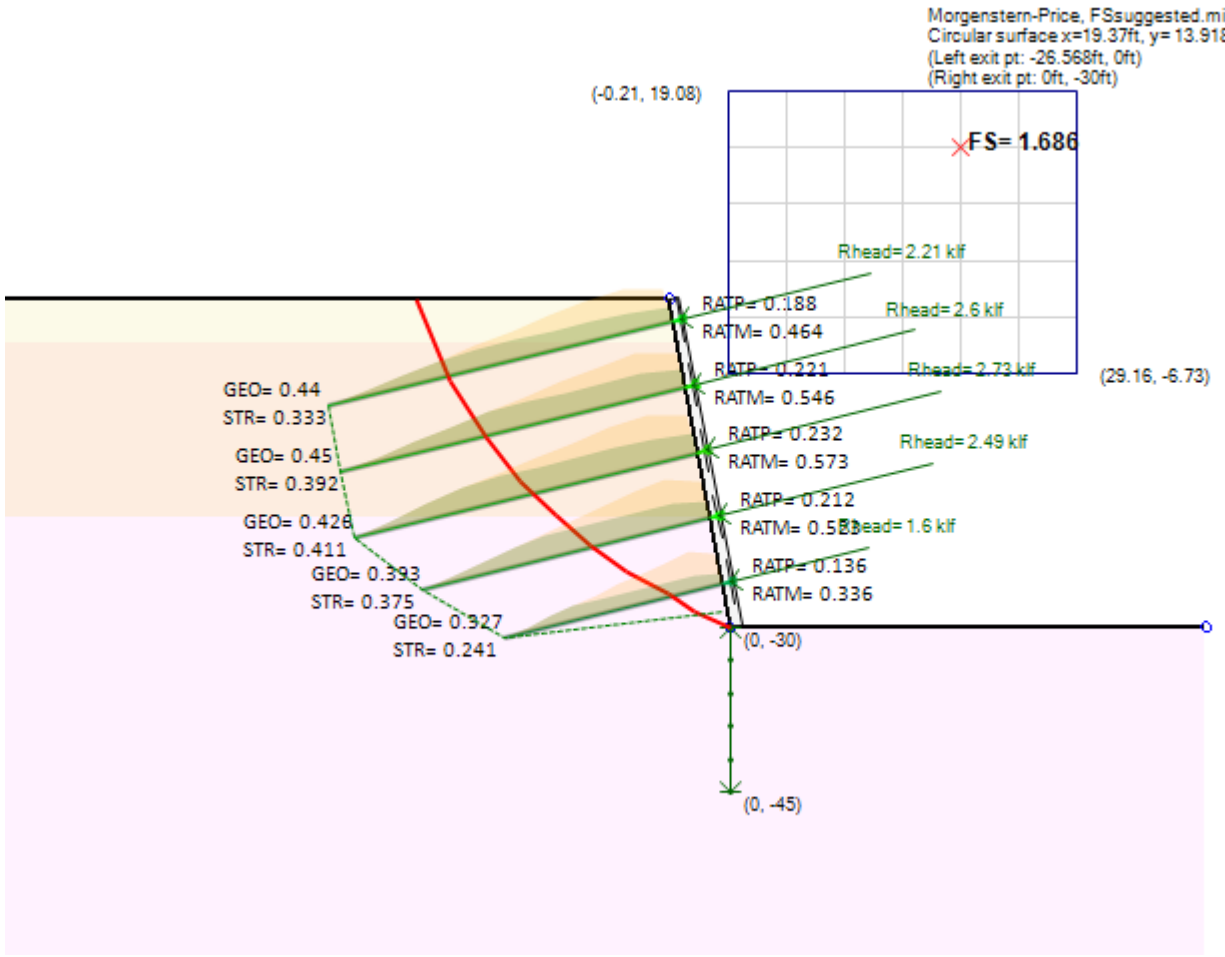
- Critical Slope Surface
- Slope Stability FS (GLE Method)
- Soil Nail Head Reactions
- Plate Punching & Moment Check Ratios
- Soil Nail Structural & Geotechnical Check Ratios

E1. Circular Surface Search Method - Input



Circular Surface Search Method:
SnailPlus checks circular slope surfaces with predefined centers and radii search limits

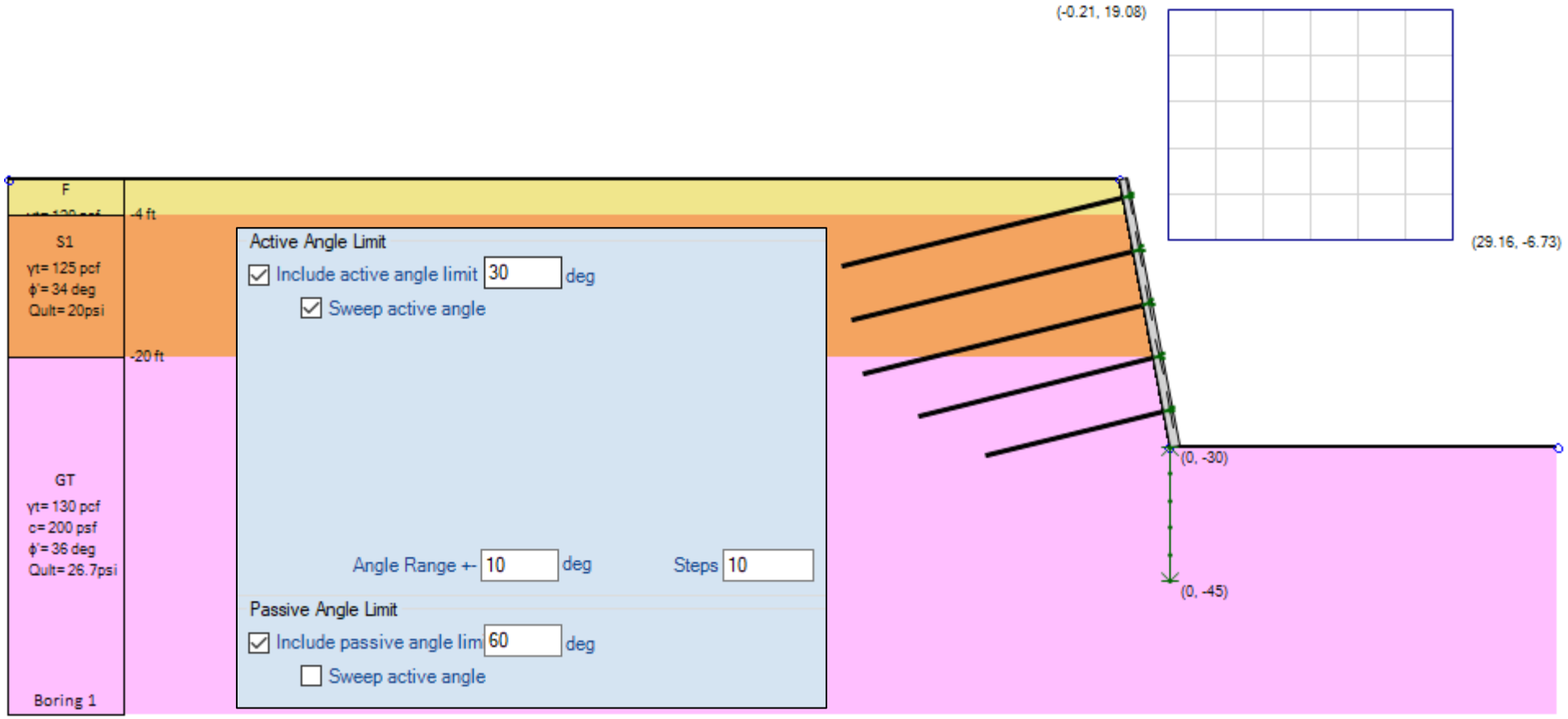
E2. Circular Surface Search Method - Slope Stability FS



Presented Results:

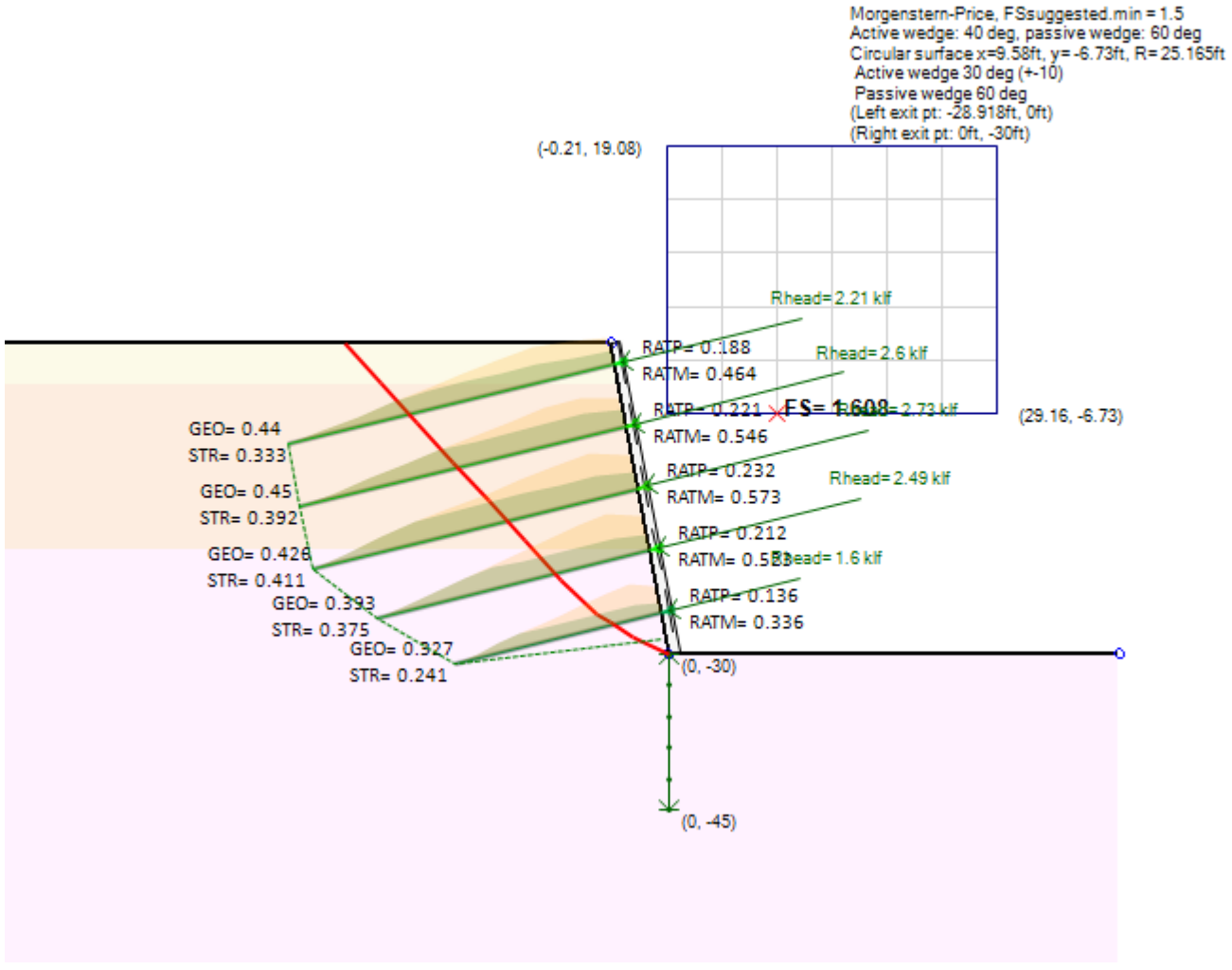
- Critical Slope Surface
- Slope Stability FS (GLE Method)
- Soil Nail Head Reactions
- Plate Punching & Moment Check Ratios
- Soil Nail Structural & Geotechnical Check Ratios

F1. Circular Surface with Wedges Search Method - Input



Circular Surface Search Method with Active/Passive Wedges:
SnailPlus checks circular slope surfaces and uses Wedges on the Active and/or Passive side

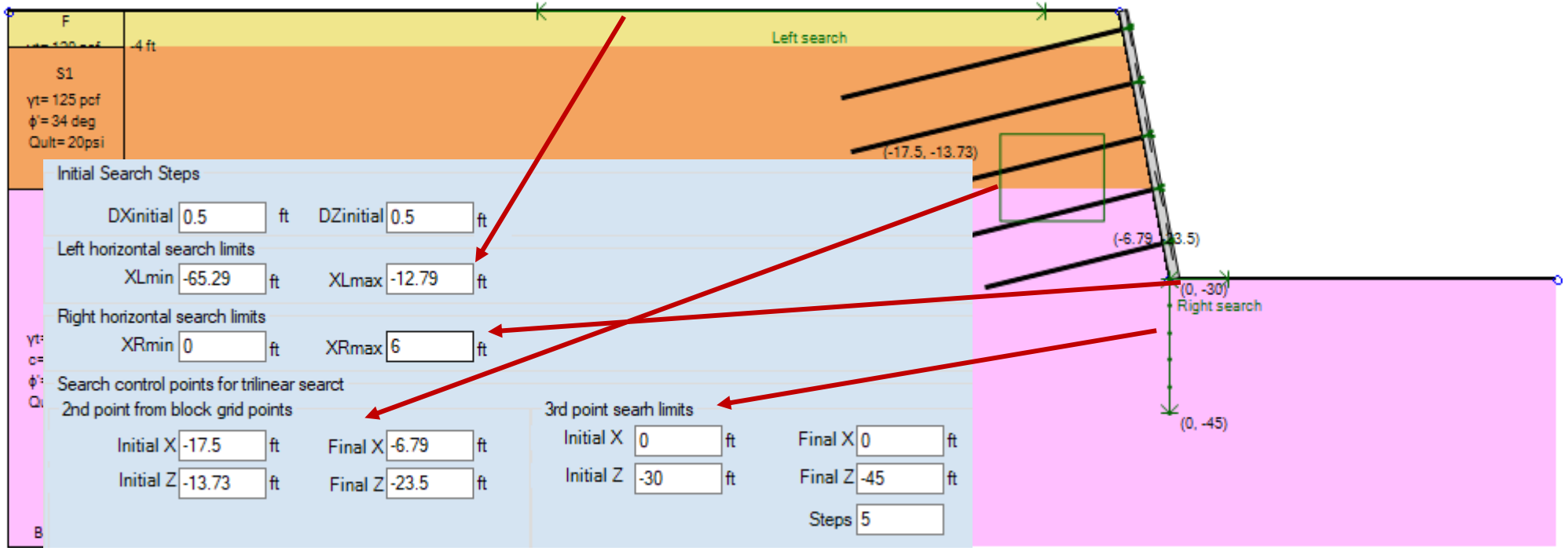
F2. Circular Surface with Wedges Search Method - Slope Stability FS



Presented Results:

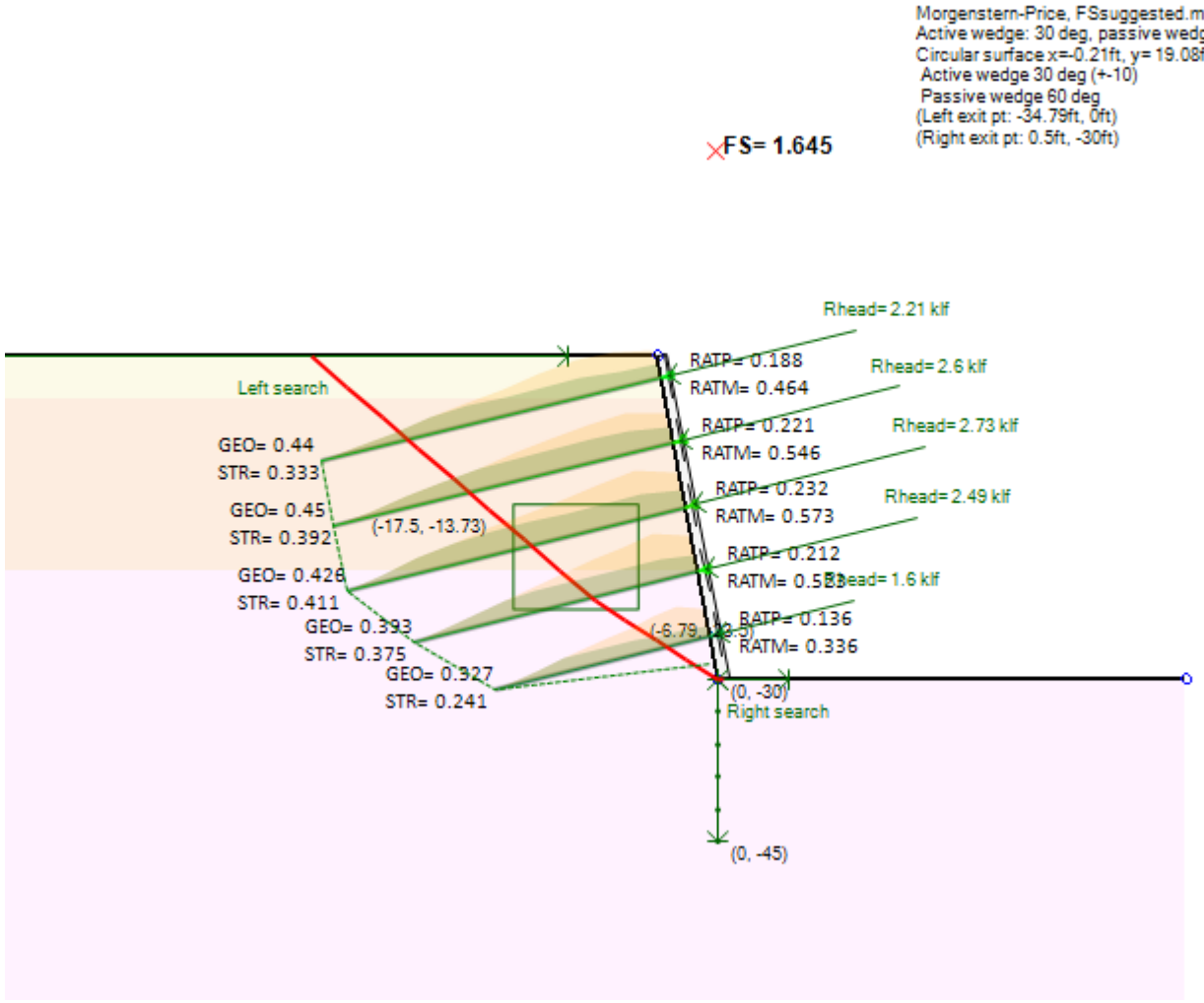
- Critical Slope Surface
- Slope Stability FS (GLE Method)
- Soil Nail Head Reactions
- Plate Punching & Moment Check Ratios
- Soil Nail Structural & Geotechnical Check Ratios

G1. Tri-Linear Search Method - Input



Tri-Linear Search Approach:
SnailPlus checks surfaces that pass from 4 points with predefined search limits

G2. Tri-Linear Search Method - Slope Stability FS



Presented Results:

- Critical Slope Surface
- Slope Stability FS (GLE Method)
- Soil Nail Head Reactions
- Plate Punching & Moment Check Ratios
- Soil Nail Structural & Geotechnical Check Ratios

H. Table Results - All Methods

Top Soil Nail & Head Plate Results for Each Method

4. Results for all stages

	Tension	Max. tension stab. analysis	Force at head Po	Max. mob. force Pmax,mc	Tension stress check	Shear stress check	Critical stress check	Tension capacity STR	Design Tension cap GEO	Crit. shear GEO	Shear C2	Shear C3	Shear C4	Shear C4 LE	Modulus ks	Lateral pressure Po	Ult. lateral pressure Pu	Length lo	IxxCalc	SxxCalc	Thickness loss	% STR loss	Moment on plate M	Plate Mres	Punching perimeter	Punching depth Dp	Punching area Ap	Ultimate punching cap PLv	Required factored load PLdes	Geotech plate cap PLgeo	Punching ratio chek RAT.Pv	Critical
Units	k	k	k	k	-	-	-	k	k	k	k	k	k	k	ksf	ksf	ksf	ft	in4	in3	in	%	k-ft	k-ft	in	in	ft2	k	k	k		Mode
0: Stage 0	19.31	33.46	13.25	17.31	0.333	0	0.44	84.24	39.36	0	Not in...	Not in...	Not in...	Not in...	N/A	N/A	N/A	N/A	0.19	0.28	N/A	N/A	2.5365...	5.46875	67.863	8.966	2	99.98	12.52	N/A	0.188	GEO
1: Stage 1	15.83	37.69	13.25	17.31	0.333	0	0.44	84.24	39.36	0	Not in...	Not in...	Not in...	Not in...	N/A	N/A	N/A	N/A	0.19	0.28	N/A	N/A	2.5365...	5.46875	67.863	8.966	2	99.98	12.52	N/A	0.188	GEO
2: Stage 2	16.81	34.04	13.25	17.31	0.333	0	0.44	84.24	39.36	0	Not in...	Not in...	Not in...	Not in...	N/A	N/A	N/A	N/A	0.19	0.28	N/A	N/A	2.5365...	5.46875	67.863	8.966	2	99.98	12.52	N/A	0.188	GEO
3: Stage 3	11.6	34.36	13.25	17.31	0.333	0	0.44	84.24	39.36	0	Not in...	Not in...	Not in...	Not in...	N/A	N/A	N/A	N/A	0.19	0.28	N/A	N/A	2.5365...	5.46875	67.863	8.966	2	99.98	12.52	N/A	0.188	GEO

Shotcrete Facing Results for Each Method

	Lh (ft)	Lv (ft)	Mxx.Nail(B (k-ft/ft)	Mxx.Span((k-ft/ft)	Myy.Nail(B (k-ft/ft)	Myy.Span((k-ft/ft)	Mcap.Nail: (k-ft/ft)	Mcap.Spar (k-ft/ft)	Mcap.Nail: (k-ft/ft)	Mcap.Spar (k-ft/ft)	Vxx (k-ft/ft)	Vyy (k-ft/ft)	Vcap (k-ft/ft)
0	6	6	-1.691	1.256	-1.691	1.256	23.717	22.611	23.509	20.012	1.208	1.208	11.831
1	6	6	-1.691	1.256	-1.691	1.256	23.717	22.611	23.509	20.012	1.208	1.208	11.831
2	6	6	-1.691	1.256	-1.691	1.256	23.717	22.611	23.509	20.012	1.208	1.208	11.831
3	6	6	-1.691	1.256	-1.691	1.256	23.717	22.611	23.509	20.012	1.208	1.208	11.831

Stage 0: Automatic Search Method
Stage 1: Circular Search Method
Stage 2: Circular Search with Wedges Method
Stage 3: Tri-linear Search Method

Thank You!

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